EXPLORING THE IMPACT OF A PROPOSED MONETARY UNION AND EXCHANGE RATE INDICES ON INTERNATIONL TRADE

By

ATEF ALRASHIDI

Bachelor of Arts in Economics
King Saud University
Qassim, Saudi Arabia
2000

Master of Science in Economics
University of Illinois at Urbana-Champaign
Urbana-Champaign, Illinois
2004

Master of Science in Economics
Syracuse University
Syracuse, New York
2006

Submitted to the Faculty of the
Graduate College of the
Oklahoma State University
in partial fulfillment of
the requirements for
the Degree of
DOCTOR OF PHILOSOPHY
July, 2012

EXPLORING THE IMPACT OF A PROPOSED MONETARY UNION AND EXCHANGE RATE INDICES ON INTERNATIONL TRADE

Dissertation Approved:

Dr. Bidisha Lahiri

Dissertation Adviser

Dr. Jim Fain

Dr. Jaebeom Kim

Dr. Shida Henneberry

Outside Committee Member

Dr. Sheryl A. Tucker

Dean of the Graduate College

TABLE OF CONTENTS

Chapter II Page

Are Trade-Weighted Exchange Rate Indices better than a Simple Real Exchange Rate in Explaining National Output?

LIST OF TABLES

LIST OF FIGURES

Figure Page

CHAPTER I

Exploring the Effects of a proposed Monetary Union on International Trade: the Case of the Gulf Cooperation Council

Abstract

The last two decades have witnessed growing numbers of economic integrations between countries with different degrees of economic convergence. One of the main objectives behind the increase in the number of some form of economic union is to increase trade and economic activities among member countries to attain better welfare. In this study we extend the augmented gravity model by including the exchange rate volatility to investigate the effect of a proposed monetary union on bilateral trade using data for years 1990 through 2009. Findings show evidence that a monetary union will increase the probability of intra-trade, and the reduction in exchange rate volatility between groups of countries due to the monetary union would have nearly the same effect of trade creation and trade diversion. More importantly, the exchange rate variable confirms the negative relationship between currency fluctuations and world trade activities.

Key Words: Monetary union, International trade, Exchange rate, Gravity model.

I.1. Introduction

The increase in economic integration between countries has encountered plenty of obstacles, including the aspiration from each member to have power over the economic decisions (e.g., monetary policies and the maintenance of control over the tax revenues). However, the last two decades have witnessed growing numbers of economic integrations between countries with different degrees of economic convergence. Many countries have reached a very advanced level of integration, such as the European Monetary Union with 27 member states where 17 share one currency (the Euro). Some countries have an advanced level of economic integration but less than the Euro area level of convergence. Those countries have accomplished several stages of economic integration such as a free trade agreement, customs union, and common union and have proposed a monetary union to be reached in the next few years, for example the East African Community (EAC) with 5 countries to reach a common currency in 2012, the Southern African Development Community (SADC) with15 countries, and the Gulf Cooperation Council (GCC), which includes six Arab countries. Others may have partial economic integration to reduce or eradicate trade barriers with their trading partners via trade agreements such as the North American Free Trade Agreement (NAFTA), the Association of Southeast Asian Nations (ASEAN), and the Union of South American Nations (USAN)[1].

One of the main objectives behind the increase in the number of some form of economic union is to increase trade and economic activities among member countries to attain better welfare. However, the question that should be answered is whether economic integrations always increase trade or whether they might hurt the member countries.

[1] See Appendix I.9.2 for more Free Trade Agreement areas

In this study I will investigate the impact of one of the world's proposed monetary unions on trade. To do this, I must start with the general investigation of the effect of exchange rate fluctuation on international trade. The inter-temporal trends of these two variables are presented in Figures 2 and 3.

I extend the recent model developed by Helpman, Melitz, & Rubinstein (HMR) by including the exchange rate volatility in order to study its impact on bilateral trade.

The Gulf Cooperation Council (GCC) is one of the most important proposed monetary unions since the European Monetary union. Since 1981 the GCC countries (Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates) have been working on achieving a one-currency union to be announced before 2015. The GCC countries have become more economically integrated, which will eventually lead to political integration. This economic integration is being reached through several stages: First the free trade, followed by a customs union, common market, and monetary union, and finally the currency union.

According to economic theory, the monetary union benefits the member countries in several ways. For instance, it eliminates exchange rate volatility, enhances trade among the member and non-member countries, and attracts more firms to invest between countries because there is no uncertainty caused by currency fluctuation and because of the absence of transaction costs.

It is very important to study the relationship between monetary unions and trade, particularly for the group of countries that possesses almost half of the world's oil reserves. Although much theoretical literature argues that the GCC monetary union will

have significant advantages for all GCC members through the creation of a true common market for goods and services and for capital and labor and through security and political integration, those theoretical suppositions need to be empirically investigated.

This paper is organized as follows. In section 2, I discuss the economic structures and the importance of the integration in the GCC countries. In section 3, I review some of the relevant literature. In section 4, I discuss the model specification. In section 5, I describe the data. In section 6, I present all estimation results. Section 7 then concludes the paper.

I.2. Economic Structures and Integration in the GCC Countries

In May 1981 the leaders of Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and United Arab Emirates, announced the achievement of a cooperative framework connecting the six countries to work in coordination for mutual benefit and their common interests with complete economic integration as an ultimate objective. The Gulf Cooperation Council (GCC) countries are pursuing economic integration through several stages. The first stage was in 1983 when the GCC countries announced their free trade agreement, followed by the second stage, which was the customs union in 2003; the third stage was a common market, announced by the end of 2007, and in 2009 four of the GCC countries (Bahrain, Kuwait, Qatar, and Saudi Arabia) announced the creation of a Monetary Council as a step toward launching a common currency, while Oman and the United Arab Emirates postponed their accession until further notice.

As an important step towards the preparation of a single currency, which was officially announced as an approved objective at the Economic Agreement in 2001, the GCC

members agreed to peg their currency to the U.S. dollar in order to continue economic stability and strengthen confidence in their economies.

There are mutual characteristics among the GCC states that contribute positively toward the integration, such as a common language and culture, shared borders and political history, and budget surpluses form rising oil prices. On the other hand, some other common features might present challenges to their economies, such as their heavy dependence on oil revenues, the rapid growth of a young labor force of both men and women, and the heavy reliance on foreign labor in most of the private sectors.

The GCC countries are considered big players in the world financial markets not just because they hold more than 36% of world's total crude oil reserves but because of their reinvestment of oil revenue in global financial assets, leading to a positive contribution to the stabilization of the world economy.

The GCC economies have been experiencing significant growth rates associated with the increases in oil prices. For example, in 2001 the nominal gross domestic product (GDP) for GCC members combined was US$ 375 billion, while in 2008 the GDP for all GCC countries accounted for more than US$ 1100 billion, exceeding Australia and more than two thirds of Canada's GDP (Figure 1). Among GCC countries, Saudi Arabia is the largest, with the highest GDP and more than two thirds of the GCC's total population. The second largest country in terms of nominal GDP and population is the United Arab Emirates. On the other hand, Qatar has the highest GDP per capita (US$ 79,409) and the

United Arab Emirates is second (US$ 66,074), while Saudi Arabia has the lowest (US$ 18,495)[2].

Although the increase in oil prices has contributed significantly to GCC countries' budget revenues, which have led to more investment in physical infrastructure, education and the countries' overall development, it is suggested that inflation in the GCC states is linked to the increase in oil prices (Mohaddes & Williams 2011). In 2008, the inflation rate was about 10% in Saudi Arabia, more than 15% in Qatar, and exceeded 12% in both Oman and the United Arab Emirates[3].

Despite the fact that oil is a non-renewable resource and that some GCC countries such as Bahrain and Oman might run out of oil within the next two decades[4], economic diversification in GCC countries has potential limits. Oil revenue is the most important factor in the GCC countries' economic development and most other industries are petroleum derivatives, such as petrochemical industries, refineries, and other related industries which cannot ease market pressures and fulfill the demand of the growing labor force.

GCC economies have been traditionally open and more recent improvements have been introduced: for example all GCC countries are members of the World Trade Organization; more financial deregulation has been implemented, resulting in many international banks and multinational corporations incoming to the market; and free trade agreements between GCC states and some countries are under negotiation.

[2] See Table I.A and I.B for detailed data
[3] Inflation is calculated based on Average consumer prices (percent change). See, for example inflation in Table I.C.
[4] According to BP statistical Review of World Energy 2007

I.3. Literature Review

A number of studies have investigated the relationship between economic integration and international trade. Rose (2000) investigates the effect of a common currency union on international trade using an augmented gravity model for 186 countries with an essentially cross-sectional approach for five years spanning 1970 through 1990. His results show a large positive relationship between a currency union and international trade. The effect of a currency union on international trade is statistically significant and indicates that two countries that share the same currency tend to trade three times as much as they would without the same currency.

Glick & Rose (2002) estimate the time-series effect of currency union membership on international trade using a large data set for 217 countries covering the period from 1984 through 1997. During this period some countries joined monetary unions while others left their monetary union. Using an augmented gravity model and after controlling for many other influences, they find statistically significant results, implying that the bilateral trade for two countries which joined a currency union was almost doubled while a pair of countries which left a currency union experienced almost a halving of bilateral trade.

Anderson & Wincoop (2003) show that the estimate of traditional gravity equation is biased due to omitted variables. They include a form of multilateral resistance, which refers to the average trade barrier. They develop a method that is more efficient and consistent using a theoretical gravity model to estimate the impact of

national borders on international trade. They use state-province data for the United States and Canada and 20 other industrialized countries. In their findings they show that national borders reduce trade between countries by 20% to 50%.

Yeyati (2003) investigates the impact of a common currency union on bilateral trade using a gravity model introduced by Rose (2000) with further adjustment to the model. Yeyati's study incorporates the distinction between a multilateral common currency, where a group of countries form a currency union, and a unilateral common currency, where one country adopts a foreign currency, such as dollarization. Yeyati finds a significant impact of currency union on trade and compares his findings to those of Rose and van Wincoop (2001) to show that the impact of a common currency on trade is smaller for multilateral common currency countries than for unilateral common currency countries.

Persson (2001) argues that the outcomes in Rose's (2000) study might be biased because of two factors. First, two countries adopting a currency union might not be randomly selected since the characteristics determining the costs of trade are very different for countries that share a common currency from those who do not share a common currency. Second, it is quite possible that some explanatory variables have a non-linear effect. Persson then suggests an alternative methodology called a *matching* approach and finds that a common currency union will increase trade by about 66 %.

Tenreyro (2001) examines the roles of several variables such as cultural similarity, geography, colonial links, size, and economic shocks as determinants of monetary union. She argues that using simple OLS regression to study the impact of a

monetary union might have biased estimates due to an omitted variable problem. In addition, she stresses the sample selection problem[5] in previous studies such as Rose (2000). To resolve these issues, she estimates the determinants of a currency union and then reexamines the effect of the currency union on trade. To correct the problem of zero trade observations, she uses aggregate flows over five years. Tanreyro's finding suggests that her correction reduces the estimated impact of a currency union on trade from approximately 200% to 100%.

Al-Shammary (2007) follows Rose and Wincoop's (2001) approach using an augmented gravity equation to study the impact of a monetary union on trade in Gulf Cooperation Council countries using aggregate and disaggregate trade data for the period from 1990 to 2005. In his finding, the monetary union has a negative impact on aggregate trade and on some sectors that require some degree of processing. As in previous studies, Al-shammary experiences selection bias and heterogeneity problems in his study.

Helpman, Melitz, and Rubinstein (2008) introduced a developed model of international trade that extends the traditional gravity equation to correct for sample selection problems and for the unobservable number of exporting firms. They suggest a two-stage estimation technique and find that estimates using the traditional gravity model are biased due to the omission of the extensive margin (number of exporter) rather than to the selection.

[5] In Rose (2000), the impacts of currency union estimates were based on a sample of countries with positive bilateral trade. Pairs of countries with zero trade flows were excluded from the sample due to the log-specification.

I.4. Empirical Specifications

McCallum (1995) estimated the following gravity equation:

$$lnx_{ij} = \beta_1 + \beta_2 ln\, Y_i + \beta_3 lnY_j + \beta_4 ln\, d_{ij} + \beta_5 \vartheta_{ij} + \upsilon_{ij} \quad (1)$$

Where x_{ij} is exports from region i to region j, Y_i and $Y_{ij}$are gross domestic production in regions i and j, d_{ij} is the distance between regions i and region j, and ϑ_{ij} is a dummy variable equal to one for interprovincial trade and zero for state-province trade.

Anderson & Wincoop (2003) developed a method that is more efficient and consistent by modifying the model in a simple symmetric form, relating bilateral trade to size, bilateral trade barriers, and multilateral resistance variables to estimate a theoretical gravity equation that incorporates the comparative statics of trade frictions. Then they used their method to solve the McCallum border puzzle. After they derived the gravity equation from the theoretical model, it can be generalized as the following:

$$lnx_{ij} = \beta_1 + \beta_2 ln\, Y_i + \beta_3 lnY_j + \sum_{m=1}^{M} \beta_m ln\left(z_{ij}^m\right) + \upsilon_{ij} \quad (2)$$

Where x_{ij} is the volume of bilateral trade flow from country i to country j, Y_i and $Y_{ij}$are the GDP of importer i and exporter j, z_{ij}^m $(m = 1, \dots, M)$ is a vector of the observable trade barriers which can be alternatively proxied by country-fixed effects. The coefficient β_m captures the effect of trade barriers on the trade volume.

The later gravity model has been investigated in many empirical studies and such investigations have resulted in two main concerns. The first concern is that the traditional gravity equation assumes symmetric trade volumes between trading partners while trade

data shows many asymmetric trading relations. Secondly, the traditional gravity model ignores the zeros in the trade matrix, whereas the data show that more than fifty percent of the bilateral trade volumes are zero (See Figure 4). Disregarding the zeros in the trade matrix will cause the selection bias problem.

Helpman, Melitz, and Rubinstein (2008) argue that disregarding countries that do not trade with each other will result in giving up significant information in the data and produce biased estimates. To correct these biases, they develop a theory that predicts positive as well as zero trade flows between countries and use the theory to derive estimation procedures that use the information contained in data sets of trading and non-trading countries identically. They contribute to the traditional gravity equation by solving the selection bias problem occurring from omitting zero bilateral trade and the heterogeneity bias.

The development of the gravity model by Helpman, Melitz and Rubenstein (HMR) (2008) helps us reconsider the significance of estimating this model.

The HMR model in a general log form is

$$m_{ij} = \beta_0 + \lambda_j + \chi_i - \gamma d_{ij} + w_{ij} + u_{ij} \quad (3)$$

Where m_{ij} is the natural logarithm value of country i's imports from j (bilateral trade flows), λ_j is a fixed effect of the exporting country and $\chi_i$is the fixed effect of the importing country, d_{ij} is the natural logarithm of the distance between countries $i\ and\ j$; w_{ij} is an unobservable monotonic function which controls for the fraction of firms that export from j to i,

$W_{ij} = max\left\{(\frac{a_{ij}}{a_L})^{k-\epsilon+1} - 1,0\right\}$ and u_{ij} is the normal distributed error term.

The theoretical model outlined below incorporates firm heterogeneity and addresses both the selection problem and the issue of asymmetric bilateral trade flows.

Firm Export Selection

Given that a country-pair with fewer trade barriers might be selected to export, the trade may take a unidirectional flow. That depends on the number of exporting firms in exporting countries. In order to avoid the heterogeneity bias, we have to control for the fraction of exporters. If some fraction of firms in any country chooses to export, these firms have to produce enough to meet the zero-profit condition.

Let the ratio of the variable export profits of the most productive firm (with productivity$\frac{1}{a_L}$) to the fixed export costs for exports from j to i be represented by Z_{ij}. Country i will export to country j only if $Z_{ij} > 1$.

$$Z_{ij} = \frac{(1-\alpha)(P_i\frac{\alpha}{c_j\tau_{ij}})^{\varepsilon-1}Y_i a_L^{1-\varepsilon}}{c_j f_{ij}} \quad (4)$$

Where α is elasticity of demand, c_i is the country specific cost and a per unit firm-specific marginal cost, $\tau_{ij}$is transportation costs, Y_i is the income of country i, and P_i is the price index of country i.

Assume that f_{ij} are stochastic fixed costs due to unmeasured i.i.d friction $v_{ij}\sim N(0,\sigma_v^2)$ that may be correlated with u_{ij} and defined as follows:

$$f_{ij} \equiv \exp\left(\phi_{EX,j} + \phi_{IM,i} + \kappa\phi_{ij} - v_{ij}\right) \quad (5)$$

Where $\phi_{EX,j}$ is a measure of fixed export costs common across all export destinations, $\phi_{IM,i}$ is a fixed trade barrier imposed by the importing country, and ϕ_{ij} is an observed measure of any additional country-pair specific fixed trade costs.

Now we can express Z in a logarithm term[6]:

$$z_{ij} = \gamma_0 + \xi_j + \zeta_i - \gamma d_{ij} - \kappa\phi_{ij} + \eta_{ij} \quad (6)$$

Where:

z_{ij} is an unobserved variable but we can observe the presence of trade flows. Therefore, $z_{ij} > 0$ when j exports to i, $z_{ij} = 0$ when it does not. Moreover, the value of z_{ij} affects the export volume. ξ_j is an export fixed effect. ζ_i is an imoprt fixed effect. d_{ij} represents the distance bewteen country i and j. and $\gamma d_{ij} - u_{ij} \equiv (\varepsilon - 1) ln\, \tau_{ij}$.

ϕ_{ij} is an observed measure of any additional country-pair-specific fixed trade cost.

Define the indicator variable T_{ij} to equal 1 when country j exports to to i and 0 when it does not. Let p_{ij} be the probability that j exports to i, conditional on the observed variables

$$p_{ij} = \Pr\left(T_{ij} = 1 \middle| observed\ variables\right) = \Phi(\gamma_0^* + \xi_j^* + \zeta_i^* - \gamma^* d_{ij} - \kappa^* \phi_{ij}) \quad (7)$$

[6] See Appendix I.9.1for the HMR model derivation.

Where $\Phi(\gamma_0^* + \xi_j^* + \zeta_i^* - \gamma^* d_{ij} - \kappa^* \phi_{ij})$ is the cdf of the unit-normal distribution, and every standard coefficient represents the original coefficient divided by the standard deviation σ_η.

The equation after the transformation is:

$$m_{ij} = \beta_0 + \lambda_j + \chi_i - \gamma d_{ij} + \ln\{\exp[\delta(\hat{z}_{ij}^* + \hat{\eta}_{ij}^*)] - 1\} + \beta_{u\eta}\hat{\eta}_{ij}^* + e_{ij} \quad (8)$$

m_{ij} the value of country i's imports from j (bilateral trade flows). λ_j is a fixed effect of the exporting country and $\chi_i$is the fixed effect of importing country.

$\beta_{u\eta} \equiv corr(u_{ij}, \eta_{ij})(\frac{\sigma_u}{\sigma_\eta})$ and $e_{ij}$is an i.i.d. error term.

The final consistent estimation equation is:

$$\begin{aligned} Trade_{ijt} = {} & \beta_0 + \beta_1 \ln(Y_i Y_j)_t + \beta_2 \ln(dist_{ij}) \quad + \beta_3(FTA_{ij})_t + \beta_4(CU_{ij})_t \\ & + \beta_5(VEX_{ij})_t + \beta_6(GCC_{ij})_t + \beta_7(GCC_{ij})_t(EX_{ij})_t + \beta_8(GCC_{ij}^*)_t \\ & + \beta_9(GCC_{ij}^*)_t(EX_{ij})_t + \beta_{10}(language_{ij}) + \beta_{11}(Border_{ij}) \\ & + \beta_{12}(Island_{ij}) + \beta_{13}(landlock_{ij}) + \beta_{14}(Religion_{ij}) + \beta_{15}(WTO_{ij})_t \\ & + \lambda_i + \chi_j + \gamma_t + \ln\{\exp[\delta(\hat{z}_{ij}^* + \hat{\eta}_{ij}^*)] - 1\} + \beta_{u\eta}\hat{\eta}_{ij}^* + e_{ijt} \end{aligned} \quad (9)$$

Where $Trade_{ij}$ is the logarithm of the export volume from country i to country j in current US dollars. Y_i and $Y_j$denotes the GDP in country i and country j respectively, $dist_{ij}$ is the distance between country i and country j, FTA_{ij} is an indicator variable that is equal to one if country i and country j have a regional trade agreement and is zero

otherwise, CU_{ij} is a dummy variable that is equal to one if country i and country j use the same currency and zero otherwise, and VEX_{ij} is the volatility of the nominal exchange rate between country i and country j at period t. The variable GCC_{ij} is an indicator variable that is equal to one when both countries are members of the Gulf Cooperation Council Monitory Union. GCC_{ij}^{*} is one when one country belongs to the GCC monetary union but not the other country; $(GCC_{ij})(EX_{ij})$ is an interaction term between the GCC binary variable and the exchange rate volatility which captures the exchange rate volatility in GCC countries; $language_{ij}$ represents a binary variable that is equal to one if country i and country j share the same language and zero otherwise; $Border_{ij}$ is a binary variable that is equal to one if country i and country j share a border and zero otherwise; $Island_{ij}$ is a binary variable that takes a value of one if either one or both countries are an island and is zero otherwise; $landlock_{ij}$ is an indicator variable that is equal to one if either one or both countries are landlocked and is zero otherwise; $Religion_{ij}$ represents the percentage of people who are members of a religion in country i and country j and is calculated as {(% Catholics in country i · Catholics in country j)+(% Muslims in country i · Muslims in country j)+(% Protestants in country i · Protestants in country j)}. WTO_{ij} is a binary variable that is one if country i and country j are members of the WTO and zero otherwise; $\lambda_i$represents a multilateral resistance variable that is one if country i is the exporter and zero otherwise; χ_j represents a multilateral resistance variable that is one if country j is the importer and zero otherwise. $\gamma_t$represents time trend effects, and e_{ij} is an error term.

I.5. Data Sources

In my empirical study, I investigate the effect of a proposed monetary union on trade using data for 165 countries for years 1990 through 2009. Annual data on the volume of bilateral trade is obtained from the International Monetary Fund database (Direction of Trade Statistics) measured in current U.S. dollars. For the variable Gross Domestic Product (GDP) data I use World Development Indicators (WDI) from the World Bank. GDP is measured in current U.S. dollars.

Data on language comes from three sources: the CIA World Fact Book, the CEPII[7]and Ethnologu: Languages of the World[8].

Data for the variables Border, Island, Landlocked, and bilateral Distance, calculated using a Great Circle distance algorithm, are compiled using three sources: the CEPII, the CIA World Fact Book and the World Bank.

Religion Data is obtained from the CIA World Fact Book and the Association of Religion Data Archives[9].

Information about the regional free trade agreements and WTO member variables are created from four sources: Table 3 of Baier & Bergstrand (2007), qualitative information contained in Frankel (1997), and the World Trade Organization's website[10]; for the

[7] http://www.cepii.fr/welcome.htm
[8] http://www.ethnologue.org
[9] http://www.thearda.com/
[10] http://www.wto.org/english/tratop_e/region_e/summary_e.xls

United States free trade agreements data, I use the US International Trade Administration web site[11]

The exchange rate volatility between two countries i and j in year t is measured using the standard deviation of the first difference of the logarithm of the monthly nominal exchange rates $\varepsilon x_{ijt,m}$ between the two countries[12]:

$$Volatility_{ijt} = stand.dev\left[ln\left(\varepsilon x_{ijt,m}\right) - ln\left(\varepsilon x_{ijt,m-1}\right)\right], \quad m = 1 \dots 12.$$

Data on the monthly bilateral nominal exchange rates are obtained from the IMF's *International Financial Statistics* CD-ROM.

I.6. Empirical Results

In this study I investigate the impact of the proposed monetary union in GCC countries on trade. Tables 1- 4 show the empirical results. The first column in Table1 provides the basic gravity estimate results for the pooled data that ignore the zero trade bias and firm heterogeneity problem because I use it as benchmark estimation and test the traditional gravity model. The second column shows the results where both country and year fixed effects are being introduced, similar to the Anderson-Wincoop approach. Columns (III) and (IV) in Table 1 correct for the selection bias using the standard Heckman method. Columns (V) and (VI) account for firm heterogeneity, which corrects for both selection bias and asymmetric bilateral trade, following the HMR technique.

[11] http://export.gov/FTA/cafta-dr/index.asp
[12] see Tenreyro S. (2007)

From Table 1, Column I, most of the variable's coefficients for the traditional gravity equation are statistically significant and present the expected signs. According to the results, the increase in overall bilateral trade between two countries is associated with the increase in the gross domestic product with a positive sign and is statistically significant in all models. Exchange rate volatility has a negative impact on overall bilateral trade, as expected from economic theory; however, the coefficient is not significant in the pooled data. The results show that one country will export more to another when they are physically near each other, they share same border, they have colonial ties, they share a common language, they are both members of the World Trade Organization (WTO), at least one of them is an island, at least one of them is not a landlocked country, both countries belong to the same regional free trade agreement (FTA), and they share the same currency. Counterintuitively, religion has a negative impact on trade. The impact of sharing the same religion is negatively significant. If two countries share the same religion, the export volume decreases by 0.03 percent.

In the second column of Table 1, I introduced both country and time fixed effects, and the results are almost the same as in the first column except for the Religion variable, which now has a positive though not statistically significant impact on trade.

Next, since the traditional gravity model suffers from the zero-trade bias and firm heterogeneity problems, I extended the investigation using a two-step consistent Heckman sample selection model (see Table 1, Columns (3) and (4)) and the HMR model (see Table 1 Columns (5) and (6)) to solve the problem. For the first stage in the HMR model, I run a Probit estimation with a bivariate dependent variable T_{ijt} that takes a value of one if country i exports to country j and zero otherwise. Both models require an

excluded variable in the second stage. The exclusion restriction should meet the condition where it affects the firm's probability to export, but has no effect on the export volume of the exporting country. In previous studies that have used the same method, some different variables were suggested, such as common language, regulation costs, island, and common religion. I follow the HMR and use common religion as an exclusive variable. In Table 1 Columns (3) and (5), the religion's coefficient is statistically significant in the selection equation but not significant in the bilateral trade equation, Columns (4) and (6). This result indicates that religion has a significant impact on the probability of the export selection, but it is irrelevant after the export decision has been taken. In another words, the religion variable affects the firm's fixed trade costs but not the variable trade costs.

According to the results in Table 1, the religion variable in the Probit equation has a significant effect on the probability of exporting; therefore it satisfies the first requirement, which requires this variable to be correlated with the latent variable. In the second stage, I included the religion as a test of the second requirement, where the latent variable should not be correlated with the residual of the second stage equation. Table 1, Columns (4) and (6) show that the coefficient of religion is not significant, indicating that the religion variable is not correlated with the second stage residual, which satisfies the second requirement and supports excluding the *Religion* variable.

While Table 1 examines the eligibility of common religion as the excluded variable, in Table 2, I reran the same model specifications excluding *Religion* variable in the second stage. The results are almost the same as in Table 1.

Columns (3) and (4) in all tables represent the Heckman sample selection model, which controls for the sample selection bias, whereas the last two columns in each table provide the results of the HMR model using nonlinear least squares (NLS), where I control for unobserved firm-level heterogeneity, that is, the impact of trade resistance and country characteristics on the number of exporting firms. Comparing the last two models, in both models the signs of the coefficients are the same. What is interesting is that while the exchange rate volatility does not appear to have a significant negative impact on trade, the exchange rate volatility is found to be significant when controlling for firm heterogeneity.

In the nonlinear least square estimation, Table 2 last column, the model explains about 76 percent of the variation in data. All of the variables have the expected signs. For example, the GDP has a positive impact on bilateral trade. The exchange rate volatility has a negative sign and is statistically significant at the 5 percent level, indicating that a 10 percent increase in the exchange rate fluctuation between two countries will decrease the bilateral trade by 0.6 percent. For other variables, as expected, two countries trade more when they are closer to each other, share the same border, and have colonial ties; when neither trading partner is landlocked; and when both have a free trade agreement, speak the same language, are members of world trade organization, and share the same currency, and one of them is an island.

The key interest lies in the estimates of the proposed monetary union's variables. Tables 3 and 4 present the results after including the Gulf Cooperation Council (GCC) variables. Four variables are included to measure the effect of the proposed monetary union on trade. First I include an indicator variable (GCC) that takes a value of one if both

countries are members of the proposed monetary union and zero otherwise to look at the trade creation level among members. Another variable (GCCExch) is an interaction term between the exchange rate volatility and the GCC indicator variable to capture the exchange rate volatility among union members. The third variable is an indicator variable (GCC*) that is equal to one if a country is a member of the GCC and is zero otherwise to capture the differences in the trade behavior between GCC members and other countries. The last variable is an interaction term between the GCC* and exchange rate volatility that explains the effect of the proposed monetary union on bilateral trade between GCC countries and the rest of the world.

Comparing the results after including the four variables (see Tables 3 and 4) to my findings in Tables 1 and 2, we see almost the same results, with one more significant result for the coefficient of the exchange rate volatility variable in Tables 3 and 4.

The results in Table 4, Columns (2), (3), (4), show that the coefficient of the indicator variable GCC is statistically significant with a negative sign. This indicates that within themselves, the GCC countries trade less than the average world bilateral trade by about 31 to 34 percent. This result is not surprising since all GCC countries produce homogenous products, mainly oil and petrochemicals.

The interaction term between the exchange rate volatility and the GCC variable is statistically significant in the Probit model with an expected negative sign indicating that the elimination of exchange rate fluctuation through the formation of the monetary union increases the predicted probability of bilateral exports among the monetary union members. However, interaction term the between exchange rate fluctuation GCC variable

is not significant, showing that the effect of exchange rate volatility is not significantly different for this group of countries. Hence, any reduction in exchange rate volatility due to the monetary union would have approximately the same effect in trade creation and diversion as explained by the exchange rate volatility coefficient.

The coefficients for the indicator variable (GCC*) are statistically significant with a negative sign[13]. These results suggest that on average a GCC country member trades less with other countries compared to trade between two non-GCC countries. For example, in the last column in Table 4, the coefficient of GCC* indicates that bilateral trade between a GCC country and an outside country is 0.10 percent less than average bilateral trade. However, the GCC* indicator interacted by the exchange rate volatility is not statistically different from zero in trade equation, indicating that any reduction of exchange rate volatility achieved by the proposed monetary union will not lead to significant trade diversion effects for countries that are already trading with the GCC countries.

I.7. Conclusion

In this paper I investigate the impact of the proposed Gulf Cooperation Council monetary union on trade. I followed Helpman, Melitz, and Rubinstein's (2008) approach to test the augmented gravity equation using aggregate trade data from 1990 to 2009.

The results present significant coefficients for most of the variables with expected signs consistent with the economic theory. While I do find evidence that a monetary union will increase the probability of within-GCC trade, there is evidence that any reduction in

[13]except for the pooled data results (column 1) where the sign is positive

exchange rate volatility due to the monetary union would have nearly the same effect of trade creation and trade diversion.

The paper contributes to the previous literature by using the HMR approach to solve for the selection bias and firm-level heterogeneity problems and apply it to the case of GCC countries. In addition, the exchange rate variable adds another important factor to confirm the negative relationship between currency fluctuations and world trade activities.

I.8. References

Alesina, Alberto, and Robert J. Barro. "Currency Unions." *Quarterly Journal of Economics* 107 (May 2002): 409-436.

Alesina, Alberto, Robert J. Barro, and Silvana Tenreyro. "Optimal Currency Areas." *NBER Macroeconomics Annual* 17 (2002): 301–355.

Al-Shammary, Nayef. "On the Impact of a Single Currency on Trade, Early Evidence from the GCC Monetary Union." *Dissertation.* Syracuse University, 2007.

Anderson, James E. "A Theoretical Foundation for the Gravity Equation." *American Economic Review* 69, no. 1 (1979): 106-116.

Anderson, James E., and Eric van Wincoop. "Gravity with Gravitas: A Solution to the Border Puzzle." *American economic review* 93, no. 1 (2003): 170-192.

Anderson, James E., and Eric van Wincoop. "Trade Cost." *Journal of Economic Literature* 42 (Sep 2004): 691-751.

Baier, S. L., and J. H. Bergstrand. "Do free trade agreements actually increase members' international trade?" *Journal of International Economics* 71, no. 1 (March 2007): 72-95.

Belenkiy, Maxim. "Robustness of the Extensive Margin in the Helpman Melitz and Rubinstein (HMR) Mode." *Munich Personal RePEc Archive*, 2009.

Brodsky, David A. "Fixed versus Flexible Exchange Rates and the Measurement of Exchangerate Instability." *Journal of International Economics* 16, no. 3-4 (1984): 295–306.

Central American Integration System. 2012. http://www.sica.int/ (accessed 5 2012).

Central European Free Trade Agreement . 2012. http://www.cefta.int/ (accessed May 2012).

Common Market for Eastern and Southern Africa. 2012. http://www.comesa.int/ (accessed May 2012).

"Direction of Trade Statistics CD-ROM." International Monetary Fund, 2011.

East African Community. 2012. http://www.eac.int/home.html (accessed May 2012).

Economic and Social Commission for Asia and the Pacific. 2012. http://www.unescap.org/tid/apta.asp (accessed May 2012).

European Commission. 2012. http://ec.europa.eu/index_en.htm (accessed May 2012).

Feenstra, Robert. *Advanced International Trade Tehory and Evidence.* New Jersey: Princeton University Press, 2004.

Frankel, J. A. *Regional Trading Blocs.* Washington, DC: Institute for International Economics, 1997.

Glick, Reuven, and Andrew K. Rose. "Does a currency union afect trade? The time-series evidence." *European Economic Review* (46), 2002: 1125 – 1151.

Helpman, Elhanan, Marc Melitz, and Yona Rubinstein. "Estimating Trade Flows: Trading Partners and Trading Volumes." *The Quarterly Journal of Economics* 123, no. 2 (May 2008): 441-487.

"International Financial Statistics CD-ROM." International Monetary Fund, 2011.

Iqbal, Ugo Fasano and Zubair. *GCC Countries: From Oil Dependence to Diversification.* International Monetary Fund, 2003.

Khan, Mohsin. *The GCC Monetary Union: Choice of Exchange Rate Regime.* International Monetary Fund, 2008.

Manova, Kalina. "Credit Constraints, Heterogeneous Firms, and International Trade." *Working paper*, 2006.

McCallum, John. "National Borders Matter: Canada-U.S. Regional Trade Patterns." *The American Economic Review* 85, no. 3 (Jun 1995): 615-623.

Melitz, Marc J. "The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry." *Econometrica* 71, no. 6 (2003): 1695-1725.

Mohaddes, Kamiar, and Oral Williams. "Inflation Differentials in the GCC:Does the Oil Cycle Matter?" *IMF Working Paper*, 2011.

Mundell, Robert A. "A Theory of Optimum Currency Areas." *The American Economic Review* 51, no. 4 (1961): 657-665.

Persson, Torsten. "Currency Unions and Trade: How Large Is the Treatment Effect?" *Economic Policy* 16, no. 33 (Oct 2001): 433-448.

Rodrik, Peter B. Kenen and Dani. "Measuring and Analyzing the Effects of Short-Term Volatility in Real Exchange Rates." *The Review of Economics and Statistics* 68, no. 2 (May 1986): 311-315.

Rose, Andrew K. "One Money, One Market: The Effect of Common Currencies on Trade." *Economic Policy* 15, no. 30 (April 2000): 7-45.

Rose, Andrew K., and Eric Van Wincoop. "National Money as a Barrier to International Trade: The Real Case for Currency Union." *The American Economic Review* 91, no. 2 (May 2001): 386-390 .

Russell Krueger, Bassem Kamar, and Jean-Etienne Carlotti. *Establishing Conversion Values for New Currency Unions: Method and Application to the planned Gulf Cooperation Council (GCC) Currency Union.* IMF Working Paper, 2009.

Southern African Develpment Community. 2012. http://www.sadc.int/ (accessed May 2012).

Tenreyro, Silvana. "On the trade impact of nominal exchnage rate volatility." *Journal of Development Economics* 82 (2007): 485-508.

Tenreyro, Sivana. "On The Causes and Consequences of Currency Unions." *Harvard University mimeo,* 2001.

The Association of Southeast Asian Nations. 2012. http://www.aseansec.org (accessed January 2012).

The Cooperation Council for the Arab States of the Gulf. 2012. http://www.gcc-sg.org (accessed April 3, 2012)

World Development Indicators. 2011. (accessed June 2011).

Yeyati, Eduardo Levy. "On the impact of acommon currency on bilateraltrade." *Economics Letters* 79, no. 1 (April 2003): 125–129.

I.9. Appendices

Appendix I.9.1. HMR Model

Note: This Appendix summarizes the theoretical part of the HMR model as it appears in the original paper written by Helpman, Melits and Rubinstein. Most of the contest are taken as they are in the original paper.

Consider a world with J countries, indexed by $j = 1,2, \dots, J$. Every country consumes and produces a continuum of products. The demand for each variety is derived from the CES utility function for each country j:

$$U_j = \left[\int_{l \in B_j} x_j(l)^{\alpha} dl\right]^{1/\alpha}, 0 < \alpha < 1, \qquad (A1)$$

Where $x_j(l)$ is country j's consumption of product l and B_j is the set of products available for consumption in country j. The parameter α determines the elasticity of substitution across products, which is $\varepsilon = 1/(1-\alpha)$.This constant elasticity, is the same in every country. Let Y_j be the income of country j which equals its expenditure level ($U_j \equiv Y_j$). That gives the following budget constraint:

$$Y_j = \int_{l \in B_j} p_j(l)\, x_j(l) \;\; dl, \qquad (A2)$$

Where $p_j(l)$ is product l's price in any country j. Maximizing (A1) subject to (A2), country j's demand for product l is:

$$x_j(l) = \frac{p_j(l)^{-\varepsilon} Y_j}{P_j^{1-\varepsilon}}, \qquad (A3)$$

Where$p_j(l)$ is the price of product l in country j and P_j is the country's ideal price index, given by

$$P_j = \left[\int_{l \in B_j} p_j(l)^{1-\varepsilon} dl \right]^{1/(1-\varepsilon)} \qquad (A4)$$

This specification indicates that every product has constant demand elasticity ε

In any country j, some of the products consumed are domestically produced and some are imported. Country j has a measure N_j of firms. Each firm is producing a differentiated product. The products produced by country j's firms are also distinct from the products produced by country i's firms for $i \neq j$ As a result; there are$\sum_{j=1}^{J} N_j$ products in the world economy.

A participant firm in country j producing one unit of output, for export or domestic consumption, endures fixed and variable costs. The combination of the country specific cost c_j and per-unit firm specific marginal cost a are assumed to be the variable cost. The inverse of $a, 1/a$ represents the firm's productivity level. Therefore, the firm with the lowest marginal cost a is the most productive. Each firm in country j is producing a

variety l using cost-minimizing combination of inputs $c_j a$. To determine how productive a firm j is, assume that a cumulative distribution function $G(a)$ with support $[a_L, a_H]$ describes the distribution of a across firms, where $a_H > a_L > 0$. This distribution function is the same in all countries.

When selling in the home market, the HMR model assumes that producers bear only variable production cost. That is, if a firm in country j with coefficient a sells domestically, the delivery cost of its product is $c_j a$. However, if the same firm seeks to sell it is product in country i, there are two additional costs. A fixed cost of serving country i, which is equal to $c_j f_{ij}$ where $f_{ij} > 0$ and a per-unit "melting iceberg" transport cost $\tau_{ij} > 1$.

There is monopolistic competition in final products. The firms choose price $p_j(l)$ of a variety l to maximize profits using demand function (A3). Therefore, any firm j maximizes profit as:

$$\max \pi = p_j(l) x_j(l) - c_j a \tau_{ij} x_j(a) - f_{ij} \qquad (A5)$$

From equation (A5), the delivery price of product l produced in country j and delivered to country i:

$$p_j(l) = \tau_{ij} \frac{c_j a}{\alpha} \qquad (A6)$$

As a result, the associated operating profits from these sales to country i are

$$\pi_{ij}(l) = (1 - \alpha) \left(\frac{\tau_{ij} c_j a}{\alpha P_i} \right)^{1-\varepsilon} Y_i - c_j f_{ij} \qquad (A7)$$

These operating profits are positive for sales in the domestic market because domestic fixed cost $f_{jj} = 0$. Therefore sales in country $i \neq j$ are profitable only if $a \leq a_{ij}$, where a_{ij} the export participation cut-off, is defined by zero-profit condition such that $\pi_{ij}(l) = 0$, or

$$(1-\alpha)\left(\frac{\tau_{ij}c_j a_{ij}}{\alpha P_i}\right)^{1-\varepsilon} Y_i = c_j f_{ij} \qquad (A8)$$

It follows that only a fraction $G(a_{ij})$ of all firms in country j export to country i. The cut-off a_{ij} defines the minimum level of productivity or the maximum marginal cost required for an exporter firm in country j to at least break-even. It is possible for $G(a_{ij})$ to be zero: no firm from country j finds it profitable to export to country i. This happens whenever$a_{ij} \leq a_L$: the least productive firm that can profitably export to country i has a coeffieicnt a below the support of $G(a)$.

The bilateral trade volume can be written as;

$$V_{ij} = \begin{cases} \int_{a_L}^{a_{ij}} a^{1-\varepsilon} dG(a) & for\ a_{ij} \geq a_L \\ 0 & otherwise. \end{cases} \qquad (A9)$$

Substituting the pricing equation (A6) and equation (A9) into the demand function (A3) will result in the following expression for the value of country i's imports form country j:

$$M_{ij} = \left(\frac{c_j \tau_{ij}}{\alpha P_i}\right)^{1-\varepsilon} Y_i N_j V_{ij} \qquad (A10)$$

The bilateral trade volume equals zero when $a_{ij} \leq a_L$, because $V_{ij} = 0$. Using the definition of V_{ij}, demand function, and pricing equation, we can option the ideal price index in country i:

$$P_i^{1-\varepsilon} = \sum_{j=1}^{J} \left(\frac{\tau_{ij} c_j}{\alpha}\right)^{1-\varepsilon} N_j V_{ij} \qquad (A11)$$

Equation (A8)-(A11) provide mapping from the income level Y_i, the numbers of firms N_i, the unit costs c_i, the fixed costs f_{ij}, and the transport costs $\tau_{ij}$to the bilateral trade flows M_{ij}.

Empirical Framework

Assume that firm productivity $1/a$ follows Pareto-truncated distribution with the following CDF:

$$G(a) = (a^k - a_L^k)/(a_H^k - a_L^k), k > (\varepsilon - 1) \quad , [a_L, a_H] \qquad (A12)$$

In HMR model, they allow for $a_{ij} \leq a_L$ for some $i - j$ pairs, inducing zero exports from j to i (i.e. $V_{ij} = 0$ and $M_{ij} = 0$). This framework also allows for asymmetric trade flows $M_{ij} \neq M_{ji}$ which may also be unidirectional, with $M_{ji} > 0$ and $M_{ij} = 0$ or $M_{ji} = 0$ and $M_{ij} > 0$.

The differentiation of equation (A12) with respect to a^k, (A9) becomes:

$$V_{ij} = \frac{k a_L^{k-\varepsilon+1}}{(k-\varepsilon+1)(a_H^k - a_L^k)} W_{ij} \text{ where } W_{ij} = max\left\{\left(\frac{a_{ij}}{a_L}\right)^{k-\varepsilon+1} - 1, 0\right\} \qquad (A13)$$

a_{ij} is determined by the zero profit condition (A8). Both V_{ij} and W_{ij} are monotonic functions of the proportion of exporters from j to i, $G(a_{ij})$.

The exporter volume from j to i, given by (A10) can now be written in log-linear form as:

$$m_{ij} = (\varepsilon - 1)\ln\alpha - (\varepsilon - 1)\ln c_j + n_j + (\varepsilon - 1)p_i + y_i + (\varepsilon - 1)\ln\tau_{ij} + \upsilon_{ij} \qquad (A14)$$

Where lowercase variables represent the natural logarithms of their respective uppercase variables. τ_{ij} captures variables trade costs: costs that affect the volume of firm-level exports. These costs are stochastic due to i.i.d unmeasured trade frictions u_{ij} which are country-pair specific. Letting $\tau_{ij}^{\varepsilon-1} \equiv D_{ij}^{\gamma}e^{-u_{ij}}$, where D_{ij} represents symmetric distance between i and j, and $u_{ij} \sim N(0, \sigma_u^2)$. Then the equation of bilateral trade flows m_{ij} yields the estimating equation

$$m_{ij} = \beta_0 + \lambda_j + \chi_i - \gamma d_{ij} + w_{ij} + u_{ij} \qquad (A15)$$

Where $\lambda_j = (\varepsilon - 1)\ln c_j + n_j$ is a fixed effect of the exporting country, and $\chi_i = (\varepsilon - 1)p_i + y_i$ is the fixed effect of importing country, d_{ij} is the natural logarithm of distance between countries $i\ and\ j$; w_{ij} is an unobservable monotonic function which controls for the fraction of firms that exports from j to i,

Firm Export Selection:

Let the ratio of the variable export profits of the most productive firm (with productivity$\frac{1}{a_L}$) to the fixed export costs for exports from j to i be represented by Z_{ij}. Country i will export to country j only if $Z_{ij} > 1$.

$$Z_{ij} = \frac{(1-\alpha)(P_i \frac{\alpha}{c_j \tau_{ij}})^{\varepsilon-1} Y_i a_L^{1-\varepsilon}}{c_j f_{ij}} \quad (A16)$$

α is elasticity of demand, c_i country specific cost and a per unit firm-specific marginal cost, τ_{ij}transportation cost, Y_i is income of country i, P_i is price index of country i.

Assume that f_{ij} are stochastic fixed costs due to unmeasured i.i.d friction $\upsilon_{ij} \sim N(0, \sigma_\upsilon^2)$ that may be correlated with u_{ij} and defined as follows:

$$f_{ij} \equiv \exp\left(\phi_{EX,j} + \phi_{IM,i} + \kappa\phi_{ij} - \upsilon_{ij}\right) \quad (A17)$$

Where $\phi_{EX,j}$ is a measure of fixed export costs common across all export destinations, $\phi_{IM,i}$ is a fixed trade barrier imposed by the importing country, ϕ_{ij} is an observed measure of any additional country-pair specific fixed trade costs.

Now we can express Z in log term:

$$z_{ij} \equiv \ln\left(Z_{ij}\right) = \gamma_0 + \xi_j + \zeta_\iota - \gamma d_{ij} - \kappa\phi_{ij} + \eta_{ij} \quad (A18)$$

Where:

z_{ij} Is unobserved variable but we can observe the presence of trade flows. Therefore, $z_{ij} > 0$ when j exports to i, $z_{ij} = 0$ when it does not. Moreover, the value of z_{ij} affects

the export volume. $\xi_j = -\varepsilon \ln c_j + \phi_{EX,j}$ is an export fixed effect. $\zeta_\iota = (\varepsilon - 1)p_i + y_i - \phi_{IM,i}$ is an imoprt fixed effect. d_{ij} represents the distance bewteen country i and j. and $\gamma d_{ij} - u_{ij} \equiv (\varepsilon - 1) ln\, \tau_{ij}$. And $\eta_{ij} \equiv u_{ij} + v_{ij} \sim N(0, \sigma_u^2 + \sigma_v^2)$ is i.i.d.

ϕ_{ij} is an observed measure of any additional country-pair-specific fixed trade coast.

To obtain the export selection equation, define the indicator variable T_{ij} to equal 1 when country j exports to i and 0 when it does not. Let ρ_{ij} be the probability that j exports to i, conditional on the observed variables. The export selection equation is the following Probit specification:

$$\rho_{ij} = \Pr\left(T_{ij} = 1 \middle| observed\ variables\right) = \Phi\left(\gamma_0^* + \xi_j^* + \zeta_i^* - \gamma^* d_{ij} - \kappa^* \phi_{ij}\right) \qquad (A19)$$

Where $\Phi(\gamma_0^* + \xi_j^* + \zeta_i^* - \gamma^* d_{ij} - \kappa^* \phi_{ij})$ is the cdf of the unit-normal distribution, and every standard coefficient represents the original coefficient divided by the standard deviation σ_η.

This selection equation has been derived from the a firm-level decision, and it therefore does not contain the unobserved and endogenous variable W_{ij} that is related to the fraction of exporting firms. Moreover, from Probit equation we derive consistent estimates of W_{ij}.

Let $\hat{\rho}_{ij}$ be the predicted probability of export from j to i, using the estimates from the Probit equation (A19). Let $\hat{z}_{ij}^* = \Phi^{-1}(\hat{\rho}_{ij})$ be the predicted value of the latent variable $z_{ij}^* \equiv z_{ij}/\sigma_\eta$. Then a consistent estimate for W_{ij} is

$$W_{ij} = max\left\{\left(Z_{ij}^{*}\right)^{\delta} - 1, 0\right\} \qquad (A20)$$

Where $\delta \equiv \sigma_{\eta}(k - \varepsilon + 1)/(\varepsilon - 1)$

Consistent Estimation of the log-linear gravity equation

Consistent Estimation of (A15) requires controls for both the endogenous number of exporters (via w_{ij}) and the selection of country pairs into trading partners. Therefore, we need estimates for $E\left[w_{ij}|.\,, T_{ij} = 1\right]$ and $E\left[u_{ij}|.\,, T_{ij} = 1\right]$. Both terms depend on $\bar{\eta}_{ij}^{*} \equiv E\left[\eta_{ij}^{*}|.\,, T_{ij} = 1\right]$. Moreover $E\left[u_{ij}|.\,, T_{ij} = 1\right] = corr(u_{ij}, \eta_{ij})(\sigma_u/\sigma_{\eta})\bar{\eta}_{ij}^{*}$. Since η_{ij}^{*} has a unit normal distribution, a consistent estimate $\hat{\bar{\eta}}_{ij}^{*}$ is obtained from the inverse Mills ratio, that is$\hat{\bar{\eta}}_{ij}^{*} = \phi(\hat{z}_{ij}^{*})/\Phi(\hat{z}_{ij}^{*})$. Therefore $\hat{\bar{z}}_{ij}^{*} \equiv \hat{z}_{ij}^{*} + \hat{\bar{\eta}}_{ij}^{*}$ is a consistent estimate for $E\left[z_{ij}^{*}|.\,, T_{ij} = 1\right]$ and $\widehat{\bar{w}}_{ij}^{*} \equiv \ln\left\{\exp\left[\delta\left(\hat{z}_{ij}^{*} + \hat{\bar{\eta}}_{ij}^{*}\right)\right] - 1\right\}$ is a consistent estimate for $E\left[w_{ij}|.\,, T_{ij} = 1\right]$ from (A20). Therefore the consistent estimation for gravity equation is

$$m_{ij} =$$

$$\beta_0 + \lambda_j + \chi_i - \gamma d_{ij} + \ln\left\{\exp\left[\delta\left(\hat{z}_{ij}^{*} + \hat{\bar{\eta}}_{ij}^{*}\right)\right] - 1\right\} + \beta_{u\eta}\hat{\bar{\eta}}_{ij}^{*} + e_{ij} \qquad (A21)$$

Where $\beta_{u\eta} \equiv corr\left(u_{ij}, \eta_{ij}\right)\left(\frac{\sigma_u}{\sigma_{\eta}}\right)$ and $e_{ij}$is an i.i.d. error term.

Appendix I.9.2. Multilateral Free Trade Area 2012

APTA	**COMESA**	**GCC**	**SAFTA**
Bangladesh	Burundi	Bahrain	Afghanistan
China	Comoros	Kuwait	Bangladesh
India	D.R. of the Congo	Oman	Bhutan
Laos	Djibouti	Qatar	India
Philippines	Egypt	Saudi Arabia	Maldives
Republic of Korea	Eritrea	United Arab Emirates	Nepal
Sri Lanka	Ethiopia		Pakistan
	Kenya	**NAFTA**	Sri Lanka
ASEAN	Libya	Canada	
Brunei	Madagascar	Mexico	**SICA**
Cambodia	Malawi	United States	Belize
Indonesia	Mauritius		Costa Rica
Laos	Rwanda	**SADC**	El Salvador
Malaysia	Seychelles	Angola	Guatemala
Myanmar	South Sudan	Botswana	Honduras
Philippines	Sudan	D.R. of the Congo	Nicaragua
Singapore	Swaziland	Lesotho	Panama
Thailand	Uganda	Malawi	
Vietnam	Zambia	Mauritius	**TPP**
	Zimbabwe	Mozambique	Brunei
CEFTA		Namibia	Chile
Moldova	**DR-CAFTA**	Seychelles	New Zealand
Albania	Costa Rica	South Africa	Singapore
Bosnia and Herzegovina	Dominican Republic	Swaziland	
Croatia	El Salvador	Tanzania	
Kosovo	Guatemala	Zambia	
Macedonia	Honduras	Zimbabwe	
Montenegro	Nicaragua		
Serbia	United States		

APTA: The Asia-Pacific Trade Agreement

ASEAN: The Association of Southeast Asian Nations

CEFTA: Central European Free Trade Agreement

CFTA: Central European Free Trade Agreement

COMESA: Common Market for Eastern and Southern Africa

GCC: Gulf Cooperation Council

NAFTA: North American Free Trade Agreement

SADC: Southern African Development Community

SAFTA: South Asian Free Trade Area

TPP: Trans-Pacific Partnership

Appendix I.9.3List of Countries with Common Currency 1990-2009

Armenian dram
Armenia
Nagorno-Karabakh Republic

Australian dollar
Australia
Christmas Island
Cocos Islands
Kiribati
Nauru
Norfolk Island
Tuvalu

CFA franc
Benin
Burkina Faso
Cameroon
Central African Republic
Chad
Côte d'Ivoire
Equatorial Guinea
Gabon
Guinea-Bissau
Mali
Niger
Republic of the Congo
Senegal
Togo

CFP franc
French Polynesia
New Caledonia
Wallis and Futuna

East Caribbean Dollar
Anguilla
Antigua and Barbuda
Dominica
Grenada
Montserrat
St. Kitts and Nevis
St. Lucia
St. Vincent and the Grenadines

Euro
Andorra
Austria
Belgium
Cyprus
Estonia
Finland
France
French Southern and Antarctic Lands
Germany
Greece
Ireland
Italy
Kosovo
Luxembourg
Malta
Mayotte
Monaco
Montenegro
Netherlands
Portugal
St. Pierre and Miquelon
San Marino
Slovakia
Slovenia
Spain
Vatican City

Indian rupee
Bhutan
India

New Zealand dollar
Cook Islands
New Zealand
Niue
Pitcairn Islands
Tokelau

Pound sterling
British Antarctic Territory
British Indian Ocean Territory
Falkland Islands
Gibraltar
Guernsey
Isle of Man
Jersey
St. Helena
S.Georgia and the S.Sandwich Islands
United Kingdom

South African rand
Lesotho
Namibia
South Africa
Swaziland

Swiss franc
Liechtenstein
Switzerland

United States Dollar
American Samoa
BES islands
British Virgin Islands
Ecuador
El Salvador
Federated States of Micronesia
Guam
Marshall Islands
Northern Mariana Islands
Palau
Panama
Puerto Rico
Timor-Leste
Turks and Caicos Islands
United States
United States Minor Outlying Islands
United States Virgin Islands

Appendix I.9.4. List of Countries in Sample

Afghanistan	Dominican Rep.	Liberia	Serbia
Albania	Egypt	Lithuania	Seychelles
Algeria	El Salvador	Luxembourg	Sierra Leone
Angola	Estonia	Macedonia FYR	Singapore
Argentina	Ethiopia	Madagascar	Slovakia
Armenia	Fiji	Malawi	Slovenia
Australia	Finland	Malaysia	Solomon Islands
Austria	France	Mali	Somalia
Azerbaijan	Gabon	Malta	South Africa
Bahamas	Gambia	Mauritania	Spain
Bahrain	Georgia	Mauritius	Sri Lanka
Bangladesh	Germany	Mexico	Suriname
Barbados	Ghana	Moldova	Sweden
Belarus	Greece	Mongolia	Switzerland
Belgium	Grenada	Morocco	Tajikistan
Belize	Guatemala	Mozambique	Tanzania
Benin	Guinea	Nepal	Thailand
Bolivia	Guinea-Bissau	Netherlands	Togo
Bosnia and Herzegovina	Guyana	New Zealand	Tonga
Brazil	Haiti	Nicaragua	Trinidad and Tobago
Brunei Darussalam	Honduras	Niger	Tunisia
Bulgaria	Hong Kong	Nigeria	Turkey
Burkina Faso	Hungary	Norway	Turkmenistan
Burundi	Iceland	Oman	Uganda
Cambodia	India	Pakistan	Ukraine
Cameroon	Indonesia	Panama	United Arab Emirates
Canada	Iran	Papua New Guinea	United Kingdom
Cape Verde	Iraq	Paraguay	United States
Central African Rep.	Ireland	Peru	Uruguay
Chad	Israel	Philippines	Uzbekistan
Chile	Italy	Poland	Vanuatu
China	Jamaica	Portugal	Venezuela
Colombia	Japan	Qatar	Vietnam
Congo	Jordan	Romania	Yemen
Costa Rica	Kazakhstan	Russian Federation	Zambia
Croatia	Kenya	Rwanda	Zimbabwe
Cyprus	Korea	Saint Kitts and Nevis	
Czech Republic	Kuwait	Saint Lucia	
Côte d'Ivoire	Kyrgyzstan	Saint Vincent and the Grenadines	
Denmark	Lao PDR	Samoa	
Djibouti	Latvia	Saudi Arabia	
Dominica	Lebanon	Senegal	

Table I.A. GDP, Current prices (Billion U.S. Dollars)

	Bahrain	Kuwait	Oman	Qatar	Saudi Arabia	UAE	GCC
2000	7.966	37.721	19.45	17.76	188.693	103.893	375.483
2001	7.969	34.886	19.399	17.538	183.257	103.312	366.361
2002	8.489	38.135	20.048	19.363	188.803	109.816	384.654
2003	9.745	47.844	21.542	23.534	214.859	124.346	441.87
2004	11.233	59.439	24.674	31.734	250.673	147.824	525.577
2005	13.456	80.806	30.905	44.52	315.758	180.617	666.062
2006	15.848	101.56	36.805	60.819	356.63	222.106	793.768
2007	18.468	114.697	41.909	79.547	385.199	258.15	897.97
2008	22.146	148.77	60.568	115.02	476.941	314.845	1138.29
2009	19.314	109.463	46.861	97.583	377.195	270.335	920.751

Source: IMF, World Economic Outlook Database, September 2011

Table I.B GDP per capita, Current prices (U.S. Dollars)

	Bahrain	Kuwait	Oman	Qatar	Saudi Arabia	UAE	GCC
2000	11889.98	17012.776	8096.833	28797.43	9216.391	34688.98	12782.4
2001	11719.42	15108.112	7939.563	27033.98	8736.41	32621.29	12121.53
2002	12127.44	15759.074	8070.475	28374.11	8785.132	32790.71	12357.96
2003	13725.67	18786.749	8529.117	32787.51	9758.017	35017.31	13777.87
2004	15601.16	21585.563	9600.733	41703.53	11126.522	39304.51	15880.86
2005	18322.67	27014.517	11805.58	50109.22	13657.947	43988.56	19330.8
2006	21156.85	31907.176	13784.25	58382.72	14784.447	52519.71	22052.17
2007	24171.15	33732.548	15369.36	64872.26	15444.417	57520.09	23917.17
2008	28416.17	43224.377	21745.19	79409.17	18495.404	66074.44	29182.43
2009	18589.38	31410.614	16255.18	59544.59	14148.337	53362.62	22582.92

Source: IMF, World Economic Outlook Database, September 2011

GCC data is calculated by Author

Table I.C Inflation, average consumer prices, percent change

	Bahrain	Kuwait	Oman	Qatar	Saudi Arabia	UAE
2000	-0.73	1.569	-1.197	1.679	-1.1	1.348
2001	-1.175	1.448	-0.841	1.436	-1.138	2.8
2002	-0.496	0.797	-0.334	0.244	0.23	2.918
2003	1.679	0.986	0.166	2.263	0.587	3.119
2004	2.248	1.257	0.673	6.797	0.355	5.041
2005	2.618	4.12	1.853	8.814	0.632	6.195
2006	2.041	3.092	3.441	11.828	2.31	9.285
2007	3.252	5.465	5.894	13.764	4.107	11.128
2008	3.533	10.622	12.56	15.049	9.871	12.251
2009	2.785	3.952	3.537	-4.865	5.057	1.56

Source: IMF, World Economic Outlook Database, September 2011

Table I.D Population (Millions)

	Bahrain	Kuwait	Oman	Qatar	Saudi Arabia	UAE
2000	0.67	2.217	2.402	0.617	20.474	2.995
2001	0.68	2.309	2.443	0.649	20.976	3.167
2002	0.7	2.42	2.484	0.682	21.491	3.349
2003	0.71	2.547	2.526	0.718	22.019	3.551
2004	0.72	2.754	2.57	0.761	22.529	3.761
2005	0.734	2.991	2.618	0.888	23.119	4.106
2006	0.749	3.183	2.67	1.042	24.122	4.229
2007	0.764	3.4	2.726	1.226	24.941	4.488
2008	0.779	3.442	2.785	1.448	25.787	4.765
2009	1.039	3.485	2.883	1.639	26.66	5.066

Source: IMF, World Economic Outlook Database, September 2011

Table I.E GDP, Current prices (Billion U.S. Dollars)

Year	GCC	Australia	Canada
2000	375.483	400.988	724.914
2001	366.361	379.245	715.442
2002	384.654	426.211	734.653
2003	441.87	542.951	865.903
2004	525.577	658.867	992.227
2005	666.062	737.196	1133.757
2006	793.768	784.459	1278.607
2007	897.97	953.656	1424.067
2008	1138.29	1061.037	1502.678
2009	920.751	988.581	1337.577

Source: IMF, World Economic Outlook Database, September 2011

Table I.1: Regression Results

	Benchmark	OLS	Heckman		NLS	
	log_BTrade	log_BTrade	T_{iit}	log_BTrade	T_{iit}	log_BTrade
GDP	0.888***	0.830***	0.301***	0.843***	0.299***	0.887***
	(450.12)	(369.45)	(171.80)	(338.41)	(171.97)	(266.91)
Exchange rate Volatility	-0.0595	-0.0517	-0.0664***	-0.0545	-0.0651***	-0.0700*
	(-1.68)	(-1.62)	(-3.41)	(-1.71)	(-3.35)	(-2.20)
Distance	-0.956***	-1.190***	-0.505***	-1.211***	-0.506***	-1.285***
	(-117.25)	(-149.39)	(-85.02)	(-148.48)	(-85.32)	(-145.15)
Religion	-0.0282***	0.00419	-0.0292***	0.00279	-0.0297***	-0.00105
	(-11.31)	(1.46)	(-14.06)	(0.97)	(-14.29)	(-0.37)
Border	1.072***	0.822***	0.0952***	0.825***	0.102***	0.828***
	(36.70)	(30.72)	(3.75)	(30.81)	(4.04)	(31.06)
Colony	0.987***	0.979***	0.279***	0.982***	0.298***	0.990***
	(29.08)	(30.44)	(6.25)	(30.51)	(6.69)	(30.93)
Landlocked	-0.467***	-1.039***	0.262***	-1.021***	0.265***	60.95***
	(-32.74)	(-9.23)	(4.10)	(-9.07)	(4.14)	(163.74)
FTA	0.823***	0.604***	0.00252	0.594***	0.0121	0.551***
	(45.71)	(35.47)	(0.17)	(34.84)	(0.81)	(32.27)
Language	0.626***	0.750***	0.516***	0.777***	0.514***	0.852***
	(46.23)	(56.39)	(54.87)	(57.60)	(54.62)	(60.09)
Island	0.252***	0.274***	0.194***	0.281***	0.193***	0.308***
	(21.51)	(19.65)	(19.90)	(20.17)	(19.81)	(22.06)
BothWTO	0.0917***	0.0616***	0.199***	0.0721***	0.198***	0.118***
	(7.94)	(4.74)	(22.85)	(5.54)	(22.72)	(8.99)
ComCurrency	0.0997*	0.253***	0.586***	0.296***	0.575***	0.421***
	(2.23)	(5.82)	(18.88)	(6.79)	(18.54)	(9.56)
Constant	-9.411***	-6.682***	-2.114***	-6.895***	-2.063***	
	(-130.24)	(-66.97)	(-32.18)	(-68.07)	(-31.54)	
Mills						-8.869***
						(-77.30)
Zhat						-7.390***
						(-38.12)
N	156907	156907	248886	156907	248886	156907
Adj R-Sq.	0.6225	0.698			0.395	0.76

Notes: Pseudo R-sq. reported for Probit

Country and year fixed effects are included in column 2-6

t statistics in parentheses * p<0.05 ** p<0.01 *** p<0.001

Table I.2: Regression Results

	Benchmark	OLS	Heckman		NLS	
	log_BTrade	log_BTrade	T_{ijt}	log_BTrade	T_{ijt}	log_BTrade
GDP	0.888***	0.830***	0.301***	0.843***	0.299***	0.887***
	(450.12)	(369.45)	(171.80)	(340.28)	(171.97)	(267.02)
Exchange rate Volatility	-0.0595	-0.0517	-0.0664***	-0.0566	-0.0651***	-0.0693*
	(-1.68)	(-1.62)	(-3.41)	(-1.78)	(-3.35)	(-2.18)
Distance	-0.956***	-1.190***	-0.505***	-1.212***	-0.506***	-1.284***
	(-117.25)	(-149.39)	(-85.03)	(-149.18)	(-85.32)	(-146.08)
Religion	-0.0282***	0.00419	-0.0293***		-0.0297***	
	(-11.31)	(1.46)	(-14.10)		(-14.29)	
Border	1.072***	0.822***	0.0951***	0.825***	0.102***	0.828***
	(36.70)	(30.72)	(3.75)	(30.82)	(4.04)	(31.06)
Colony	0.987***	0.979***	0.278***	0.981***	0.298***	0.991***
	(29.08)	(30.44)	(6.24)	(30.50)	(6.69)	(30.93)
Landlocked	-0.467***	-1.039***	0.262***	-1.022***	0.265***	-6204.8***
	(-32.74)	(-9.23)	(4.10)	(-9.07)	(4.14)	(-16670.29)
FTA	0.823***	0.604***	0.00247	0.594***	0.0121	0.551***
	(45.71)	(35.47)	(0.16)	(34.83)	(0.81)	(32.33)
Language	0.626***	0.750***	0.516***	0.778***	0.514***	0.851***
	(46.23)	(56.39)	(54.88)	(57.79)	(54.62)	(60.31)
Island	0.252***	0.274***	0.194***	0.281***	0.193***	0.308***
	(21.51)	(19.65)	(19.90)	(20.15)	(19.81)	(22.06)
BothWTO	0.0917***	0.0616***	0.199***	0.0727***	0.198***	0.117***
	(7.94)	(4.74)	(22.85)	(5.59)	(22.72)	(8.98)
ComCurrency	0.0997*	0.253***	0.586***	0.295***	0.575***	0.421***
	(2.23)	(5.82)	(18.88)	(6.77)	(18.54)	(9.56)
Constant	-9.411***	-6.682***	-2.114***	-6.889***	-2.063***	
	(-130.24)	(-66.97)	(-32.18)	(-68.14)	(-31.54)	
Mills						-8.804***
						(-76.74)
Zhat						-7.324***
						(-37.79)
N	156907	156907	248886	156907	248886	156907
Adj R-Sq.	0.6225	0.698			0.395	0.76

Notes: Pseudo R-sq. reported for Probit

Country and year fixed effects are included in column 2-6

t statistics in parentheses * p<0.05 ** p<0.01 *** p<0.001

Table I.3: Regression Results Including GCC Variables

	Benchmark	OLS	Heckman		NLS	
	log_BTrade	log_BTrade	T_{ijt}	log_BTrade	T_{ijt}	log_BTrade
GDP	0.887***	0.832***	0.303***	0.844***	0.301***	0.884***
	(447.22)	(367.89)	(171.93)	(336.42)	(172.11)	(264.71)
Exchange rate Volatility	-0.0656	-0.0623	-0.0737***	-0.0654*	-0.0730***	-0.0802*
	(-1.78)	(-1.88)	(-3.65)	(-1.97)	(-3.62)	(-2.43)
Distance	-0.940***	-1.197***	-0.513***	-1.218***	-0.514***	-1.288***
	(-112.19)	(-147.78)	(-85.42)	(-146.71)	(-85.75)	(-142.91)
Religion	-0.0308***	0.00582*	-0.0250***	0.00469	-0.0252***	0.00192
	(-12.26)	(2.01)	(-11.84)	(1.62)	(-11.97)	(0.66)
Border	1.079***	0.823***	0.0824**	0.825***	0.0885***	0.826***
	(36.83)	(30.70)	(3.24)	(30.76)	(3.48)	(30.93)
Colony	0.998***	0.973***	0.269***	0.975***	0.287***	0.982***
	(29.37)	(30.22)	(6.04)	(30.29)	(6.45)	(30.63)
Landlocked	-0.459***	-1.039***	0.268***	-1.022***	0.271***	-14.44***
	(-32.12)	(-9.23)	(4.21)	(-9.08)	(4.25)	(-64.35)
FTA	0.856***	0.591***	-0.0143	0.581***	-0.00598	0.535***
	(46.44)	(34.26)	(-0.95)	(33.61)	(-0.40)	(30.93)
Language	0.622***	0.756***	0.513***	0.780***	0.510***	0.849***
	(45.70)	(56.42)	(54.40)	(57.51)	(54.13)	(59.57)
Island	0.249***	0.277***	0.199***	0.284***	0.198***	0.310***
	(21.24)	(19.85)	(20.34)	(20.35)	(20.28)	(22.16)
BothWTO	0.0956***	0.0607***	0.196***	0.0706***	0.194***	0.114***
	(8.27)	(4.67)	(22.45)	(5.42)	(22.29)	(8.69)
ComCurrency	0.115*	0.244***	0.577***	0.284***	0.567***	0.395***
	(2.57)	(5.60)	(18.58)	(6.50)	(18.25)	(8.95)
GCC	0.359***	-0.312***	0.680**	-0.320***	0.696**	-0.343***
	(3.87)	(-3.69)	(3.00)	(-3.77)	(3.07)	(-4.06)
GCCexch	-9.987	-11.33	-119.2***	-13.36	-119.5***	-22.32
	(-0.43)	(-0.54)	(-4.65)	(-0.64)	(-4.66)	(-1.07)
GCCstar	0.125***	-0.0682**	-0.209***	-0.0773**	-0.219***	-0.105***
	(6.48)	(-2.84)	(-12.55)	(-3.22)	(-13.22)	(-4.39)
GCCstarExch	0.141	0.0990	0.0324	0.0999	0.0348	0.124
	(1.05)	(0.82)	(0.44)	(0.83)	(0.47)	(1.03)
Constant	-9.539***	-6.635***	-2.066***	-6.832***	-2.017***	
	(-129.11)	(-66.18)	(-31.37)	(-67.17)	(-30.74)	
Mills						-8.552***
						(-74.57)
Zhat						-6.987***
						(-36.07)
N	156907	156907	248886	248886	248886	156907
Adj R-Sq.	0.6225	0.698			0.395	0.76

Notes: Pseudo R-sq. reported for Probit
Country and year fixed effects are included in column 2-6
t statistics in parentheses * p<0.05 ** p<0.01 *** p<0.001

Table I.4: Regression Results Including GCC Variables

	Benchmark	OLS	Heckman		NLS	
	log_BTrade	log_BTrade	T_{ijt}	log_BTrade	T_{ijt}	log_BTrade
GDP	0.887***	0.832***	0.303***	0.843***	0.301***	0.884***
	(447.22)	(367.89)	(171.94)	(338.75)	(172.11)	(264.86)
Exchange rate Volatility	-0.0656	-0.0623	-0.0738***	-0.0686*	-0.0730***	-0.0863**
	(-1.78)	(-1.88)	(-3.65)	(-2.07)	(-3.62)	(-2.62)
Distance	-0.940***	-1.197***	-0.513***	-1.219***	-0.514***	-1.288***
	(-112.19)	(-147.78)	(-85.42)	(-147.14)	(-85.75)	(-143.50)
Religion	-0.0308***	0.00582*	-0.0251***		-0.0252***	
	(-12.26)	(2.01)	(-11.90)		(-11.97)	
Border	1.079***	0.823***	0.0824**	0.826***	0.0885***	0.827***
	(36.83)	(30.70)	(3.24)	(30.79)	(3.48)	(30.94)
Colony	0.998***	0.973***	0.269***	0.975***	0.287***	0.982***
	(29.37)	(30.22)	(6.04)	(30.27)	(6.45)	(30.62)
Landlocked	-0.459***	-1.039***	0.268***	-1.023***	0.271***	-14.47***
	(-32.12)	(-9.23)	(4.21)	(-9.08)	(4.25)	(-64.40)
FTA	0.856***	0.591***	-0.0144	0.580***	-0.00598	0.535***
	(46.44)	(34.26)	(-0.95)	(33.58)	(-0.40)	(30.93)
Language	0.622***	0.756***	0.513***	0.782***	0.510***	0.850***
	(45.70)	(56.42)	(54.40)	(57.73)	(54.13)	(59.82)
Island	0.249***	0.277***	0.199***	0.284***	0.198***	0.309***
	(21.24)	(19.85)	(20.34)	(20.32)	(20.28)	(22.15)
BothWTO	0.0956***	0.0607***	0.196***	0.0716***	0.194***	0.114***
	(8.27)	(4.67)	(22.45)	(5.51)	(22.29)	(8.73)
ComCurrency	0.115*	0.244***	0.577***	0.282***	0.567***	0.394***
	(2.57)	(5.60)	(18.58)	(6.46)	(18.25)	(8.93)
GCC	0.359***	-0.312***	0.680**	-0.315***	0.696**	-0.341***
	(3.87)	(-3.69)	(3.00)	(-3.71)	(3.07)	(-4.04)
GCCexch	-9.987	-11.33	-119.2***	-13.38	-119.5***	-22.74
	(-0.43)	(-0.54)	(-4.65)	(-0.64)	(-4.66)	(-1.09)
GCCstar	0.125***	-0.0682**	-0.208***	-0.0716**	-0.219***	-0.103***
	(6.48)	(-2.84)	(-12.54)	(-3.02)	(-13.22)	(-4.36)
GCCstarExch	0.141	0.0990	0.0324	0.100	0.0348	0.125
	(1.05)	(0.82)	(0.44)	(0.83)	(0.47)	(1.04)
Constant	-9.539***	-6.635***	-2.066***	-6.824***	-2.017***	
	(-129.11)	(-66.18)	(-31.38)	(-67.17)	(-30.74)	
Mills						-8.506***
						(-74.17)
Zhat						-6.941***
						(-35.85)
N	156907	156907	248886	248886	248886	156907
Adj R-Sq.	0.6225	0.698			0.395	0.76

Notes: Pseudo R-sq. reported for Probit
Country and year fixed effects are included in column 2-6
t statistics in parentheses * p<0.05 ** p<0.01 *** p<0.001

Figure I.1: GDP, Current Prices (Billion U.S. Dollars)

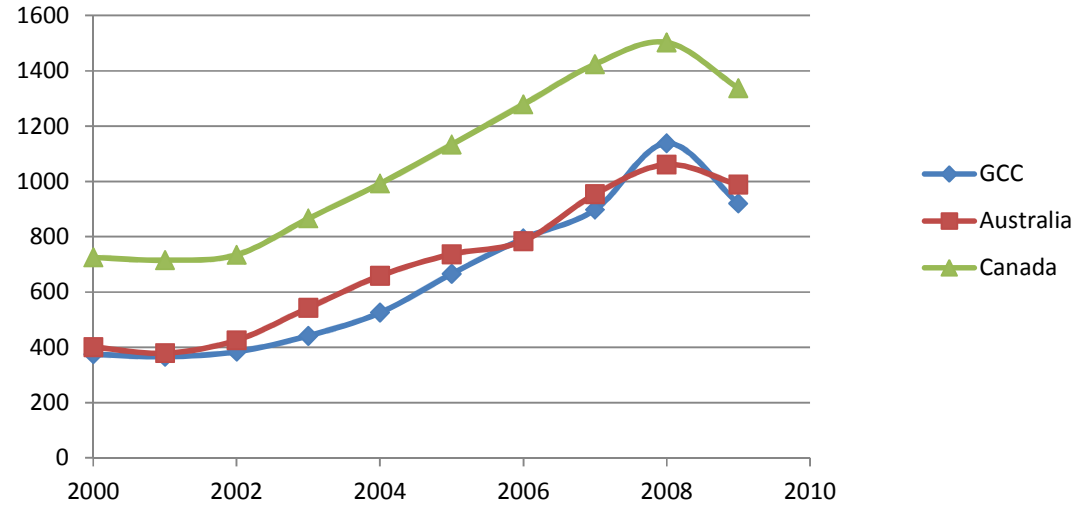
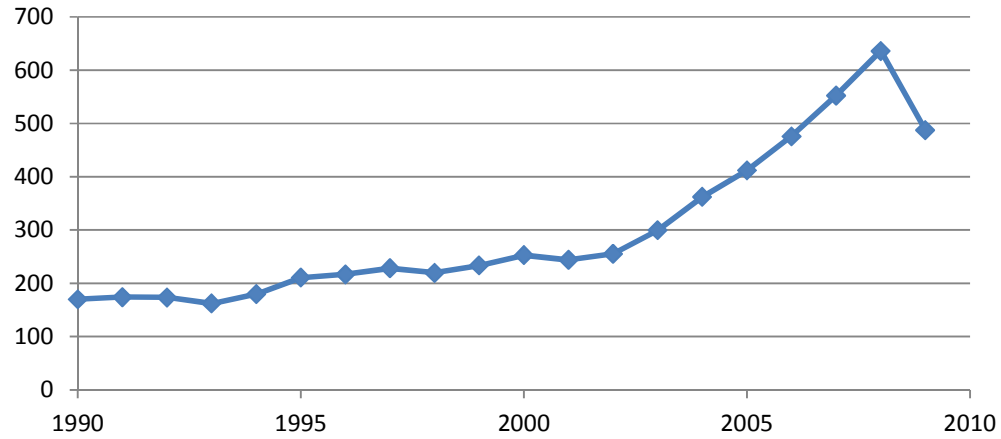


Figure I.2: Average Aggregate Volumes of Exports in Billions of US Dollars



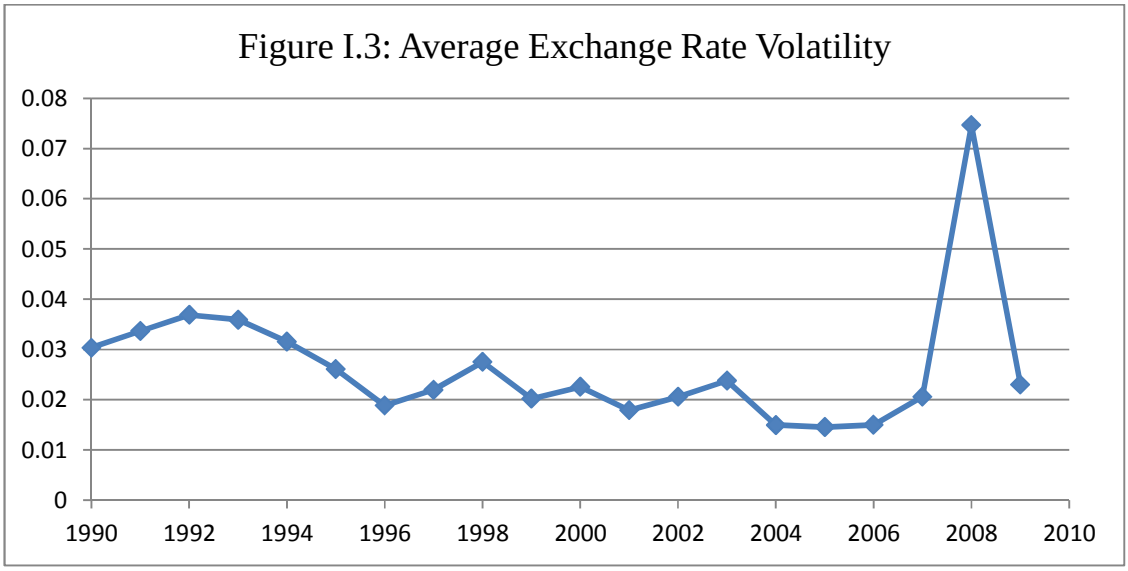


Figure I.3: Average Exchange Rate Volatility
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010

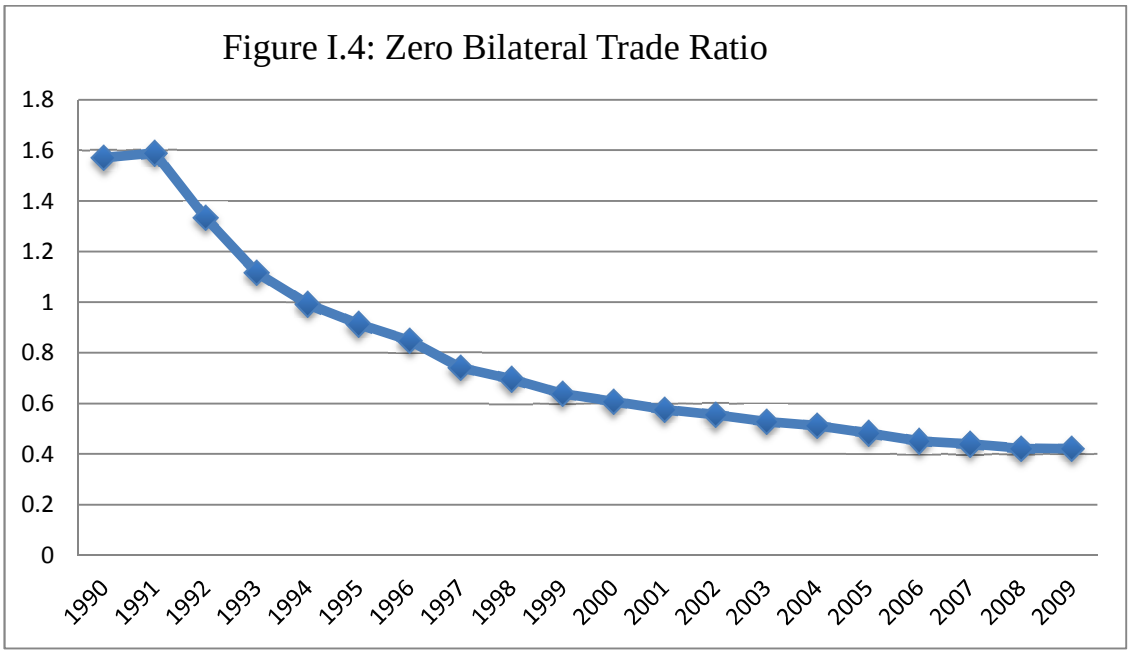
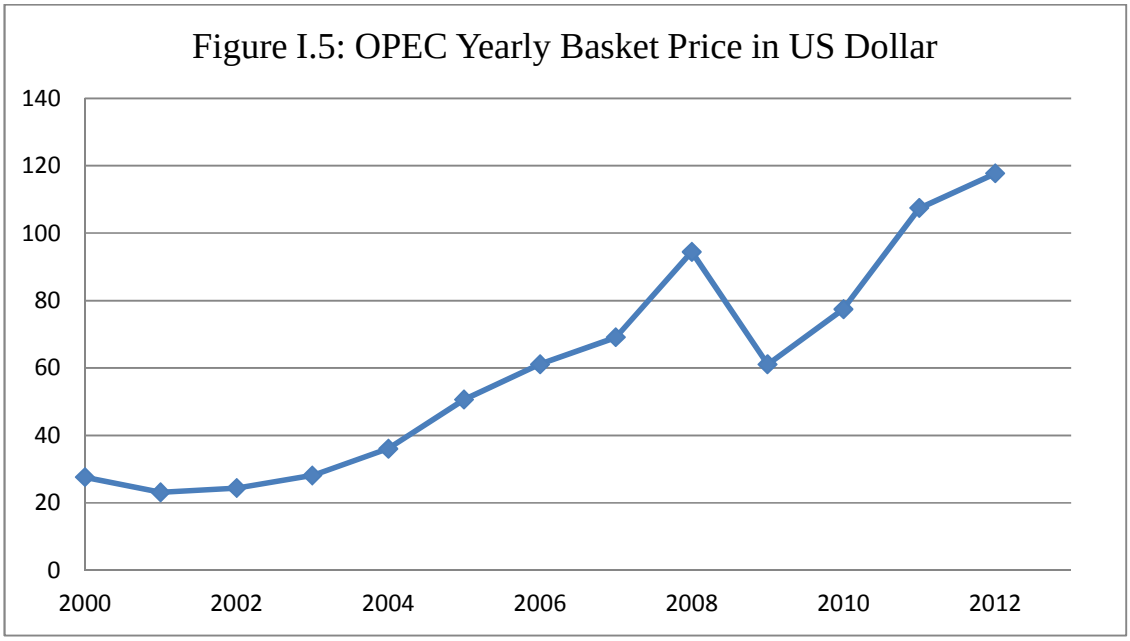


Figure I.4: Zero Bilateral Trade Ratio
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009



Source: OPEC Web Site

CHAPTER 2

Are Trade-Weighted Exchange Rate Indices better than a Simple Real Exchange Rate in Explaining National Output?

Abstract

In this study we use three weighted exchange rate indices constructed for specific industries to investigates the impact of exchange rate on national output using data for ASEAN+3 countries for the period from 1992 to 2004. Results in show that compared to the nominal exchange rate, industry-specific indices have a better performance in explaining the movement in industrial output. The findings show that there is always a significant relationship between currency depreciation and the change of the level of industry output.

Key Words: Industry-Specific, Exchange rate, Output.

II.1. Introduction

While many studies investigate the impact of exchange rates on economic activities, several interesting ideas remain unexplored. I analyze the relationship between exchange rate fluctuation and outputs at the industry level for country members of the Association of Southeast Asian Nations ASEAN Plus Three (APT) countries (Brunei, Cambodia, China, Indonesia, Japan, Korea, Laos, Malaysia, Myanmar (Burma), Philippines, Singapore, Thailand, and Vietnam). Those countries have a vision to achieve full economic integration in 2020. One of the benefits of economic integration is to eliminate the impact of exchange rate fluctuation among members by using a single currency. The important contributions of this paper are using real exchange rate indices instead of a simple real exchange rate.

There are many empirical studies investigate the effect of exchange rates on different economic activities using aggregate indices. I study the effect of exchange rate movements on output using the Goldberg approach. Goldberg (2004) stated that at the national level, studies of exchange rate movements often rely on aggregate trade-weighted exchange rates. Such indices are helpful at a macroeconomic level. However, the industry-specific distinction is omitted. For example, the aggregate trade-weighted exchange rate depends on all exports and imports of the entire economy. However, the importance of the competition among particular trading countries differs based on their within-industry sectors, not just the aggregate trade.

In this study I contribute to the previous study by investigating the impact of exchange rate movement on outputs for ten Asian countries using industry-specific exchange rates. On the basis of this measure, this study analyzes the impact of exchange rates by constructing three industry-specific indices using data for the period 1992-2004 and compares the results from the indices to those using aggregated real exchange rates.

The structure of this paper is as follows. Section 2 contains the literature review. In Section 3, the Industry-Specific Exchange Rate ASEAN Plus Three (APT) is briefly reviewed. The data are described in Section 4. In Section 5, the empirical model and different measures of exchange rates are described. The main results are presented in Section 6. In Section 7, a summary and conclusion are provided.

II.2. Literature Review:

Goldberg (2004) constructs three indices for industry- specific real exchange rates and studies the effect of these indices on corporate profits of specific U.S. industries. She finds the advantage of using industry-specific indices over the aggregate indices computed by the Board of Governors of the Federal Reserve System. The aggregate indices use the aggregate trade-partner exchange rates; these weights are based on the total exports and imports of the U.S. economy. Industry-specific real exchange rate indices can be more effective than aggregate, trade-weighted indices in capturing changes in the competitive environment in an industry caused by movement.

Goldberg compared the results of using industry-specific exchange rates to those using the board exchange rate. In five high-trade-exposure industries, the board exchange rate

measure is statistically insignificant when the non-interacted exchange rate term is excluded while the industry-specific exchange rates are all statistically significant with negative signs. Her finding states that the use of industry-specific exchange rates accurately identifies the effect of the dollar movement on the profit.

Goldberg points to more results for specific industries and, using an industry-by-industry regression, finds evidence that the effect of the exchange rate on specific industries allows for changes over time in industry exposure to international trade. The interacted term (exchange rate with trade) estimated coefficient for the import is statistically significant for the Nonelectrical Machinery and Electrical Machinery and Electronics industries.

Ihrig and Prior (2005) examine whether the type of exchange rate used or the size of the movement in the exchange rate matters in estimating the exchange rate exposure of U.S. manufacturing firms. In their study, they replaced the board exchange rate with an industry-specific exchange rate following Goldberg's approach. They construct 2-digit SIC manufacturing industry exchange rates using monthly data for the period between 1995 and 1999 for 901 U.S. manufacturing firms[14]. They use the JPMorgan Board exchange rate as a benchmark rate and use a 2-digit SIC industry exchange rate. Ihrig and Prior estimate a simple Jorion regression with both the 2-digit SIC industry exchange rate and the board exchange rate, where the dependent variable is the firm's return while the independent variables are the market return, change in the exchange rate, and crisis indicator that is non-zero in a month when there is a crises. They find that there is an

[14] 901 U.S. manufacturing firms include 548 U.S. multinationals and 353 U.S. domestic firms.

improvement when using the industry exchange rate over the board exchange rate. Fifteen percent of the multinational firms have significant exposure when they use the industry-specific exchange rate. Their analysis suggests that controlling for the exchange rate movement size matters.

Dominguez and Tesar (2006) study the relationship between the exchange rate exposure and firms' returns. Their data set includes firm-level, industry-level, and market-level returns and exchange rates for a sample of both OECD and developing countries. The data cover the period from 1980-1999 for eight countries: Chile, France, Germany, Italy, Japan, the Netherlands, Thailand, and the United Kingdom. They define exposure by looking at the relationship between the change in the exchange rate and excess returns at the firm level or industry level. In their model they have the return on firm as the dependent variable and two explanatory variables, including return on market portfolio and the change in the relevant exchange rate. The first objective for Dominguez and Tesar (2006) is to examine the relationship between profitability and the exchange rate. After they find a statistically significant relationship, the second objective is to study why some firms are more exposed than others. The exposure coefficient estimated for the first objective is used in a set of second-stage estimations to examine why some firms are exposed. They test three hypotheses. First, they test whether firm characteristics such as firm size and its industry affiliation have any relationship to exposure. The second hypothesis tests whether firms engaging in international activities have a greater chance to have an effect from the changes in the exchange rates. The third hypothesis examines whether the firms that are more engaged in international trade are more likely to expect exchange rate risks.

In their results regarding the first hypothesis, they find that small size firms are more likely to experience exchange rate exposure than large and medium size firms. Small firms might be exposed because they do not have access to as many instruments for hedging exposure. On the second hypothesis, they find that multinational firms and firms heavily engaged in foreign trade or holding international assets are more likely to face exchange rate exposure. Results for the final hypothesis show that there is no strong evidence that exporting firms will benefit from currency depreciation; however, the results are strongest for importing firms, where they find that such firms are more likely to be harmed by currency depreciation.

Hasan, Mitra, and Ramaswamy (2007) follow Goldberg's approach using three industry-specific real exchange rate measures to study the effect of major trade reforms initiated in India in 1990 on demand elasticity of labor in the manufacturing sector. Using disaggregated data by industry and state for the period from 1980-1997, they find that first reducing protection will significantly increase labor demand elasticity. Second, states with less restriction on firing and hiring of labor have more labor demand elasticity in response to reductions in protection.

Berument and Pasaogullari (2003) formed a bivariate analysis to investigate the relationship between the real exchange rate and output in Turkey using quarterly data from 1987 to 2001. In their study, they find a negative relationship between output and the real exchange rate.

Agénor (1991) used an aggregate output equation derived from a rational expectations macro-model to study the impact of the real exchange rate on output, using

annual data for the period 1978-87 for a group of 23 countries. The empirical estimation shows that unanticipated devaluations increase the level of output, while anticipated devaluations decrease the level of output.

II.3. ASEAN Plus Three (APT) and Industry-Specific Exchange Rates

Economic integration and countries' cooperation have become obvious in our recent world. The uniqueness of the European Monetary Union in terms of the common central bank and one currency is a good example of economic integration. Many countries in different regions have attempted to form at least a free trade area to enhance trade and to strengthen their global trade market competition. One of the most important regional trade agreements, the Association of Southeast Asian Nations (ASEAN), was established in August 1967 in Bangkok, Thailand with an aim to achieve full economic integration by 2020. The original participants were Indonesia, Malaysia, Philippines, Singapore, and Thailand. Brunei Darussalam then joined in 1984, Vietnam in 1995, Laos PDR and Myanmar in 1997, and Cambodia in 1999[15]. The increase in trade interdependence among Southeast Asian countries has developed a need for strong economic relations, particularly with more developed countries like Japan, Korea, and China. In 1997 ASEAN began the process of broadening and deepening overall economic cooperation and expanding their free trade agreement by adding three more countries—China, Japan, and Korea—to be called ASEAN plus Three (APT). Trade agreements between ASEAN and the Plus Three countries have had a significant impact on the ASEAN economy. In

[15] Date source See http://www.aseansec.org

2010 ASEAN's total trade with the Plus Three countries documented a significant increase of 28.9%, totaling US$533.3 billion. Exports increased by 34.9% and imports by 23.5%. The share of ASEAN Plus Three countries' total trade accounted for 26.1% in 2010[16]. Smaller economies are more likely to suffer more adverse results from a financial crisis and one way to avoid that is to build a strong economic relationship with a more-developed partner. The Asian crisis in 1997 was one of the reasons for ASEAN countries to speed up the process of economic integration. Before the Asian Financial crisis, Southeast Asian countries were enjoying an economic growth at an average of over 8% in 1995 and 7.5% in 1996. During the crisis, in 1998, Southeast Asian countries lost 7.8% of their GDP.

The behavior of firms in the ASEAN Plus Three (APT) countries is like that of other international firms in terms of responding to exchange rate fluctuations. In 1995 the appreciation of the US dollar had a negative impact on the exports of East Asian countries (Fischer, 2001). The APT countries have experienced remarkable movement in their exchange rates and their firms' outputs were affected as a result. Most APT counties experienced changes in their exchange rate policies, including a shift from a fixed exchange rate regime to a pegged float regime using crawling bands or crawling pegs; some countries had to change from a fixed exchange rate regime to a flexible exchange rate regime. In July 1997, Thailand had to switch from a fixed exchange rate to a flexible exchange rate regime, allowing the Thai Baht to depreciate. Following Thailand in the same month, the Philippine Peso and the Singapore Dollar were allowed to depreciate. Under floating exchange rates in Malaysia, the Ringgit sharply depreciated.

[16] Joint Media Statements of the 14th ASEAN Plus Three Economic Ministers' (AEM+3) Meeting, Manado, Indonesia, 12 August 2011.

One month later, Indonesia could not defend the Rupiah anymore and had to let it float. The Korean Won, Japanese Yen, and Chinese Renminbi (RMP) also depreciated (see Table 1).

In theory, significant appreciation in real exchange rates has a negative impact on export competitiveness. In export-oriented economies such as Malaysia, Thailand, and Singapore, exchange rate appreciation adversely affects export sectors, which constitute more than 50% of GDP (OECD, 2012).

II.4. Data Sources

The data sample I use in this study covers the period from 1992 to 2004 for ASEAN+3 countries. The output data are obtained at the 2-digit level of ISIC Revision 3 from the United Nations Industrial Statistics Database. The data for nominal exchange rates are obtained from the International Financial Statistics (IFS). Bilateral trade (export and import) data are obtained from the United Nations Commodity Trade Statistics database via World Integrated Trade Solution (WITS)[17]. I obtained an industry-level data set for ASEAN+3 that are disaggregated at 2-digit SITC Revision 3. GDP (constant 2000 US dollars), Consumer price index (CPI), and real interest rates are obtained from the World Bank's World Development Indicators.

Due to lack of data availability, some countries or years for main countries or their partner countries are excluded. Output data for Brunei, Laos, and Myanmar are not available. Therefore, those countries are excluded from the ASEAN+3 data sample.

[17] https://wits.worldbank.org/

II.5. Empirical Approach

Exchange Rate Measures

As Goldberg highlights, the importance of exports and imports may differ substantially from country to country; as a result, movements in bilateral exchange rates can have different effects on competitive conditions across countries. For example, Singapore imported more than 21% of its total power-generating equipment from the United States in 2000 but less than 2.5% of the United States beverages. In contrast, Singapore imports more than 55 % of its total beverage from France but less than 5% of its total power-generating equipment imports[18]. Movements in the exchange rate policy in the ASEAN+3 countries may have an effect on industry structure, as industries react with different levels of sensitivity to the fluctuations of exchange rates. It is important to construct exchange rate indices using trading partners to explain the response of firms in each industry. The importance of trade-weighted industry-specific exchange rates rises from the differences in the import and export destinations.

I will discuss different exchange rate measures in this section. First, I will present the bilateral real exchange rate, which is a common exchange used in most literature. Second, I will follow Goldberg's methodology to construct trade-weighted, industry-specific exchange rates for ASEAN+3 countries.

1) The Bilateral Real Exchange Rate

The real exchange rate, in most common definitions, is the nominal exchange rate adjusted by the price level. The bilateral real exchange rate between each ASEAN+3

[18] Source: UNcomtrade for WITS, calculations by author.

(APT) country and its trading partner is constructed as the nominal bilateral rate of each APT currency with regard to the country's partner currency multiplied by the partner's CPI relative to each APT's CPI. It can be expressed as

$$RER_{k,APT} = \frac{Nominal\ Exchange\ Rate}{CPI_{APT}} \times CPI_k \qquad for\ country\ k$$

Where APT indicates each ASEAN Plus Three country.

2) Industry-Specific Exchange Rate

Goldberg (2004) implies that industry-specific measures can be more effective for changes in industry competitiveness as a result of bilateral exchange rate movements[19]. Following her methodology, I will construct industry- specific exchange rates for ASEAN+3 countries for each industry. Two measures are constructed using the weights of exports and imports, respectively, with respect to each trading partner as follows:

The Export-weighted real exchange rate of country k in industry i:

$$XER^i_{k,t} = \sum_j w^i_{kj,t} \cdot RER_{kj,t}\ , where\ w^i_{kj,t} = \frac{X^i_{kj,t}}{\sum_j X^i_{kj,t}}$$

Where $RER_{kj,t}$ are the bilateral real exchange rates between country k (each APT country) and its trading partner j at time t. The weight $w^i_{kj,t}$ is the share of country j in country k's exports in specific industry i. In a similar manner,

The Import-weighted real exchange rate of country k in industry i

[19] Goldberg constructed three industry-specific exchange rate indices for the United States for each U.S. industry.

$$MER_{k,t}^{i} = \sum_{j} w_{kj,t}^{i} \cdot RER_{kj,t}\,, where\ w_{kj,t}^{i} = \frac{M_{kj,t}^{i}}{\sum_{j} M_{kj,t}^{i}}$$

Where $w_{kj,t}^{i}$ is the import share.

Finally, the Trade-weighted average exchange rate is constructed by combining the export and import rates as follows:

$$TER_{k,t}^{i} = 0.5 \cdot\ XER_{k,t}^{i} + 0.5 \cdot MER_{k,t}^{i}$$

An increase in the value of the indices means a real appreciation of country k's currency.

II.6. Empirical Model

Several empirical studies investigate the impact of exchange rates on output[20], others investigate the impact of exchange rates on firms' profitability. I will follow Goldberg's approach to investigate the impact of several industry-specific real exchange rate indices on outputs using the following first-differenced model.

$$\Delta Y_{k,t}^{i} = \alpha_{k}^{i} + \beta_{0}^{i}\Delta IND_{k,t}^{i} + \beta_{1}^{i} Trade_{k,t}^{i} \cdot \Delta IND_{k,t}^{i} + \beta_{2}\Delta I_{k,t} + \beta_{3}\Delta GDP_{k,t} + u_{t}$$

Where Δ denotes change in logarithms of all variables in the model except for interest rates (change in levels) and all variables are represented in real terms, i represents industry in country k, Time is t, and Y denotes output for an industry. The variable IND represents industry-specific exchange rates (XER, MER, TER). The variable $Trade$ denotes total trade (export plus import) of a specific industry. The variable I represents

[20] See, for example Agénor (1991), Berument & Pasaogullari (2003), Edwards (1986), Kamina & Rogers (2000) Rogers & Wang (1995), Fackler & Rogers, (1995)

the real interest rate, which is the lending interest rate, adjusted for inflation as measured by the GDP deflator. GDP is in real values and varies across countries and year.

The exchange rate term ($\beta_0^i \Delta IND_{k,t}^i$) captures the impact of currency movements of industry-specific exchange rate indices in the ASEAN Plus Three countries. The exchange rate term interacted with Trade ($\beta_1^i Trade_{k,t}^i \cdot \Delta IND_{k,t}^i$) is introduced to capture the changes over time in an industry's overall level of exposure to international trade.

The expected relationship between interest rate and output can be negative since a decrease in interest rate leads to an increase in investment and increase in output. However, the relationship might be positive because of the response of monetary policy to the change in output.

One explanation is that in developing countries, most manufacturing inputs are largely imported and if there are increases in input prices due to local currency depreciations or foreign currency appreciations, firms' input cost will increase, which results in higher output prices and a decrease in demand for output. However, monetary policy might respond to the decrease of output by reducing the interest rate in order to stimulate economies, which will show a positive sign in the data between output and interest rate.

II.7. Empirical Results

The effect of exchange rate on output is first examined by pooling the ten countries and 21 sectors into a single panel. Then three industry-specific exchange rate measures are applied with fixed effects and compared to the ordinary real exchange rate.

To further investigate the role of exchange rate across industry, I run a separate regression for each individual sector. For robustness tests, I run separate tests with and without China, since it is the biggest trading country. Finally, the data is divided into export versus import samples to check whether there are significant changes.

Tables 1through 7 summarize the empirical results using different measures of the real exchange rate. All explanatory variables are lagged to avoid a simultaneity problem. I employ the specifications with fixed effects: country-fixed effects, time-fixed effects, and industry-fixed effects.

Table 1.A shows estimation results using all indices with both country and time-fixed effects. Table 1.B presents estimation results with country-fixed effects and industry-fixed effects. Table 1.C provides estimation results with only country-fixed effects.

According to Table 1(A.B.C), the coefficients of real GDP and real interest rate are generally significant and positive, which is consistent with Goldberg's results. The coefficients of different measures of the exchange rate are negative but significant only for the specifications of the import-weighted and export-weighted real exchange rate. The negative sign shows that the appreciation in the real exchange rate of local currency discourages the production of industrial output. For example, a one percent appreciation of ASEAN+3 currencies will cause industrial output to drop by 0.21 % based on the import-weighted index and 0.093 % based on the export-weighted index. The aggregate index of real exchange rates is statistically insignificant in all regressions. Interest rate is found to have a positive effect on output.

In addition, I test for asymmetric effects of currency appreciation and depreciation for all three exchange rate indices. The results in Table 1(A.B.C) show coefficients for the depreciation variable are all significant and with a negative sign. However, the appreciation coefficients are not statistically significant. The negative sign for the depreciation coefficients indicates that currency depreciation in any one of the ASEAN+3 currencies will lead to more decrease in output and that is consistent with Ahmed's (2003) findings. One possible reason for the negative impact of the currency depreciation is that currency depreciation will increase the cost of inputs, which will discourage firms' output.

More results are obtained for specific industries. Tables 3 through 5 show results for industry-by-industry output regressions for different manufacturing industries. In Table 3, I report results from regressions that include both the trade-weighted index and the interaction term. Those results show statistically significant coefficients for two sectors, fabricated products with a negative sign and furniture products with a positive sign, based on the trade-weighted index. The interaction term shows only one positive significant coefficient: for non-metallic mineral products. The coefficient for non-metallic mineral products indicates that a one percent appreciation in ASEAN +3 currencies with trade exposure will lead to an increase in output but with a very small percentage increase (0.00000278). The positive relationship might be because there are imported intermediate inputs that become cheaper after the currency appreciation and as a result the final outputs increase. Table 4 provides the results where the interaction term is excluded and uses only the trade-weighted exchange rate term, which presents almost the same results. The results suggest that the relationship between trade exchange rate and

industry output might be driven by fabricated products and furniture products. An appreciation of 10 % in local currency reduces the fabricated industry output by 0.0435 %; while an appreciation of 10 % in ASEAN+3 currency will result in a 0.0236 % increase in the output of the furniture industry.

For a robustness check, Table 5 provides estimation results where China is excluded from the data sample. Interestingly, the furniture products coefficient is no longer significant, while the fabricated products coefficient remain statistically significant with the same sign. This finding could indicate that a significant furniture industry share is being produced in China.

For an additional robustness check, I divide the data into two groups, export and import sample data. Tables 6 through 9 provide estimation results for export and import regressions. Table 6 reports the results of three regressions for the full export sample data of twenty one industries. The estimated coefficient of the export-weighted index is always statistically significant with a negative sign, implying a negative relationship between exchange rate and industry output, while the interaction term between trade and the export-weighted index is statistically insignificant. Looking at the results of industry-by-industry output regressions, the estimated coefficient of the wearing apparel products industry is statistically significant at the 1% level of significance with a negative sign, as shown in Table 7.

On the other hand, Table 8 summarizes the empirical results for the full import sample data at the aggregate level, where the Import-weighted real exchange rate is found to be not statistically significant. However, when the trade variable is interacted with the

exchange rate, the estimated coefficient of the interaction term is statistically significant with a positive sign. At the industry level, the influence of the Import-weighted real exchange rate on output is not statistically significant for all industries sectors.

II.8. Conclusion

In this paper, I measure industry-specific real exchange rate impacts on output for ASEAN+3 countries using data for 10 countries and their partners during the period 1992-2004. The impact of industry-specific real exchange rates is examined using both aggregate and disaggregate industry-level data. In addition the study compares the findings to the use of the real exchange rate index.

The study contributes to the understanding of the effect of exchange rates on output in several ways. Although there are wide uses of bilateral exchange rates in the empirical literature, I find that compared to the nominal exchange rate, industry-specific indices have a better performance in explaining the movement in industrial output. Second, comparing the use of simple real exchange rates to industry-specific real exchange rate indices, all the simple exchange rate coefficients are statistically insignificant and do not provide sufficient explanations. Third, the test for asymmetric effects of currency appreciation and depreciation shows that there is always a significant relationship between currency depreciation and output.

II.9. References

Agénor, P.-R. (1991). Devaluation and the Real Exchange Rate in Developing Countries. *Weltwirtschaftliches Archiv, 127*(1), 18-41.

Ahmed, S. (2003). Sources of economic fluctuations in Latin America and implications for choice of exchange rate regimes. *Journal of Development Economics, 72*, 181– 202.

Berument, H., & Pasaogullari, M. (2003). Effects of the Real Exchange Rate on Output and Inflation: Evidence From Turkey. *The Developing Economies, 41*(4), 401–435.

Dominguez, K. M., & Tesar, L. L. (2006). Exchange rate exposure. *Journal of International Economics*, *68*, 188– 218.

Edwards, S. (1986, August). Are Devaluation Contractionary. *Review of Economics and Statistics*, *68*(3), 501-508.

Fackler, J. S., & Rogers, J. H. (1995). Output, Inflation and Stabilization: A Counterfactual Analysis. *Journal of International Money and Finance, 14*(5), 619-640.

Fischer, S. (2001, Spring). Exchange Rate Regimes: Is the Bipolar View Correct? *The Journal of Economic Perspectives, 15*(2), 3-24.

Gil, I., Huang, Y., & Kharas, H. (2007). *East Asian visions : perspectives on economic development.* Washington, DC: World Bank.

Goldberg, L. S. (2004, May). Industry-Specific Exchange Rates for the United States. *Economic Policy Review*, *10*(1), 16.

Hasan, R., Mitra, D., & Ramaswamy, K. (2007, August). TRADE REFORMS, LABOR REGULATIONS, AND LABOR-DEMAND ELASTICITIES: EMPIRICAL EVIDENCE FROM INDIA. *The Review of Economics and Statistics, 89*(3), 466-481.

Ihrig, J., & Prior, D. (2005, July). The effect of exchange rate fluctuations on multinationals' return. *Journal of Multinational Financial Management, 15*(3), 273-286.

Kamina, S. B., & Rogers, J. H. (2000). Output and the real exchange rate in developing countries: An application to Mexico. *Journal of Development Economics, 61*(1), 85-109.

Krugman, P. (1986, May). Pricing to Market When the Exchange Rate Changes. *NBER Working Paper Series*.

Mejı´a-Reyesa, P., Osborna, D. R., & Sensie, M. (2010). Modelling Real Exchange Rate Effects On Growth In Latin America. *Applied Economics, 42*, 2491-2503.

Nanto, D. K. (1998). *The 1997-98 ASIAN Financial Crisis.* Washington, DC: Congressional Research Service.

OECD. (2012). *Southeast Asian Economic Outlook 2011/12.* OECD Publishing.

Rangan, S., & Lawrence, R. Z. (2003). The Responses of U.S. Firms to Exchange Rate Fluctuations: Piercing the Corporate Veil. *Brookings Paper on Economic Activity, 2*, 341-369.

Rao, V. (1998, Jun 6-12). East Asian Economies: The Crisis of 1997-98. *Economic and Political Weekly, 33*(23), 1397-1416.

Rogers, J. H., & Wang, P. (1995). Output, Inflation, and Stabilization in a Small Open Economy: Evidence from Mexico. *Journal of Development Economics, 46*(2), 271-293.

Table II.1.A. Estimation Results using all Indices with Both Country and Time Fixed Effects

	(1) ΔOutput	(2) ΔOutput	(3) ΔOutput	(4) ΔOutput	(5) ΔOutput	(6) ΔOutput	(7) ΔOutput
Real I	0.0116***	0.0116***	0.0116***	0.0116***	0.0116***	0.0119***	0.0116***
	(28.54)	(28.63)	(28.48)	(28.53)	(29.70)	(28.18)	(29.69)
Real GDP	3.847***	3.840***	3.848***	3.850***	3.819***	3.877***	3.819***
	(38.97)	(38.89)	(38.98)	(39.01)	(41.79)	(38.26)	(41.79)
MER	-0.00216**						
	(-2.82)						
Depreciate MER		-0.00476***					
		(-3.88)					
Appreciate MER		0.000318					
		(0.27)					
XER			-0.000931*				
			(-2.09)				
Depreciate XER				-0.00322***			
				(-3.77)			
Appreciate XER				0.00133			
				(1.57)			
TER					-0.000852		
					(-1.71)		
Depreciate TER						-0.00419***	
						(-3.35)	
Appreciate TER						-0.000790	
						(-1.10)	
Real Ex rate							-0.000269
							(-0.28)
Constant	-0.0910***	-0.0956***	-0.113***	-0.121***	-0.0948***	-0.126***	-0.0947***
	(-7.00)	(-7.29)	(-6.00)	(-6.40)	(-7.59)	(-6.41)	(-7.58)
N	21913	21913	21914	21914	23736	20822	23736
R-sq.	0.317	0.317	0.317	0.317	0.317	0.318	0.317

t statistics in parentheses

* p<0.05 ** p<0.01 *** p<0.001

Table II.1.B. Estimation Results using all Indices with Both Country and Industry Fixed Effects

	(1) ΔOutput	(2) ΔOutput	(3) ΔOutput	(4) ΔOutput	(5) ΔOutput	(6) ΔOutput	(7) ΔOutput
Real I	0.00834***	0.00837***	0.00832***	0.00833***	0.00811***	0.00845***	0.00811***
	(25.71)	(25.82)	(25.67)	(25.69)	(25.63)	(25.17)	(25.63)
Real GDP	4.375***	4.371***	4.381***	4.382***	4.309***	4.374***	4.309***
	(78.57)	(78.48)	(78.74)	(78.76)	(80.73)	(76.52)	(80.73)
MER	-0.00261***						
	(-3.32)						
Depreciate MER		-0.00589***					
		(-4.68)					
Appreciate MER		0.000579					
		(0.47)					
XER			-0.00104*				
			(-2.28)				
Depreciate XER				-0.00281**			
				(-3.19)			
Appreciate XER				0.000709			
				(0.81)			
TER					-0.000105		
					(-0.21)		
Depreciate TER						-0.00521***	
						(-4.06)	
Appreciate TER						-0.0000452	
						(-0.06)	
Real Ex rate							-0.0000838
							(-0.09)
Constant	-0.0772***	-0.0818***	0.0700***	-0.0800***	-0.0758***	-0.158***	-0.0757***
	(-5.16)	(-5.44)	(3.72)	(-4.28)	(-5.33)	(-10.63)	(-5.33)
N	21913	21913	21914	21914	23736	20822	23736
R-sq.	0.285	0.285	0.285	0.285	0.283	0.286	0.283

t statistics in parentheses

* p<0.05 ** p<0.01 *** p<0.001

Table II.1.C. Estimation Results using all Indices with Country Fixed Effects only

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	ΔOutput	ΔOutput	ΔOutput	ΔOutput	ΔOutput	ΔOutput	ΔOutput
Real I	0.00831***	0.00835***	0.00829***	0.00830***	0.00809***	0.00844***	0.00809***
	(25.30)	(25.42)	(25.25)	(25.27)	(25.24)	(24.80)	(25.24)
Real GDP	4.357***	4.351***	4.363***	4.364***	4.290***	4.350***	4.291***
	(77.25)	(77.15)	(77.42)	(77.46)	(79.35)	(75.15)	(79.34)
MER	-0.00278***						
	(-3.50)						
Depreciate MER		-0.00646***					
		(-5.09)					
Appreciate MER		0.000740					
		(0.60)					
XER			-0.00129**				
			(-2.79)				
Depreciate XER				-0.00366***			
				(-4.13)			
Appreciate XER				0.00105			
				(1.20)			
TER					-0.000802		
					(-1.55)		
Depreciate TER						-0.00568***	
						(-4.38)	
Appreciate TER						-0.000631	
						(-0.84)	
Real Ex rate							-0.000405
							(-0.41)
Constant	-0.125***	-0.131***	-0.0435**	-0.0519***	-0.126***	-0.134***	-0.126***
	(-14.82)	(-15.25)	(-2.93)	(-3.44)	(-15.39)	(-15.34)	(-15.38)
N	21913	21913	21914	21914	23736	20822	23736
R-sq.	0.263	0.264	0.263	0.263	0.261	0.264	0.261

t statistics in parentheses

* p<0.05 ** p<0.01 *** p<0.001

Table II.2. Estimation Result using Trade-Weighted Index and Trade Interaction Term

	(1) ΔOutput	(2) ΔOutput	(3) ΔOutput	(4) ΔOutput	(5) ΔOutput	(6) ΔOutput
Real I	0.00809***	0.0116***	0.00811***	0.00810***	0.0116***	0.00812***
	(25.24)	(29.69)	(25.63)	(25.25)	(29.70)	(25.65)
Real GDP	4.291***	3.819***	4.309***	4.290***	3.819***	4.309***
	(79.34)	(41.79)	(80.73)	(79.35)	(41.80)	(80.73)
Real Ex rate	-0.000405	-0.000269	-0.0000838			
	(-0.41)	(-0.28)	(-0.09)			
TER				-0.000993	-0.00103*	-0.000295
				(-1.90)	(-2.05)	(-0.57)
TERTRADE				1.86e-09*	1.78e-09*	1.79e-09*
				(2.36)	(2.34)	(2.29)
Constatnt	-0.126***	-0.0947***	-0.0757***	-0.126***	-0.0948***	-0.0757***
	(-15.38)	(-7.58)	(-5.33)	(-15.41)	(-7.59)	(-5.33)
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	No	Yes	No	No	Yes	No
Industry FE	NO	No	Yes	No	No	Yes
N	23736	23736	23736	23736	23736	23736
R-sq.	0.261	0.317	0.283	0.261	0.317	0.283

t statistics in parentheses

* p<0.05 ** p<0.01 *** p<0.001"

Table II.3. Estimation Result Using Trade-Weighted Index and Interaction Term by Sectors

ΔOutput	TER	TERTRADE	Real Interest rate	Real GDP	Constant	N	adj. R-sq.
Food and Beverages	0.000129	3.02e-09	0.0103***	2.055***	0.0157	1200	0.511
	(0.12)	(1.10)		(10.58)	(0.56)		
Tobacco products	0.00207	-9.17e-09	0.0169***	4.426***	-0.256**	1076	0.316
	(0.55)	(-0.10)	(7.08)	(7.12)	(-2.63)		
Textiles	0.000360	-4.79e-09	0.0141***	2.361***	-0.183***	1283	0.61
	(0.33)	(-1.07)	(17.53)	(11.52)	(-6.91)		
Wearing apparel	0.00000714	-5.19e-10	0.0190***	3.364***	0.202***	1440	0.62
	(0.00)	(-0.16)	(19.24)	(12.95)	(4.43)		
Leather Products	0.000702	-6.23e-09	0.00456***	3.691***	-0.237***	770	0.75
	(0.73)	(-1.11)	(4.74)	(19.35)	(-8.09)		
Wood Products	-0.00186	-5.07e-10	0.00909***	3.402***	-0.0572	1230	0.741
	(-1.47)	(-0.04)	(11.97)	(16.04)	(-1.37)		
Paper Products	0.0000804	2.89e-08	0.00692***	5.589***	-0.289***	1155	0.547
	(0.04)	(1.36)	(4.31)	(15.90)	(-6.16)		
Refined Petroleum Products	-0.00376	4.36e-09	0.00653	4.973***	-0.938***	1119	0.351
	(-0.79)	(1.08)	(1.60)	(5.63)	(-6.71)		
Chemical products	0.000546	8.99e-10	0.00462***	1.536***	0.250***	1213	0.485
	(0.40)	(0.24)	(4.91)	(6.32)	(7.04)		
Rubber and plastic products	0.000532	6.96e-09	0.0112***	3.361***	-0.202***	1235	0.684
	(0.49)	(0.60)	(12.48)	(16.27)	(-7.09)		
Non-metallic mineral	-0.000803	2.78e-08*	-0.00599**	2.145***	-0.266***	1133	0.518
	(-0.67)	(2.19)	(-2.82)	(8.43)	(-7.60)		
Basic Metals	-0.000752	-1.88e-10	0.0114***	2.172***	0.0805*	1222	0.601
	(-0.60)	(-0.10)	(11.62)	(9.93)	(2.00)		
Basic metals Products	0.000937	-7.16e-09	0.00993***	4.294***	0.0290	1082	0.632
	(0.57)	(-0.06)	(8.07)	(15.70)	(0.86)		
Fabricated Products	-0.00442**	4.90e-10	0.00311*	5.602***	-0.0881*	1310	0.452
	(-2.63)	(0.24)	(2.12)	(18.83)	(-2.12)		
Machinery and Equipment	0.00180	1.94e-10	0.0224***	8.932***	0.0318	800	0.552
	(0.72)	(0.05)	(7.82)	(14.14)	(0.24)		
Office Machinery	0.000708	1.46e-09	0.0283***	6.575***	-0.134*	1191	0.445
	(0.28)	(0.68)	(11.17)	(13.56)	(-2.06)		
Communication Equipment	-0.000470	1.35e-08	-0.00559**	-0.258	0.287***	794	0.499
	(-0.24)	(1.62)	(-3.13)	(-0.55)	(4.01)		
Medical instruments	-0.000604	3.36e-09	0.00185	1.544**	0.236*	1136	0.325
	(-0.23)	(0.56)	(0.74)	(3.05)	(2.43)		
Motor Vehicles	-0.00225	1.66e-10	0.0383***	6.597***	0.287***	1315	0.7
	(-1.09)	(0.14)	(27.49)	(19.15)	(5.47)		
Other Transport equipment	0.0000405	1.04e-09	0.0176***	4.012***	-0.0959	704	0.476
	(0.02)	(0.25)	(10.35)	(11.26)	(-1.60)		
Furniture	0.00257*	-2.79e-09	-0.00361***	2.370***	-0.0996**	1328	0.54
	(2.30)	(-0.81)	(-4.50)	(11.48)	(-2.66)		

t statistics in parentheses , * p<0.05 ** p<0.01 *** p<0.001

Table II.4. Estimation Results Using Trade-Weighted Index by Sectors

ΔOutput	TER	Real Interest rate	Real GDP	Constant	N	adj. R-sq.
Food and Beverages	0.000464	0.0103***	2.058***	0.0161	1200	0.511
	(0.45)	(11.57)	(10.59)	(0.57)		
Tobacco products	0.00200	0.0169***	4.427***	-0.256**	1076	0.317
	(0.54)	(7.08)	(7.13)	(-2.63)		
Textiles	0.0000190	0.0141***	2.366***	-0.183***	1283	0.61
	(0.02)	(17.51)	(11.54)	(-6.90)		
Wearing apparel	-0.0000324	0.0190***	3.363***	0.201***	1440	0.62
	(-0.02)	(19.25)	(12.95)	(4.43)		
Leather Products	0.000435	0.00456***	3.697***	-0.238***	770	0.75
	(0.47)	(4.74)	(19.39)	(-8.13)		
Wood Products	-0.00187	0.00909***	3.402***	-0.0572	1230	0.741
	(-1.52)	(11.97)	(16.07)	(-1.37)		
Paper Products	0.000763	0.00696***	5.577***	-0.290***	1155	0.546
	(0.42)	(4.33)	(15.87)	(-6.18)		
Refined Petroleum Products	-0.00233	0.00659	4.990***	-0.938***	1119	0.351
	(-0.51)	(1.61)	(5.65)	(-6.71)		
Chemical products	0.000636	0.00462***	1.536***	0.250***	1213	0.486
	(0.48)	(4.92)	(6.32)	(7.04)		
Rubber and plastic products	0.000700	0.0112***	3.364***	-0.202***	1235	0.684
	(0.66)	(12.49)	(16.29)	(-7.09)		
Non-metallic mineral	-0.00000279	-0.00599**	2.137***	-0.267***	1133	0.517
	(-0.00)	(-2.81)	(8.39)	(-7.62)		
Basic Metals	-0.000787	0.0114***	2.172***	0.0805*	1222	0.601
	(-0.66)	(11.62)	(9.93)	(2.00)		
Basic metals Products	0.000910	0.00993***	4.294***	0.0290	1082	0.633
	(0.57)	(8.08)	(15.71)	(0.86)		
Fabricated Products	-0.00435**	0.00312*	5.605***	-0.0874*	1310	0.452
	(-2.63)	(2.13)	(18.87)	(-2.10)		
Machinery and Equipment	0.00183	0.0224***	8.932***	0.145	800	0.553
	(0.75)	(7.82)	(14.14)	(1.07)		
Office Machinery	0.00112	0.0283***	6.576***	-0.135*	1191	0.445
	(0.46)	(11.16)	(13.57)	(-2.07)		
Communication Equipment	0.000640	-0.00556**	-0.240	0.288***	794	0.498
	(0.35)	(-3.11)	(-0.52)	(4.03)		
Medical instruments	-0.000327	0.00184	1.540**	0.236*	1136	0.326
	(-0.13)	(0.73)	(3.04)	(2.43)		
Motor Vehicles	-0.00222	0.0383***	6.595***	0.287***	1315	0.7
	(-1.08)	(27.50)	(19.17)	(5.48)		
Other Transport equipment	0.000112	0.0176***	4.008***	0.370***	704	0.476
	(0.07)	(10.36)	(11.27)	(7.10)		
Furniture	0.00236*	-0.00359***	2.372***	-0.0994**	1328	0.54
	(2.17)	(-4.48)	(11.48)	(-2.66)		

t statistics in parentheses , * p<0.05 ** p<0.01 *** p<0.001

Table II.5. Estimation Result Using Trade-Weighted Index by Sectors Excluding China

ΔOutput	TER	Real Interest rate	Real GDP	Constant	N	adj. R-sq
	(-0.08)	(11.17)	(9.39)	(-2.86)		
Tobacco products	0.00250	0.0177***	4.155***	-0.630***	842	0.336
	(0.56)	(6.63)	(5.72)	(-5.22)		
Textiles	-0.000693	0.0163***	1.853***	0.348***	1083	0.658
	(-0.60)	(19.66)	(8.72)	(9.61)		
Wearing apparel	0.000348	0.0199***	3.029***	-0.117**	1193	0.614
	(0.19)	(18.23)	(10.40)	(-2.96)		
Leather Products	0.000463	0.00456***	3.697***	-0.335***	730	0.729
	(0.47)	(4.62)	(18.87)	(-11.17)		
Wood Products	-0.00165	0.00901***	3.271***	0.124***	973	0.742
	(-1.09)	(10.90)	(13.90)	(3.68)		
Paper Products	-0.000329	0.00789***	5.285***	-0.103	904	0.563
	(-0.16)	(4.58)	(13.96)	(-1.86)		
Refined Petroleum Products	-0.00186	0.00562	5.025***	-0.0492	794	0.353
	(-0.29)	(1.07)	(4.37)	(-0.28)		
Chemical products	0.000452	0.00498***	1.424***	0.238***	1022	0.471
	(0.29)	(4.72)	(5.14)	(6.11)		
Rubber and plastic products	0.00103	0.0116***	3.325***	-0.166***	1052	0.702
	(0.88)	(12.19)	(15.32)	(-5.97)		
Non-metallic mineral	0.0000463	0.00116	1.575***	-0.121*	903	0.472
	(0.03)	(0.44)	(5.55)	(-2.45)		
Basic Metals	-0.000757	0.0136***	1.693***	-0.141***	1026	0.615
	(-0.61)	(14.16)	(7.92)	(-3.64)		
Basic metals Products	-0.000153	0.00942***	4.592***	-0.125*	769	0.672
	(-0.08)	(7.27)	(15.81)	(-2.20)		
Fabricated Products	-0.00465*	0.000470	6.147***	-0.185**	1106	0.483
	(-2.54)	(0.29)	(18.87)	(-2.72)		
Machinery and Equipment	0.00185	0.0224***	8.932***	-0.0175	788	0.551
	(0.75)	(7.77)	(14.04)	(-0.17)		
Office Machinery	0.00136	0.0267***	7.085***	-0.113	1036	0.493
	(0.54)	(10.33)	(14.42)	(-0.98)		
Communication Equipment	0.000675	-0.00556**	-0.240	0.429***	763	0.488
	(0.36)	(-3.05)	(-0.51)	(7.28)		
Medical instruments	-0.000401	-0.00119	1.925***	-0.249**	932	0.364
	(-0.14)	(-0.44)	(3.50)	(-2.61)		
Motor Vehicles	-0.000713	0.0394***	5.805***	0.377***	1086	0.719
	(-0.29)	(26.40)	(15.37)	(6.32)		
Other Transport equipment	0.000120	0.0176***	4.008***	0.134*	676	0.469
	(0.07)	(10.15)	(11.04)	(2.41)		
Furniture	0.00221	-0.00243**	2.111***	0.184***	1130	0.538
	(1.84)	(-2.87)	(9.42)	(4.21)		

t statistics in parentheses, * p<0.05 ** p<0.01 *** p<0.001

Table II.6. Estimation Results Using Export-Weighted Index

	(1) ΔOutput	(2) ΔOutput	(3) ΔOutput
XER	-0.00189** (-2.65)	-0.00129* (-2.29)	
TRADEXER	4.02e-11 (1.36)		
Real Interest rate	0.0113*** (27.54)	0.0113*** (27.55)	0.0113*** (27.55)
Real GDP	4.110*** (42.50)	4.110*** (42.50)	4.111*** (42.50)
Real Exch Rate			-0.000918 (-1.04)
Constant	-0.105*** (-7.97)	-0.105*** (-7.98)	-0.105*** (-7.99)
N	20277	20277	20277
adj.R-Sq.	0.345	0.345	0.345

t statistics in parentheses

* p<0.05 ** p<0.01 *** p<0.001

Table II.7. Estimation Results Using Export-Weighted Index By Sectors

ΔOutput	XER	Δ Real Interest rate	Δ Real GDP	Constant	N	adj. R-sq.
Food and Beverages	0.000468	0.00820***	2.194***	-0.123***	1058	0.666
	(0.44)	(11.46)	(13.04)	(-4.13)		
Tobacco products	-0.00482	0.0127***	3.688***	-0.137	873	0.315
	(-1.45)		(5.64)	(-1.19)		
Textiles	0.00149	0.0137***	2.426***	-0.146***	1072	0.611
	(1.14)	(15.87)	(10.97)	(-4.82)		
Wearing apparel	-0.00534**	0.0166***	4.182***	0.0953	1088	0.543
	(-2.79)	(12.52)	(12.51)	(1.74)		
Leather Products	0.000120	0.00875***	3.901***	-0.0658	599	0.703
	(0.10)	(9.31)	(15.31)	(-1.62)		
Wood Products	0.00255	0.00737***	3.563***	-0.375***	1032	0.739
	(1.73)	(8.09)	(14.40)	(-10.03)		
Paper Products	0.00271	0.00822***	4.821***	-0.117*	1040	0.526
	(1.27)	(5.63)	(13.69)	(-2.45)		
Refined Petroleum Products	-0.000355	0.000124	7.963***	-1.282***	876	0.372
	(-0.07)	(0.03)	(8.55)	(-6.95)		
Chemical products	0.0000923	0.00309**	1.731***	-0.0211	1136	0.501
	(0.06)	(2.83)	(6.17)	(-0.57)		
Rubber and plastic products	-0.000914	0.00908***	3.614***	-0.0156	1074	0.715
	(-0.79)	(11.54)	(18.94)	(-0.56)		
Non-metallic mineral	-0.00205	-0.00448*	2.383***	-0.292***	993	0.501
	(-1.50)	(-2.24)	(9.16)	(-8.75)		
Basic metals Products	0.0000643	0.0119***	2.696***	-0.0993**	1100	0.604
	(0.04)	(11.74)	(11.19)	(-3.12)		
Fabricated Products	-0.00132	0.00663***	5.110***	-0.0796*	1055	0.639
	(-0.86)	(5.24)	(19.58)	(-2.01)		
Machinery and Equipment	-0.00129	0.00169	5.658***	-0.0116	1081	0.475
	(-0.65)	(1.15)	(17.75)	(-0.27)		
Office Machinery	-0.00183	0.0260***	9.543***	0.0572	664	0.511
	(-0.57)	(7.94)	(13.42)	(0.42)		
Communication Equipment	0.00101	0.0304***	6.784***	-0.0473	1107	0.534
	(0.36)	(15.04)	(14.84)	(-0.56)		
Medical instruments	0.000247	-0.00376	0.460	0.0350	662	0.497
	(0.10)	(-1.87)	(0.97)	(0.45)		
Motor Vehicles	-0.00376	0.00273	3.193***	-0.0295	1070	0.367
	(-1.37)	(1.26)	(6.47)	(-0.48)		
Other Transport equipment	0.00268	0.0381***	6.392***	-0.272***	1085	0.675
	(0.99)	(22.56)	(15.11)	(-4.28)		
Furniture	-0.00215	0.0149***	3.911***	0.311***	531	0.415
	(-1.21)	(6.57)	(9.17)	(4.79)		

t statistics in parentheses * p<0.05 ** p<0.01 *** p<0.001

Table II.8. Estimation Results Using Import-Weighted Index

	(1) ΔOutput	(2) ΔOutput	(3) ΔOutput
MER	-0.000684	0.000194	
	(-1.09)	(0.40)	
TRADEMER	5.56E-11*		
	(2.23)		
Real Interest rate	0.0103***	0.0103***	0.0103***
	(19.53)	(19.52)	(19.53)
Real GDP	3.750***	3.749***	3.748***
	(32.99)	(32.97)	(32.97)
Real Exch Rate			-0.000597
			(-0.60)
Constant	-0.104***	-0.103***	-0.215***
	(-6.89)	(-6.88)	(-10.85)
N	16012	16012	16014
adj. R-sq.	0.289	0.289	0.289

t statistics in parentheses

* p<0.05 ** p<0.01 *** p<0.001

Table II.9. Estimation Results Using Import-Weighted Index

ΔOutput	MER	Real Interest rate	Real GDP	Constant	N	adj. R-sq.
Food and Beverages	0.0000943	0.00933***	2.351***	-0.0291	981	0.584
	(0.12)	(11.34)	(13.21)	(-1.10)		
Tobacco products	-0.000188	0.0152***	4.669***	0.559**	360	0.292
	(-0.04)	(3.71)	(4.67)	(2.79)		
Textiles	0.000854	0.0131***	2.477***	-0.0486	979	0.61
	(0.92)	(13.04)	(11.20)	(-1.27)		
Wearing apparel	-0.000944	0.0142***	4.137***	-0.416***	838	0.567
	(-0.73)	(9.54)	(14.05)	(-9.70)		
Leather Products	0.000276	0.00594***	4.108***	-0.0536	532	0.76
	(0.32)	(5.56)	(19.05)	(-1.43)		
Wood Products	-0.000972	0.00853***	4.062***	-0.174***	812	0.717
	(-0.86)	(7.13)	(15.68)	(-4.81)		
Paper Products	0.00235	0.00786***	4.308***	-0.245**	725	0.541
	(1.26)	(4.57)	(9.80)	(-3.12)		
Refined Petroleum Products	-0.00223	0.0113*	5.211***	-0.358	658	0.335
	(-0.46)	(1.98)	(4.01)	(-1.35)		
Chemical products	0.00141	0.00203	1.796***	-0.284***	942	0.542
	(1.19)	(1.94)	(6.83)	(-7.04)		
Rubber and plastic products	-0.000851	0.00920***	3.583***	-0.199***	691	0.665
	(-0.70)	(7.93)	(13.83)	(-5.93)		
Non-metallic mineral	0.00124	-0.00128	1.851***	-0.131**	815	0.457
	(1.07)	(-0.50)	(6.08)	(-2.98)		
Basic metals Products	0.000942	0.0122***	2.530***	-0.197***	1005	0.613
	(0.90)	(11.36)	(9.98)	(-4.04)		
Fabricated Products	-0.000210	0.0103***	4.562***	-0.172***	534	0.634
	(-0.12)	(5.71)	(11.87)	(-3.43)		
Machinery and Equipment	-0.00294	0.00203	6.084***	-0.0115	948	0.465
	(-1.65)	(1.18)	(15.11)	(-0.21)		
Office Machinery	-0.00238	0.0235***	8.681***	0.0897	608	0.526
	(-0.96)	(6.80)	(13.22)	(0.73)		
Communication Equipment	0.000878	0.0298***	5.467***	-0.112	987	0.426
	(0.36)	(10.70)	(9.44)	(-0.89)		
Medical instruments	0.00124	-0.0110**	0.213	0.0336	513	0.488
	(0.58)	(-2.97)	(0.34)	(0.28)		
Motor Vehicles	0.000577	0.0000230	2.195***	-0.200*	871	0.317
	(0.21)	(0.01)	(3.72)	(-2.52)		
Other Transport equipment	-0.000620	0.0380***	5.118***	0.426***	732	0.533
	(-0.25)	(13.32)	(8.85)	(6.21)		
Furniture	-0.00106	0.0105***	4.499***	-0.382***	423	0.417
	(-0.59)	(4.52)	(7.97)	(-4.22)		

t statistics in parentheses

* p<0.05 ** p<0.01 *** p<0.001

Table II.10. Country Specific Estimations

		Interest Rate	GDP	INDEX-Appreciation	INDEX-Depreciation	Constant	N	R-sq.
CHINA	1)MER	-0.00587***	-1.585***	-0.00201	0.00167	0.483***	3431	0.088
		(-7.06)	(-7.46)	(-1.07)	(0.91)	(7.02)		
	2)XER	-0.00602***	-1.610***	0.000835	0.000328	0.492***	3431	0.087
		(-7.28)	(-7.58)	(0.65)	(0.26)	(7.15)		
INDONESIA	1)MER	0.0108***	4.247***	-0.00730	-0.00495	0.0136	2770	0.418
		(20.00)	(26.79)	(-1.45)	(-1.03)	(0.25)		
	2)XER	0.0107***	4.259***	-0.00853**	0.00187	-0.00897	2770	0.419
		(19.97)	(27.01)	(-2.69)	(0.59)	(-0.16)		
JAPAN	1)MER	0.0876***	2.847***	0.00306	0.00258	0.0216	2065	0.373
		(13.33)	(9.29)	(1.25)	(1.30)	(1.12)		
	2)XER	0.0852***	2.741***	-0.000639	0.000780	0.0216	2065	0.372
		(13.20)	(9.05)	(-0.48)	(0.64)	(1.12)		
KOREA	1)MER	-0.0109***	3.808***	-0.000150	0.000869	-0.142***	4660	0.694
		(-12.77)	(85.78)	(-0.14)	(0.77)	(-13.83)		
	2)XER	-0.0110***	3.801***	-0.000547	-0.000649	-0.141***	4660	0.694
		(-12.89)	(85.74)	(-0.72)	(-0.85)	(-13.51)		
MALAYSIA	1)MER	-0.00983***	2.005***	-0.00439	-0.00283	-0.0550	2567	0.158
		(-8.16)	(8.71)	(-1.52)	(-0.97)	(-0.99)		
	2)XER	-0.00972***	2.030***	0.00192	-0.0000928	-0.0539	2567	0.157
		(-8.08)	(8.82)	(0.95)	(-0.05)	(-0.97)		
PHILIPPINE	1)MER	0.00220	3.899***	-0.00322	-0.000393	0.0200	1573	0.183
		(1.35)	(7.55)	(-0.78)	(-0.09)	(0.39)		
	2)XER	0.00227	3.895***	0.00108	0.00406	0.0172	1573	0.184
		(1.39)	(7.55)	(0.37)	(1.41)	(0.33)		
SINGAPORE	1)MER	-0.00424***	1.361***	0.00191	-0.00268	-0.0659*	2657	0.227
		(-4.42)	(11.97)	(1.13)	(-1.66)	(-2.22)		
	2)XER	-0.00414***	1.366***	-0.00108	0.000891	-0.0732*	2658	0.226
		(-4.35)	(12.01)	(-0.91)	(0.77)	(-2.44)		
THAILAND	1)MER	-0.00661	6.320***	-0.0297***	0.0133	0.328	1671	0.303
		(-1.08)	(21.97)	(-3.31)	(1.51)	(1.71)		
	2)XER	-0.00701	6.394***	-0.0194**	0.00312	0.323	1671	0.301
		(-1.15)	(22.40)	(-2.73)	(0.43)	(1.66)		
VIETNAM	1)MER	0.129***	-15.76***	-0.00139	0.00351	1.654***	519	0.585
		(20.00)	(-9.17)	(-0.50)	(1.14)	(12.63)		
	2)XER	0.129***	-15.81***	0.00400	-0.00130	1.666***	519	0.587
		(19.93)	(-9.22)	(1.85)	(-0.57)	(12.73)		

t statistics in parentheses

* p<0.05 ** p<0.01 *** p<0.001"

Table II.11. Concordance between SITC Revision 3 and ISIC Revision 3

ISIC 2-digit Revision 3 Product Code	Product Description	SITC 2-digit Revision 3 Product Code
15	FOOD PRODUCTS AND BEVERAGES	00,01,02,03,04,05,06,07,08,09,10,11, 21, 22,29,41,42,43
16	TOBACCO PRODUCTS	12
17	TEXTILES	26,65
18	WEARING APPAREL; DRESSING AND DYEING OF FUR	84
19	LEATHER, LEATHER PRODUCTS AND FOOTWEAR	61,83,85
20	WOOD PRODUCTS (EXCEPT FURNITURE)	24,63
21	PAPER AND PAPER PRODUCTS	25,64,91
23	COKE, REFINED PETROLEUM PRODUCTS AND NUCLEAR FUEL	32,33,34
24	CHEMICALS AND CHEMICAL PRODUCTS	51,52,53,54,55,56,57,58,59
25	RUBBER AND PLASTICS PRODUCTS	23,62
26	NON-METALLIC MINERAL PRODUCTS	27,66
27	BASIC METALS	28,67,68,69
28	FABRICATED METAL PRODUCTS	81
29	MACHINERY AND EQUIPMENT N.E.C.	72,73,74
30	OFFICE, ACCOUNTING AND COMPUTING MACHINERY	75
31	ELECTRICAL MACHINERY AND APPARATUS N.E.C.	35,71,77
32	RADIO, TELEVISION AND COMMUNICATION EQUIPMENT AND APPARATUS	76
33	MEDICAL, PRECISION AND OPTICAL INSTRUMENTS, WATCHES AND CLOCKS	87,88
34	MOTOR VEHICLES, TRAILERS AND SEMI-TRAILERS	78
35	OTHER TRANSPORT EQUIPMENT	79
36	FURNITURE; MANUFACTURING N.E.C.	82,89,93,96,97,I,II

VITA

ATEF ALRASHIDI

Candidate for the Degree of

Doctor of Philosophy/Economics

Thesis: EXPLORING THE IMPACT OF A PROPOSED MONETARY UNION AND EXCHANGE RATE INDICES ON INTERNATIONL TRADE

Major Field: Economics

Biographical:

Education:

Completed the requirements for the Doctor of Philosophy/Economics in International Economics at Oklahoma State University, Stillwater, Oklahoma in May, 2012

Master of Science in Economics at Syracuse University/, Syracuse, NY/ USA in 2006.
Master of Science in Economics at University of Illinois at Urbana-Champaign, IL/ USA in 2004.

Bachelor of Science in Economics at King Saud University, Qassim, Saudi Arabia in 2000.

Experience:
Fall 2010- Spring 2012 Graduate Teaching Associate, Oklahoma State University

Name: ATEF ALRASHIDI Date of Degree: July, 2012

Institution: Oklahoma State University Location: Stillwater, Oklahoma

Title of Study: EXPLORING THE IMPACT OF A PROPOSED MONETARY UNION AND EXCHNAGE RATE INDICES ON INTERNAIONLA TRADE

Pages in Study: 83 Candidate for the Degree of Doctor of Philosophy

Major Field: Economics

Scope and Method of Study:
This dissertation consists of two chapters. Chapter 1 extends the augmented gravity model by including the exchange rate volatility to investigate the effect of a proposed monetary union on bilateral trade using data for years 1990 through 2009. Chapter 2 uses three weighted exchange rate indices constructed for specific industries to investigates the impact of exchange rate on national output using data for ASEAN+3 countries for the period from 1992 to 2004.

Findings and Conclusions:
Findings show evidence that a monetary union will increase the probability of intra-trade, and the reduction in exchange rate volatility between groups of countries due to the monetary union would have nearly the same effect of trade creation and trade diversion. More importantly, the exchange rate variable confirms the negative relationship between currency fluctuations and world trade activities. Results in Chapter 2 show that compared to the nominal exchange rate, industry-specific indices have a better performance in explaining the movement in industrial output. The findings show that there is always a significant relationship between currency depreciation and the change of the level of industry output.

ADVISER'S APPROVAL: Dr.Bidisha Lahiri