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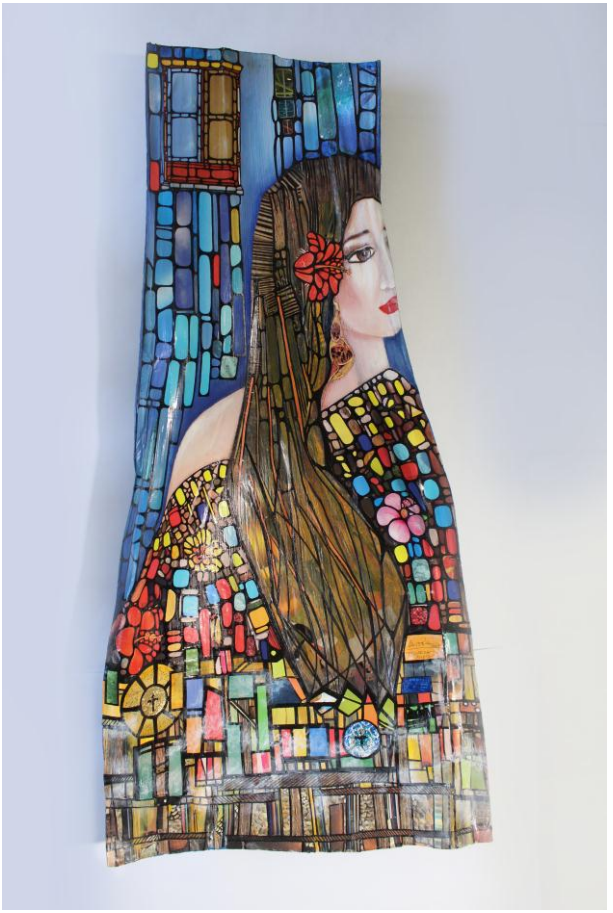

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# Is migration good for trade across MENA region?

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## Abstract

This study investigates empirically the impact of migrants on trade for Middle East and North Africa (MENA) region. The estimated model is tested using the Poisson Pseudo Maximum Likelihood estimator. Using such approach may successfully deal with issues of zero trade observations by forgoing the traditional ordinary Least Squares (OLS) estimator and the log-log model. Importantly, the main findings show that higher migrant levels lead to higher trade relations between MENA countries and migrant countries. As a conclusion, higher migrant levels in host MENA countries attract more trade with migrant countries.

**Keywords:** Migrant Flows, Trade Direction, Poisson.

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# ¿Es la migración buena para el comercio en la región MENA?

**Resumen**

Este estudio investiga empíricamente el impacto de los migrantes en el comercio para la región de Medio Oriente y África del Norte (MENA). El modelo estimado se prueba utilizando el estimador de probabilidad máxima pseudo de Poisson. El uso de este enfoque puede tratar con éxito las cuestiones de observaciones de cero comercio al renunciar al estimador de mínimos cuadrados (OLS) tradicional y al modelo log-log. Es importante destacar que los principales hallazgos muestran que los niveles más altos de migrantes conducen a relaciones comerciales más altas entre los países MENA y los países migrantes. Como conclusión, los niveles más altos de migrantes en los países anfitriones de MENA atraen más comercio con los países migrantes.

**Palabras clave:** Flujos migratorios, Dirección de Comercio, Poisson.

## 1. INTRODUCTION

Given the current socio-economic instability that disturbs numerous countries around the world, many citizens tend to migrate out of necessity for a better quality of life. Migration is the voluntary movement from one's own country of origin to a foreign country for various reasons. In general, people migrate mostly for higher wages, improved quality of life, job opportunities, and to escape toxic environments due to war and/or conflict. This paper aims to understand the effect of a change in migrant levels, on trade direction of the host counties. The MENA region was selected to be studied for

various reasons. The most prominent of which is that Asia as a continent has the highest number of migrants as of 2015 ranging at 104 Million migrants with the fastest annual growth of migrants at 2.8 percent per year. As per recent migration reports, almost 67 percent of all migrants live within twenty countries. Among those countries, nine countries are in Asia and the rest are scattered in Europe, Northern America, Africa and Oceania. Furthermore, when it comes to international migrants as a percentage of total population, the three top countries among the world are the United Arab Emirates with 88 percent of the total population consisting of Migrants, Qatar at 75 Percent, and Kuwait at 74 percent. As the MENA region has such an influx of migrants with some of the highest population levels worldwide, especially considering the relative size of countries such as Saudi Arabia versus the United States. It is compelling to understand the implications of these international migrant numbers and their influence on the economy overall, and more specifically trade. Analyzing the growth and declining migrant population across MENA countries and the consequential effect on trade in addition to other variables influencing exports and imports, such as the exchange rate and distance between countries for the period from 1990 to 2015. Clarifying the effect migrants have on a trade level, whether it is positive or negative through the Poisson Maximum Likelihood (PML) estimator. More specifically using the Poisson Pseudo Maximum Likelihood (PPML) in lieu of other more common ones such as the Ordinary Least Squares (OLS), limits issues dealing with zero trade observation. Finally, the PPML estimator provides the same weight to all observations without emphasizing higher values over lower for

more balanced and equally reflective regression results. Findings of PPML estimator show that Migrant Levels are highly significant and positively affecting Total trade, Exports, and Imports. As such an increase in the population of migrants within a host country will increase its international trade with its top migrating partners. Reminder of the paper is organized as the following; Section II presents a survey of the literature. Section III provides the theoretical framework as well as the methodology used. Section V explains the data description. Empirical results will be discussed in Section IV. Finally, the concluding remarks, policy recommendations and further research will be provided in Section VI.

## 2. LITERATURE REVIEW

The various readings and studies that focus on the effect immigration have on trade have rarely investigated the MENA region, specifically GCC countries such as the UAE which has the highest percentage of migrants as part of the total population. Head and Ries (1998) research the effect immigration has on trade in Canada using trade data from 136 countries during the years 1980 until 1992. They suggest that immigrants may expand trade of the host country with their own countries of origin due to their familiarity, knowledge, and access to foreign markets. Immigration is found to create a significant positive relationship for Canadian bilateral trade, the results indicate that a 10% increase in immigrants led to a 1% increase in Canadian exports to the immigrant's home country and a 3% increase in imports.

In 1992 immigrants generated an additional 3000 US dollars in exports and 8000 US dollars in imports. Immigration may increase imports more than exports possibly due to the preference to home country goods. Independent immigrants are found to have a larger influence on trade than refugees who have the least impact on trade. Canadian immigration policy has a strong influence on both exports and import levels. The results of the paper are consistent with the theory that immigration lowers transaction costs and generates gains from trade in return. Expanded trade is likely to increase the general welfare level through trade creation. Immigration does have negative effects, as it can increase trade deficits which may result in currency depreciation leading to a lower real income. Head and Ries (1998) make a point to note that trade effects are only one aspect of positive or negative effects of immigration.

Khan estimates that each Pakistani migrant contributes 422 US Dollars to Pakistan exports to the selected Middle East trading partners as per the available data. The increase in exports is partially due to the reduction of transaction costs. This study confirms the theory that migrants assist in increasing international trade due to foreign relations. Yaron (2013) examines the impact of migration on bilateral trade in an augmented panel gravity framework. Specifically on the relationship between Turkish migrant stock in the 13 OECD countries and bilateral trade volume (imports and exports) for the years 2000-2012. The results show that migration has a significant impact on bilateral trade both in terms of imports and exports. Economic size and distance are found to have a positive and negative effect respectively

on trade (Alali, 2016; Kadasala., Narayanan & Liu, 2016; Asad et al., 2018; Faisal et al., 2016; Hussain et al., 2018; Imran et al., 2018). Bahcekapili (2015) study the impact of forced migration (Syrian Refugees) on regional economies in Turkey. Findings regarding foreign trade concluded that in cases where migration increased foreign trade balance improved.

Studies such as Çağatay (2014), Robert and Robert (1993) analyze the impact of migration on international trade and product diversity. Mediterranean Partners and Eastern European Countries constitute the home, the EU 27 constitutes the host countries. Trade analysis on total and industry-level bilateral exports and imports find migration to have a significant impact on exports and imports in most cases. The effect of migration on trade is a relevant topic considering the current state of migration levels worldwide, thus the analysis of such can provide benefits, insight, and understanding to countries and their respective economies on how trade volumes fluctuate. If rising or falling migrant population levels have an impact on international trade and if so what is the extent of the said impact. Some MENA countries have migrant levels where the citizen population levels are below the migrant population level. As such, it is interesting to research the effect of high migrant levels on smaller economies such as most countries in the MENA region. As opposed to the effect of the migrant population on larger and stronger economies such as the United States. Finally, Silva and Tenreyro's (2006) explain why the parameters of log-linearized models estimated by OLS lead to biased estimates and propose the Poisson pseudo-maximum-likelihood estimator to be used

in the presence of heteroskedasticity as a substitute for the standard log linear model. Using the gravity equation for trade to illustrate their point, they find significant differences between estimates obtained with the proposed estimator and those obtained with the traditional method (Haseeb, Bakar, Azam, Hassan, & Hartani, 2014; Tanoos, 2017; Aremu & Ediagbonya 2018).

## 3. METHODOLOGY & MODEL SPECIFICATION

This paper attempts to find whether the level of migrant workers affected is significant for the trade of most Middle Eastern and North African countries as well as what other variables explain the trade level for the past 25 years. The Poisson regression model is based on the Poisson distribution, named after the French mathematician Siméon Denis Poisson. It is a discrete probability distribution which consists of the probability of a given number of events occurring in a fixed interval of time and/or space. If these events occur with a known average rate, and independently of the time since the last event, then they are considered to follow the Poisson distribution. To confirm if a variable follows the distribution, it must consist of the number of times the event occurs in an interval take values such as 7, 8, 9, . . . the first event must have no effect of the probability of the second event, as in each event occurs independently of the previous and next. The variable must have a constant rate for which events occur, and the event may not occur in the exact same instant. Finally, the probability of this event must be a small interval proportional to the length of the same

interval. The variables and data set used in this paper do not follow the Poisson distribution and most are not considered count data which goes against the Poisson regression methodology. However, as in the paper of Silva and Tenreyro (2006), the variables do not have to follow the distribution for the Poisson Pseudo Maximum Likelihood estimator to remain consistent; what must occur is that the conditional mean must be correctly specified:

$$(1) \qquad E(y_i|x) = \exp(x_i\beta)$$

Where $y_i$ does not have to be an integer for the estimator to remain consistent. Nevertheless, the below Poisson regression model can be explained following the Poisson distribution to understand the basic model before proceeding with the non-Poisson distributed trade data using the PPML estimator. The Poisson regression estimator is a generalized log-linear model that is able to deal with dependent variables that cannot be normally distributed and as no monotonic transformation such as logging the variables can move the mode from one end of the distribution to the middle as a normal distribution requires aims to explain a variable Y, counting the number of times an event occurs during a specific time period. For example $Y_i$ (number of car accidents) for individual $i$ during the past 7 years, Poisson explains $Y_i$ with an explicative variable $x_i$ where $1 \leq i \leq n$ , if the explicative variables were $\beta^t x_i$ then the conditional mean function of the Poisson

regression model is, using an exponential function on the right side ensuring $Y_i$ remains positive:

$$(2) \quad E[Y_i|x_i] = \exp(\beta^t x_i).$$

To be able to use maximum likelihood (ML) estimator, finding the parameters of a model that maximizes the likelihood of making the observations given said parameters, the distribution of $Y_i$ must be specified given the explicative variable $x_i$ following Poisson distribution with parameter $\lambda_i$ to estimate the unknown parameter $\beta$ :

$$(3) \quad E[Y_i|x_i] = \lambda_i = \exp(\beta^t x_i).$$

We observe data $\{(x_i, y_i)|1 \leq i \leq n\}$. The number $y_i$ is a realization of the random variable $Y_i$ . The total log-likelihood is, using independency, given by:

$$(4) \quad LogL(y_i,\dots,y_n|\beta,x_i,\dots,x_n) = \sum_{i=1}^{n} \log P(Y_i = y_i|\beta,x_i),$$

With,

$$(5) \quad P(Y_i = y_i|\beta,x_i) = \frac{\exp(-\lambda_i)\lambda_i^{y_i}}{y_i!}$$

And $\lambda_i = \exp(\beta^t x_i)$. With $LogL(\beta)$ as shorthand notation for the total likelihood. Then:

$$(6) \qquad LogL(\beta) = \sum_{i=1}^{n} \{-\exp(\beta^t x_i) + y_i(\beta^t x_i) - \log(y_i!)\}$$

Then, ML estimator is defined as:

$$(7) \qquad \hat{\beta}_{ML} = \underset{\beta}{\operatorname{argmax}} LogL(\beta)$$

However, in some cases, the data sets contain zero value observations which call for the use of the Zero-Inflated Poisson Model (ZIP), a statistical model based on the zero-inflated probability distribution for data sets with frequent zero value observations. When there is excess zero count data in unit time there are two zero generating processes, the first is a binary distribution which generates structural zeros, and the second is the Poisson distribution which includes counts that may be zero, for example, lack of trade between two countries. Binary distribution with structural zeros is represented by:

$$(8) \qquad \Pr(y_j = 0) = \sigma + (1 - \sigma)e^{-\lambda}$$

The Poisson distribution with zero count data is:

$$(9) \qquad \Pr(y_j = h_i) = (1-\sigma)\frac{\lambda^{h_i} e^{-\lambda}}{h_i!}, h_i \geq 1$$

Where $y_j$ stands for non-negative integer values, $\lambda_i$ is the expected Poisson count for the $i$th individual and finally $\sigma$ is the probability of extra zeros. With mean and variance of:

$$(10) \qquad (1-\sigma)\lambda, \lambda(1-\sigma)(1+\lambda\sigma)$$

It is recommended to include the zero trade observations when dealing with international trade data to ensure results reflect actuality and maintain the integrity of observations. Not logging the dependent variable and using a different estimator then OLS such as the Poisson pseudo-maximum likelihood (PPML) as recommended by Silva and Tenreyro (2006) due to its well behaved nature when dealing with dependent variables that have large collections of zero trade observations, the estimator is able to incorporate zero values into the regression, as well as regress the variables that do not follow the Poisson distribution. As opposed to the Ordinary Least squares estimator that requires traditional log linearization of both the dependent and independent variables, when taking the log of trade said zero trade observations are dropped which convolutes results as those observations are very common in international trade data. Using PPML ensures sample data is not truncated (excluding countries due to zero trade observations) which may alter the true regression results, it ensures unrealistic solutions are not taken as they may alter data and

outcomes to meet OLS assumptions. The Poisson Pseudo-Maximum-Likelihood estimator also ensures OLS biases such as biased estimates of true elasticities are avoided and is resilient to the presence of a specific type of measurement error of the dependent variable. PPML discrete distribution is as follows:

$$(11) \qquad \Pr\left(X_{ij} = k \middle| \hat{X}_{ij}\right) = \frac{e^{-\hat{x}_{ij}}\left(e^{\hat{x}_{ij}}\right)^{k}}{k!}, k = 0,1,2, ..$$

Expected value and variance are the exports:

$$(12) \qquad E[X_{ij}] = \hat{X}_{ij}; Var[X_{ij}] = \hat{X}_{ij}$$

Log likelihood is:

$$(13)\ LogL = \sum_{ij} LogPr\left(X_{ij} \middle| \hat{X}_{ij}\right) = \sum_{ij} \{-X_{ij} + X_{ij} * Log\hat{X}_{ij} - LogX_{ij}!\}$$

On the other hand, the random effect model removes omitted variables bias by measuring change within a group across time, controlling for the number of potential omitted variables unique to the group and assumes a normal distribution. It studies the variable variations assuming that they are random and uncorrelated. It also

allows for inferences about the population from which the scope is drawn, if the effect size in each subject relative to the variance between subjects is large enough, the population can be presumed to exhibit said effect. To ensure the multi-dimensional model that we are using does not endure massive over specification we use the random effect analysis, this model of regression coefficients has been proven to be more statistically efficient than its counterpart the fixed effect. The model's specific effect is uncorrelated with independent variables and as the differences across the independent variables influence the dependent variable it is recommended to use the random effect model. Guaranteeing a proper understanding of the explanatory independent variables we need to take the mean effect with equally distributed weights, and estimate coefficients for explanatory variables that are constant over time (Language or Distance). Therefore the reduced form of the estimated model for the gravity equation is as follows:

$$(14) \quad \begin{aligned} T_{ij} = {} & \beta_0 + \beta_1 \ln(MGNT_i) + \beta_2 \ln(GDPP_i) \\ & + \beta_3 \ln(GDPC_j) + \beta_4 \ln(XR_{ij}) \\ & + \beta_5 \ln(D_{ij}) + \beta_6 \ln(LANG_{ij}) \\ & + \beta_6 \ln(BORD_{ij}) + \varepsilon_{ij} \end{aligned}$$

Where, $T_{ij}$ represents bilateral trade flows for countries $i$ and $j$, $MGNT_i$ represents migrant levels for country $i$, GDPP represents Gross Domestic Product for the partner country, GDPC represents Gross Domestic Product for the home country. The exchange rate between countries $i$ and $j$ is represented by $XR_{ij}$, D is the distance

between the two countries, $LANG_{ij}$ and $BORD_{i}$ are dummy variables representing Language and Border respectively, and finally $\varepsilon_{ij}$ is the error term. Migrant levels ($MGNT$) is expected to have a positive or negative effect on bilateral trade flows ($T_{ij}$) between the partnering countries as there has been a sharp increase in the migrant population worldwide. Gross Domestic Product (GDP) might likely affect the trade flows between countries as a larger GDP might indicate an increase in total trade and perhaps exports, indicating that countries with higher GDP's trade more with their partner countries due to their higher production levels. Exchange Rate ($XR_{ij}$) might affect the volume of trade flows between partnering countries depending on the appreciation or depreciation of the rate between the countries. Distance (D) might impact the levels of trade depending on how far apart partnering countries are from each other and whether further distances have an effect or not. Language ($LANG_{ij}$) and Border ($BORD_{ij}$) are expected to affect bilateral trade levels if the partnering countries share a common language or a border in a positive manner, with higher trade levels than those non-bordering countries and that speak a different language.

## 4. DATA

Recall that the purpose of this paper is to understand the effect migrants have on trade with additional significant independent

variables, specifically the effect migrants have on MENA countries as certain countries have higher populations of migrants than citizens. The time period is 5 year intervals from 1990 until 2015. Each MENA countries migrant population is broken down by nationality to find the top ten countries with the highest population presence. After which, the top ten migrant countries are partnered with the corresponding MENA country. The Migrant data for each country and its partner is collected from United Nations, Department of Economic and Social Affairs. Gross Domestic Product (GDP) and the exchange rate (versus US Dollar) data is from the World Bank. The exchange rate which represents the annual averages, is based on monthly averages. The partner country's rate was divided by the MENA country to represent the exchange rate; the exchange rate between the two currencies. Bilateral distance in kilometers for country pairs worldwide is from the Centre d'Etudes Prospectives et d'Informations Internationales.

## 5. RESULTS

The reduced form of the estimated model for the gravity equation is regressed using the Poisson Pseudo-Maximum-Likelihood Estimator and the Random Effect Model, where the dependent variable is Total Trade and the independent variables are migrant levels Migrants, Gross Domestic Product of the Partner country, and Gross Domestic Product of the home Country. The Exchange Rate between partnering countries, Distance between the two countries, and finally Language and Border as dummy variables representing a common

language and a shared border. According to table 1.1, the population of Migrants in the host country, GDP of the said country, and GDP of the partner country, are both highly significant and have a positive relationship with the dependent. This means that if there is an increase in any of the three variables, total trade will increase accordingly. Therefore, the increase in the level of migrants will lead to higher trade between partnering countries, as will the GDP of those countries. The GDP of the partner country has a very high effect on total trade which signifies that a country with a higher GDP is more likely to trade. On the other hand, however, most MENA countries trade more with farther countries, as the level of migrants is much higher from distant countries and the volumes of trades from countries with higher GDP's is much more than those bordering and close countries. Which is why, overall, the Distance variable is negative. For example, of the top ten migrating countries to Kuwait, six of which are distant, the higher volumes of trade lie between the countries with higher GDP's (which are the likes of India and more).

The PPML regression results as shown in Table 1.1 confirm that all independent variables are significant — some more highly than others — such as Migrant Level and Border. To take an in-depth look into the effect said variables have on the trade of a host country, regressing the import and export volumes of trade against Migrant level, Gross Domestic Product of the home country, Gross Domestic Product of the partner country, Exchange Rate, Distance, Language, and Border. Migrant level, Gross Domestic Product of the home country, Gross Domestic Product of the partner country, and Distance

are all consistently highly significant across all the dependent trade variables Total Trade, Exports, and Imports, whilst Exchange rate, Language, and Border have more varying levels of significance for the different dependents. Exchange Rate is statistically significant with a negative relationship across trade direction. However, it is least significant at the third level for the dependent Exports, indicating that exchange rate appreciations/depreciations have a slight effect on the change in exports for MENA and partnering migrating countries. It is highly significant for imports, which is consistent with the price theory, as well as with the negative relationship. Should the currency of the partner depreciate against the host country, imports will increase as it is now cheaper to purchase the same goods that were previously sold at a higher price. In general, the constantly statistically significant variables which have a direct relationship to total trade, exports, and imports, are Migrant levels, GDP of the home country, GDP of the partner country, the Distance between partner countries, and the Exchange rate. Language and Border are statistically significant for some of the dependent variables when regressed, but do not impact trade between MENA and partnering countries in any vital way. After determining the independent variables and the relationship with trade, it is clear that increasing and/or decreasing migrant levels have an effect on the trade of the host country, in this case, the MENA region. An increase in migrants will increase exports and imports for the host nation, this could be due to various reasons such as relations developing between the partner countries, growth in the local economy producing more goods to be exported and more explained further in the conclusion.

To avoid over-specification and to ensure that zero trade observations do not impact regression whilst taking the mean effect with equally distributed weights, we conduct the Random Effects Poisson regression on Total Trade, Exports and Imports. This regression as shown in table 1.2 yields that migrant Levels and Gross Domestic Product Levels have a positive effect on the volume of trade for the host country, whilst the Exchange Rate has a negative relationship. Therefore, a depreciating exchange rate increases trade, as the price of goods is now cheaper, increasing the demand. This also provides insight into the types of goods traded which are normal and non-inferior as with the PPML regression.

## 6. CONCLUSION

The time period ranges from 1990 to 2015 in 5-year intervals, each MENA country has approximately ten top migrating countries over the past 25 years that have fluctuated somewhat, leading to some countries having 14 top migrating partner countries as opposed to 10 or less. The estimated model uses the Poisson Pseudo Maximum Likelihood regression estimator which is able to handle data that does not follow the Poisson distribution and simultaneously deal with zero trade observations which regularly occur due to countries that have never, stopped or started trading sometime between the years for 1990 and 2015. Poisson Pseudo Maximum Likelihood (PPML) is a relatively new approach to regressing the gravity model proposed by Santos Silva and Tenreyo (2006) and stems from the Poisson

Regression estimator, a generalized log-linear model which overcomes the shortcomings of more traditional estimators. OLS estimation would call for the traditional log-linearization of the variables thereby dropping all zero trade observations which are common in international trade data, however, the Poisson Pseudo Maximum Likelihood allows for the use of non-Poisson distributed data and ensures no zero trade observations are dropped as the logging of trade is not required to regress. Furthermore, the Random-Effect Poisson Regression is implemented as it removes omitted variables bias and massive over-specification, henceforth the relationship and effect Migrants, GDP of the host and partner country, Exchange Rate, Distance, and Language can now be clarified and brought to light for the MENA region countries selected. Migration policies may be implemented through laws, regulations, and programs dependent on the host country's government views and objectives towards the needs and wants of the economy and the people. Policies are implemented to manage the volume, origin, direction, and composition of migration flows whether it be to decrease, increase, or maintain migrant levels. The policies are based not only on each country's needs but also the relationship it has with its partners (some nations have treaties and pacts that influence the flow of trade).

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## APPENDIX 1

| | (Total Trade) | (Exports) | (Imports) |
|---|---|---|---|
| Migrant Level | 4.95*** | 4.45*** | 4.38*** |
| | (0.000) | (0.000) | (0.000) |
| GDP Host Country | 9.24*** | 8.95*** | 6.43*** |
| | (0.000) | (0.000) | (0.000) |
| GDP Partner Country | 15.16*** | 14.22*** | 11.39*** |
| | (0.000) | (0.000) | (0.000) |
| Exchange Rate | -2.46** | -1.86* | -2.57*** |
| | (-0.014) | (0.063) | (0.010) |
| Distance | -5.02*** | -3.96*** | -4.71*** |
| | (0.000) | (0.000) | (0.000) |
| Language | -2.41** | -2.64*** | -1.36 |
| | (0.016) | (0.008) | (0.172) |
| Border | 2.48** | 0.25 | 3.76*** |
| | (0.013) | (0.804) | (0.000) |
| R-Squared | 0.6927 | 0.6795 | 0.5503 |
| Number of Observations | 887 | 873 | 874 |

1.1 Poisson Pseudo Maximum Likelihood Regression

Note: Statistical Significance is indicated by *(10%), ** (5%), *** (1%) and, P-value are shown in parenthesis

| | (Total Trade) | (Exports) | (Imports) |
|---|---|---|---|
| Migrant Level | 75000*** | 18000*** | 82000*** |
| | (0.000) | (0.000) | (0.000) |
| GDP Host Country | 76000*** | 60000*** | 53000*** |
| | (0.000) | (0.000) | (0.000) |
| GDP Partner Country | 140000*** | 100000*** | 92000*** |
| | (0.000) | (0.000) | (0.000) |
| Exchange Rate | -47000*** | -17000*** | -43000*** |
| | (0.000) | (0.000) | (0.000) |
| Distance | -2.35** | -2.48** | -1.89* |
| | (0.019) | (0.013) | (0.059) |
| Language | 0.11 | -0.26 | 0.41 |
| | (0.909) | (0.794) | (0.680) |
| Border | 1.22 | 0.51 | 0.98 |
| | (0.221) | (0.607) | (0.327) |
| Number of Observations | 887 | 873 | 873 |

1.2 Random Effects Poisson Regression

Note: Statistical Significance is indicated by *(10%), ** (5%), *** (1%) and, P-value are shown in parenthesis

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