# People Following Goods:
## Are Refugee Flows Associated with International Trade?

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## Introduction

The study of refugee flows has never been more important as 4.6 million Syrian refugees seek asylum in the Middle East, North Africa and Europe and yet another 6 million people are internally displaced within Syria.[1] However, refugees have been of global concern since after World War II when over 6 million people were left homeless, malnourished and abused across Europe.[2] Even after the UNHCR was formed in 1950 with the mandate to "lead and coordinate international action for the worldwide protection of refugees and the resolution of refugee problems," the number of worldwide refugees continued to grow as brutal civil wars, genocides and natural disasters erupted in places such as Afghanistan, Colombia, the Democratic Republic of the Congo, Somalia and Pakistan.[3] At the end of 2014, there were 19.5 million refugees registered with the UNHCR not including the 38 million internally displaced people who were driven out of their homes but remain in their country of origin.[4] The international community has a lot to gain from a better understanding of how refugee crises arise and how they are resolved in order to direct policy on this salient issue.

Refugee flows have been studied extensively by anthropologists, political scientists, sociologists, historians and lawmakers. However, it was only recently that economists began to investigate the topic through both theoretical and empirical analysis. Migration movements, on the other hand, have been thoroughly studied by economists. Migration is tightly linked with labor flow and therefore is often studied in conjunction with international trade. However, refugee flows are inherently different from migration movements and therefore merit their own distinct investigations and analyses. Refugee flows differ from migration movements in two ways. First, the flow of refugees is usually a group movement, many individuals fleeing at once, as opposed to a sequenced movement

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[1] Syria's Refugee Crisis in Numbers. 4 September 2015. Amnesty International. 17 February 2016. Web. < https://www.amnesty.org/en/latest/news/2015/09/syrias-refugee-crisis-in-numbers/>.
[2] Postwar Refugee Crisis and the Establishment of the State of Israel. 29 January 2016. United States Holocaust Memorial Museum. 17 February 2016. Web. <http://www.ushmm.org/wlc/en/article.php?ModuleId=10005459>.
[3] UNHCR Mission Statement. December 2011. UNHCR. 17 February 2016. Web. <http://www.unhcr.org/pages/49ed83046.html>.
[4] Refugee Figures. 2016. UNHCR. 17 February 2016. Web. <http://www.unhcr.org/pages/49c3646c1d.html>.

of individuals, which characterizes migration.[5] Second, refugee flows typically arise from some deleterious event that impacts harshly on a few, and triggers the movement of many. These events may be caused by nature or humans (e.g. drought, famine, civil war, genocide, etc.).[6]

In order to distinguish between refugees, internally displaced persons and migrants, it is necessary to understand the definition of each. The UNHCR defines refugees as "someone who, owing to a well-founded fear of being persecuted for reasons of race, religion, nationality, membership of a particular social group or political opinion, is outside the country of his nationality, and is unable to, or owing to such fear, is unwilling to avail himself of the protection of that country."[7] Internally Displaced Persons are "people or groups of individuals who have been forced to leave their homes or places of habitual residence, in particular as a result of, or in order to avoid the effects of armed conflict, situations of generalized violence, violations of human rights or natural- or human-made disaster, and who have not crossed an international border."[8] The last part of the definition is crucial to understanding the distinction between refugees and internally displaced persons in that a refugee is someone who has crossed an international border while an internally displaced person is still within their country of origin. Finally, the UNHCR describes migrants in comparison to refugees by saying "migrants choose to move not because of a direct threat of persecution or death but mainly to improve their lives by finding work, or in some cases for education, family reunion, or other reasons. Unlike refugees who cannot safely return home, migrants face no such impediment to return."[9]

Social scientists can postulate and theorize about the causes, consequences and patterns of refugee flows, however, theories are limited in their legitimacy if they are not supported by empirical evidence. Not only is data analysis incredibly important in

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[5] Stark, Oded. "On the Economics of Refugee Flows." February 2004. Bonn Center for Development Research, University of Bonn. 17 February 2016. Web. <http://www.zef.de/uploads/tx_zefportal/Publications/zef_dp84.pdf>.
[6] Ibid.
[7] Refugees. 2016. UNHCR (The UN Refugee Agency). 16 February 2016. Web. <http://www.unhcr.org/pages/49c3646c125.html>.
[8] UNHCR Statistical Online Population Database: Sources, Methods and Data Considerations. 1 January 2013. UNHCR (The UN Refugee Agency). 16 February 2016. Web. <http://www.unhcr.org/45c06c662.html#idps>.
[9] UNHCR viewpoint: 'Refugee' or 'migrant' – Which is right?. 27 August 2015. UNHCR (The UN Refugee Agency). 16 February 2016. Web. <http://www.unhcr.org/55df0e556.html>.

discovering trends in refugee crises as well as refugee flow patterns, but there is a strong economic element to refugee flows both in a refugees' decision to flea their country of origin and in the effects of this decision on the economies of asylum countries. It is widely acknowledged that economic analysis is a powerful tool that could garner significant findings for policy guidance and crisis management in the future. Recently, the President of the American Economic Association, Robert Shiller, dedicated a large segment of the Association's annual meeting to discussing the global refugee crisis in economic terms and inviting distinguished economic scholars to propose policies to address it.[10]

This paper seeks to contribute to the growing economic field of refugee studies by understanding whether economic linkages between countries have implications for asylum destinations during a refugee crisis. The hypothesis is that if two countries have strong trade ties, when a refugee crisis breaks out, refugees will flee from their country of origin to those asylum countries with which their country's economic ties are strongest. This could be because, due to trade, transportation channels are more readily available. Perhaps, people have more knowledge of those potential asylum destinations with which their country of origin trades more due to the sharing of information that trading involves. In short, trade ties may decrease certain costs of migration for refugees. In addition, strong trade ties could indicate a strong economy in the potential asylum country, thus playing a hand in encouraging migration. If refugee flight patterns are found to be linked to trade relations between countries, it could be highly informative for policy moving forward as well as helpful in predicting flight patterns before a crisis breaks in order to anticipate where aid should be focused. Lastly, if the conclusion can be drawn that refugee flows follow the trade of goods and services it would substantiate important implications for globalization and economic dependence.

[10] Shiller, Robert. "Economists on the Refugee Path." 19 January 2016. Project Syndicate. 17 February 2016. Web. < https://www.project-syndicate.org/commentary/economic-research-contribution-to-asylum-reform-by-robert-j--shiller-2016-01>.

## Literature Review

Much of the existing empirical analysis of refugee flight patterns is based on the theoretical and empirical models developed to study migration movements. Therefore, in building a model to assess the correlation of both migration and refugee flight destinations with economic trade patterns, it is useful to understand previous research on migration. The most relevant strand of migration research is that which focuses on the push and pull factors that contribute to an individuals' decision to migrate. Although refugees are different than migrants in that they are forced to leave their homes due to violence or natural disasters, there are both theoretical and empirical studies that claim that a refugees' choice of asylum destination is not haphazard, but rather that there are certain factors that influence the decision. Therefore, it can be inferred that many of the pull factors affecting a migrant's decision may also be a determinant in a refugees' decision.

There are two influential models that have been used to study migration movements, A. D. Roy's Model of Self-Selection (1951) and the Gravity Model of International Trade first used by Jan Tinbergen in 1962. These models will be discussed in more detail later in the paper, however, they are at the basis of almost all empirical studies of migration and refugee movements.

George Borjas was the first economist to adapt Roy's model to use it for migration analysis in his article "Self-Selection and the Earnings of Immigrants" (1987). Borjas uses the model to make the claim that migrants perform an income maximization calculation to decide whether to leave their country to migrate to another (Borjas, 1987). In other words, Borjas argues that migrants make their decision based on potential earnings. In this model, Borjas describes the income maximization problem as the potential wages in the destination country minus the migration costs minus the current earnings in the country of origin (Borjas, 1987). If this number is greater than zero, the individual will choose to migrate. The model implies that if net earnings are higher in the destination country than the country of origin, the individual will migrate. If the potential earnings are lower, the individual will not leave their country.

In this analysis, Borjas determined the types of selection biases created by the tendency of individuals to make the migration decision based on the suspected income differentials between their home country and the potential destination country. Borjas

aimed to empirically test the claim that immigrants are a "select" group, and that the selection mechanism sends the ablest and most ambitious persons in any country of origin to the United States, Borjas' country of focus. The study looks at the U.S. earnings of immigrants from 41 countries relative to natives in their country of origin. Borjas finds evidence to support the fact that foreign-born persons in the United States need not be drawn from the ablest and most ambitious in the country of origin, which he attributes to the fact that migrants are income maximizers (Borjas, 1987). This finding suggests that there may be similarities in the pull factors for migrants and refugees. If Borjas had found the reverse, that it was the most able-bodied who were migrating, it would have suggested a divergence in the pull factors for migrants and refugees because refugees necessarily do not represent the most able-bodied from a country's population. Borjas's study also identifies key economic and political variables that may explain the variance in the "quality" of immigrants which will be important to inform this study. The relevant economic and political variables include measures of a politically competitive system, recent loss of freedom, number of assassinations in the country of origin, income inequality, distance from the US, per capita GNP, and changes in immigration quotas (Borjas, 1987).

Jeffrey Grogger and Gordon H. Hanson expanded on Bojas's study in their paper "Income Maximization and the Selection and Sorting of International Migrants" to show that an increase in the reward to skill in a destination should cause immigration from source countries to rise and the mix of migrants to become more skilled. Greggor and Hanson's model provided estimating equations for the scale of migration, the selection of migrants in terms of schooling and the sorting of migrants across destinations by schooling (Grogger et al., 2008). They find evidence in strong support of the income maximization theory of migration, that migrants, as Roy predicts, make their decision based on potential earnings. Greggor and Hanson develop an empirical model with the wage of a refugee from source country j in destination h as the dependent variable. The independent variables are the levels of schooling the refugee received (primary, secondary and tertiary). The model takes wages as a function of an individual's skill level. An individual will migrate from country 0 to country 1 if the expected income in the destination country net of migration costs is greater than the expected income in the origin country. An index I is then defined

that measures the net benefit of moving relative to staying at home for a risk-neutral individual. These studies, which confirm the application of Roy's model to migration theory, emphasize the income maximization aspect of flight patterns. It follows that if a large degree of trade between a refugee's country and a potential asylum country lowers migration costs, this is likely to decrease the cost side of a refugees' income maximization problem, thus encouraging flight to said asylum country.

Another influential study by Anna Maria Mayda in the realm of international migration will guide the model used to analyze refugee flows. Mayda, in 2010, built on previous research utilizing the gravity model of trade in order to empirically investigate economic and non-economic determinants of bilateral immigrant flows, across destination and origin countries. Her study focuses on the inflow of migration into fourteen OECD countries, between 1980 and 1995 (Mayda, 2010). Mayda ties theory with empirical study by testing determinants that theory would suggest have a large impact on migration flows such as economic, geographic, cultural and demographic variables. Through her study, Mayda finds that pull factors such as improvements in the mean income opportunities in the destination country significantly increase the size of emigration rates. She estimates that the emigration rate to a given destination is an increasing function of that country's per worker GDP and a decreasing function of the average per worker GDP of all the other host countries in the sample (Mayda, 2010).

In her study, Mayda controls for destination and origin countries' fixed effects as well as distance between country of origin and destination, two components that will be important in this study of refugees flows. In addition, Mayda uses a dummy variable to indicate the sharing of a border, which could also have an effect on migration. The dummy is equal to one if the countries share a land border and zero if they do not. She also uses dummy variables to represent a common language spoken in both territories as well as a former colonial history. Mayda finds that cultural variables do not play a significant role in migration decisions, which suggests that cultural variables may not be important when constructing a model to evaluate refugee flows. Lastly, Mayda investigates the importance of network effects in determining migration flows. She finds that bilateral migration flows are highly correlated over time, indicating evidence that migrants choose communities based on community links (Mayda, 2010).

There is a large body of literature that addresses the relationship between international trade and international migration. Many of these studies examine the causal effect of international migration on trade, however few studies look at the possibility of trade relations as a determinant for migration. In the literature, there is disagreement about the validity of the traditional trade theory principle presented by the Heckscher-Ohlin model of trade that suggests that the movement of goods across borders should be a substitute to the movement of production factors (e.g. people) (Sgrignoli et al., 2015). Most modern trade models and empirical studies find complementarity between migration and trade implying that greater trade between two nations should lead to greater migration. One of the earliest studies looking at complementarity of trade and migration was carried out by Collins et al. (1999). This study analyzed trade and factor movements between overseas countries and Europe for the time period from 1970-1940. The results showed a weak economic link between factor and trade flows, however, regarding migration, the relationship with trade points to complementarity. In 2005, Mundra analyzed bilateral trade between the US and 47 trading partners for a time period from 1973 to 1980. The empirical analysis was based on a semi-parametric panel model. His findings show that immigration promotes imports regarding finished and intermediate goods, again implying a complementary relationship (Mundra, 2005). One of the most influential contributors to the field is James Rauch who looks at the role of ethnic immigrants' networks in facilitating trade. His argument is that formal and informal links among co-ethnic migrants in other countries and at home facilitate trade by providing potential trading partners with easier access to valuable information (Rauch, 2002). He attributes the pro-trade effect of migration to a reduction of trade barriers ad search costs associated with market transactions.

Although there is a breadth of literature that points to migration as a complement to trade most studies in the field look at the impact of migration on trade, with trade as the dependent variable. In this study, refugee flight will be used as the dependent variable to understand if perhaps the relationship is multi-directional. Rauch (2002) claims that networks of migrants facilitate trade by reducing costs, however as mentioned earlier, theoretically it would make sense that trade between two countries would also reduce the costs of migration for many of the same reasons such as a reduction of transportation costs

due to pre-existing transportation channels, a reduction in informational costs because of a pre-existing relationship between the two countries and better employment opportunities because the existence of trade may imply a complementarity of economies. It is important to understand if the trade/migration complementarity works in both directions just as it is important to understand if these same cost reductions might apply to refugees when they make the decision to flee.

An important debate in the history of refugee literature has been about whether patterns exist in relation to refugee flight or if their choice of destination country is haphazard. Scholars such as Day, White and Patterson (2003) claim that refugees are passive migrants, dependent upon institutional forces and thus have no choice in their decision to flee or the asylum country where they end up. Others such as Moore and Shellman (2004) and Robinson and Segrott (2002) have found that there exists some form of refugee-decision-making process and that refugees are pulled in certain direction when they flee. That said, there are very few studies assessing the determinants of refugee flows on an international level. One such study was carried out by Timothy J. Hatton (2015) in which he set out to study determinants of asylum applications, a dependent variable very similar to the one being studied here. Hatton examined a database of asylum applications to 19 OECD destinations from 48 origin countries over the years 1997-2012. Hatton uses dyads of origin/destination asylum application numbers as his independent variable and includes many possible explanatory variables including a measure of civil war combat deaths in the country of origin, the political terror scale in the country of origin, freedom house indices of civil liberties and political rights, real GDP per capita in both origin and destination, unemployment rate at destination, and asylum country policies on access, processing and welfare. Many of these same explanatory variables will be incorporated into this study including GDP per capita in origin and destination, distance between origin and destination, and freedom house indices of civil liberties and political freedom. Other explanatory variables used by Hatton will be left out and values for imports and exports will be added in order to test the correlation between refugee flows and trade. Hatton finds that political terror and human rights abuse are at the heart of refugee flights. His results also suggest that improving GDP in country of origin would help reduce asylum

applications. Hatton's results have important policy implications. For this reason, his research was used to guide this investigation on determinants of refugee flight patterns.

**Economic Analysis**

The theoretical model that underpins many studies of migration movements is the Roy Model of Self-Selection developed in Roy's "Thoughts on the Distribution of Earnings" (1951). The model in its simplest form is an income maximization function that states that if an individual is deciding between jobs, he will choose the option that gives him the highest total wage. Roy argued that workers may have skills in multiple occupations and will therefore self-select the sector that gives them the highest expected earnings (Roy, 1951). In his model, Roy attributes individual earnings to two parts: one part due to socioeconomic variables and the other part due to unobserved characteristics. Together, these observed socioeconomic variables along with the unobserved characteristics make up a person's wage. When applying the Roy Model to migration the choice faced by the migrant is not between two occupations but rather between staying in his/her home country and migrating. Here, log earnings in source country i are given by:

$$w_0 = \mu_0 + \varepsilon_0$$

If this person was to migrate to a distinct destination country j, their earning would be:

$$w_1 = \mu_1 + \varepsilon_1$$

Assuming that the cost of migrating is C and that each worker knows $u_0$, $u_1$ and his individual epsilons: $e_0$, $e_1$, the worker will choose to migrate if:

$$\mu_1 + \varepsilon_1 - C > \mu_0 + \varepsilon_0$$

$$= (\mu_1-\mu_0-C) + (\varepsilon_1-\varepsilon_0)>0$$

This is known as the self-selection decision rule.

Therefore, given that $v= e_1-e_0$ and I = 1 if the selection rule is satisfied and I = 0 otherwise, the probability that a randomly chosen worker from country i will migrate to country j is equal to:

$$
\begin{aligned}
P &= \Pr[I = 1] \\
&= \Pr[\nu > (\mu_0 - \mu_1 + \pi)] \\
&= \Pr\left[\frac{\nu}{\sigma_\nu} > \frac{(\mu_0 - \mu_1 + \pi)}{\sigma_\nu}\right] \\
&= 1 - \Phi\left(\frac{(\mu_0 - \mu_1 + \pi)}{\sigma_\nu}\right) \\
&= 1 - \Phi(z)
\end{aligned}
$$

where C = π. From this, it can be inferred that the larger is z, the lower is the probability of migration from country i to country j. This is because z is rising in the mean earnings of country i($u_0$) and the cost of migration(C). These are defined as the mean effects and drive, in part, self-selection in the Roy Model.

Roy's model differed from previous work in that it is a multiple index model (containing 2 indices): workers have skills in each occupation, but they can only use one skill or the other. Therefore, workers self-select the occupation that gives them the highest expected earnings. This multiple index model also lent the Roy Model to be adapted for immigration as migrants are faced with two distinct choices when evaluating expected earnings, earnings at home vs. potential earnings from migrating. Roy's Model underlies the assumption that refugee flows, like migration, are not random and that refugees actively weigh multiple options when deciding where to flee to and choose the option that they believe will give them the best chance at survival. For this study, the Roy Model is expanded to include multiple options equal to the refugees' expected utility from fleeing to each country i, j, k, etc. In addition, it can be taken as a given that the refugee will flea because he/she has already made the decision that they are unsafe in their country of origin, the critical distinction between migrants and refugees. Therefore, the model becomes:

$$U_i = \mu_I - C_i + \varepsilon_i$$

$$U_j = \mu_j - C_j + \varepsilon_j$$

Where $U_i$ represents potential utility from fleeing to country i (utility rather than wages because it is not longer a decision based solely on economic gain) and $U_j$ represents potential utility from fleeing to country j. If $U_i < U_j$, the refugee will migrate to country j.

This decision is made across all possible asylum countries and influenced by many distinct variables.

Another model that has become very important in the study of migration is the Gravity Model of Immigration first developed by Joshua J. Lewer and Hendrik Van den Berg at the University of Nebraska (2008). This model is adapted from the Gravity Model of International Trade and is an empirical model rather than Roy's Model which is largely theoretical. This model has been adapted for many migration studies as well as, recently, studies of refugee flows. As explained earlier, many early migration studies by scholars such as Friedberg and Hunt (1995), Card (2001) and Borjas (2003) use a standard labor market model in which immigrant workers respond to differences in wages between countries. However, Lewer and Van den Berg developed the Gravity Model of Immigration keeping in mind that many other factors influence immigration. The original Gravity Model of Trade, as developed by Jan Tinbergen in 1962 is as follows:

$$TRADE_{ij} = f\,[(GDP_i \times GDP_j) / DIST_{ij}]$$

With the regression equation specified as:

$$Trade_{ij} = B_0 + B_1\,(gdp_i \times gdp_j) + B_2\,(dist_{ij})$$

Researchers often then include variables to control for demographic, geographic, ethnic/linguistic and economic conditions as outlined in many of the studies discussed previously. Tinbergen and others after him have found the Gravity Model of Trade to explain a large proportion of the variation in international trade flows. Lewer and Van den Berg posit that "immigration, like international trade, is driven by the attractive force between immigrant source and destination countries impeded by the costs of moving from one country to another," unlike in the Roy Model (labor market model) that suggests the attractive force between immigrant source and destination countries depends on the difference between labor incomes in the two countries (Lewer et al., 2008). Lewer and Van den Berg argue that population size also matters, taking into account that the more people there are in a source country, the more people are likely to migrate, and the larger the

population in the destination country, the larger the labor market for immigrants. They also suggested taking distance into account due to the fact that migration costs are likely to be correlated with physical distance between countries. This led them to develop the Gravity Equation of Immigration as:

$$Imm_{ij} = B_0 + B_1(pop_i \times pop_j) + B_2(rely_{ij}) + B_3(dist_{ij})$$

In this model, $imm_{ij}$ represents the log of immigration to destination country I from source country j, and $rely_{ij}$ is the ratio of destination to source country per capita incomes. Lewer and Van den Berg also suggest an augmented immigration gravity equation based on findings that show distinctive ethnic concentrations of immigrants in the United States and Zawodny (1997) who finds that family ties overwhelm other factors in determining immigration. The augmented gravity model controls for additional influences on immigration and is as follows:

$$Imm_{ij} = B_0 + B_1(pop_i \times pop_j) + B_2(rely_{ij}) + B_3(dist_{ij}) + B_4(stock_{ij}) + B_5LANG_{ij} + B_6CONT_{ij} + B_7LINK_{ij}$$

In this model, $stock_{ij}$ is the number of source country natives already living in the destination country. To conclude their introduction of this model, Lewer and Van den Berg perform four gravity regressions using panel data on total legal immigration to each of 16 OECD destination countries from all source countries throughout the world for 1991-2000 to show that the findings are highly significant and that the gravity model of international trade is a useful regression model for testing hypothesized influences on trade flows between pairs of countries.

In the model developed by Lewer and Van den Berg, each variable is bilateral in that it applies to both countries i and j. However, other researchers wanted to test the influence of unilateral variables on immigration. These unilateral variables only apply to one country in the model rather than both. Redding and Venables (2004) and Rose and van Wincoop (2001) show that gravity model estimates are likely to be biased by standard error clustering when some variables in the model only apply to one of the two countries. For

example, including the GDP per capita of the origin country as an explanatory variable would bias the results because it only applies to the country of origin. To solve this problem, Feenstra (2004) shows that adding fixed effects to the model eliminates the bias. This technique was used in this study of refugees to avoid the potential for this kind of bias. Lewer and Van den Berg claim that distance is almost always an important explanatory variable when analyzing determinants of migration but set forth the gravity model of immigration as a method for testing the marginal influence of additional variables on immigration.

**Data**

The refugee data for this study came from The United Nations Commissioner for Refugees Statistical Database which contains data on the number of refugees registered in a country of asylum from a specific country of origin for the years 1975-2013. The Refugee Project, which shows the three asylum countries with the most refugees from a certain country of origin for every country in the world, was used as a supplement to the UNHCR database to isolate the top three asylum countries for each origin-asylum country dyad. The final dataset used for this study therefore includes the number of refugees from 169 countries of origin in each of the top three asylum destinations for those countries of origin for each year from 2001-2013. Any countries not included were left out due to lack of sufficient data. The years used for the study were chosen based on available trade data, which is discussed in more detail below.

Import and export data between the country of origin and country of asylum was used to represent trade between the two countries. This data was collected from the International Trade Center's trade by commodity statistics. This study only includes the years 2001-2013 because the ITC's trade data does not start before 2001. The ITC provides yearly trade data for 220 countries and territories that includes all 5,300 products of the Harmonized System in thousands of US dollars. The Harmonized System is an international nomenclature for the classification of products developed by the World Customs

Organization.[11] It allows participating countries to classify traded goods on a common basis for customs purposes and therefore facilitates the collection of international trade statistics.[12] For this study, import and export values were collected in terms of imports to the country of origin from the country of asylum ($IM_{ij}$) and exports from the country of origin to the country of asylum ($XP_{ij}$). For years and countries for which trade data did not exist, the entire observation was eliminated from the data set.

Population data as well as GDP per capita data for each country was collected from The World Bank's population databank. Population data was collected for each country of origin. The World Bank defines population as all residents regardless of legal status or citizenship – except for refugees not permanently settled in the country of asylum, who are generally considered part of the population of their country of origin.[13] The values shown in the data are mid-year estimates of total population for each year from 2001-2013. Population data was used to construct the dependent variable, the total number of refugees from a specified country of origin registered in a designated country of asylum as a percent of the total population of the country of origin. This was intended to reduce bias in the dependent variable given that a certain number of refugees from a small country is quite different than that same number of refugees from a much larger country. GDP per capita data for each country of origin as well as each country of asylum, unlike population data, was used as an independent variable, as a reflection of the status of the economy in each of the specified countries. GDP per capita, as a representation of strength of an economy in a given country is often a determinant in migration flows and therefore likely to be a significant explanatory variable when examining refugee flows.

Google Maps was used to collect a measure of the distance between the capital cities of each origin and asylum country in kilometers. It is clear from previous studies that distance between countries is an important explanatory variable when it comes to migration as well as refugee flows. However, there is no perfect way to measure the distance between two countries as all methods are biased to some extent. The most accurate measure would have been the distance between the closest borders of the two

[11] What is the Harmonized System (HS). World Customs Organization. 2016. < http://www.wcoomd.org/en/topics/nomenclature/overview/what-is-the-harmonized-system.aspx>.
[12] Ibid.
[13] Population, total. The World Bank. 2016. <http://data.worldbank.org/indicator/SP.POP.TOTL>.

countries in question. However, this method proved infeasible due to the lack of available resources to collect this measurement. Another option was to use a dummy variable to represent a certain number of degrees of separation between countries, i.e. whether the countries share a border or not. However, this would have enforced a binary on data with a broad range. That said, this shared border dummy variable would be something interesting to test in future studies. The distance between two capital cities was chosen as the measure of distance used in this study because it accounted for the broad range of possibilities in addition to the fact that it was easy to obtain. Google Maps uses the great circle distance formula to measure distance between two cities.

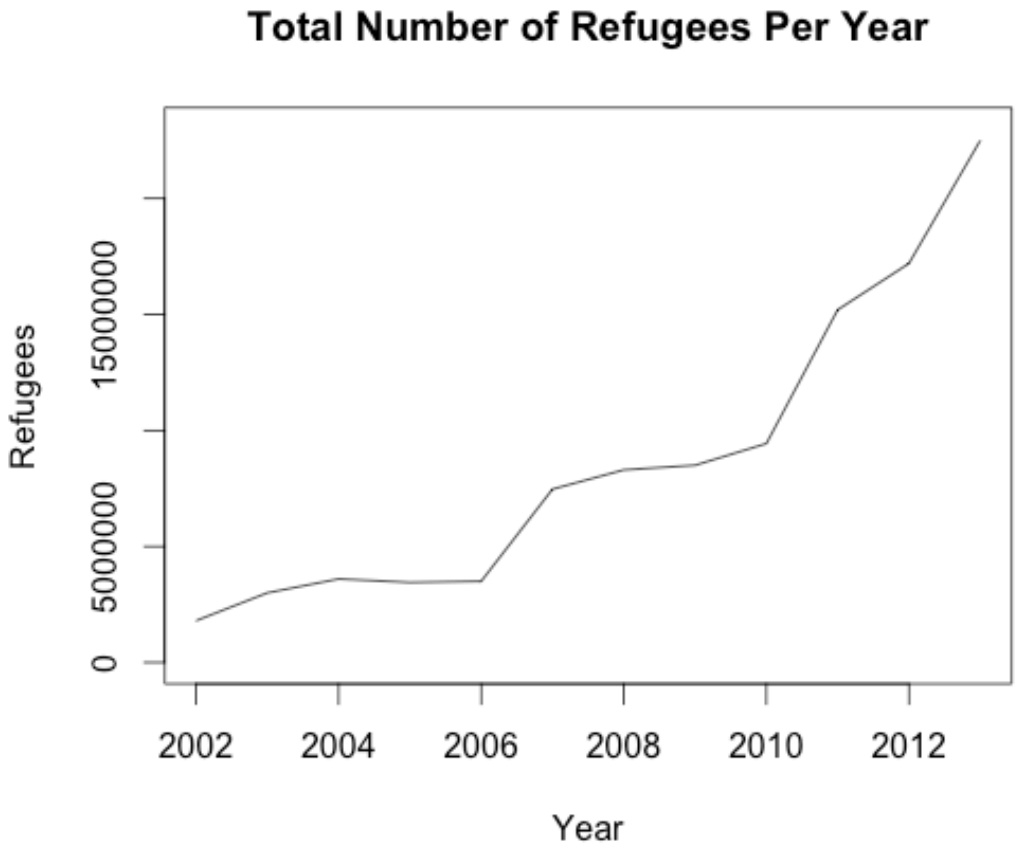
Data for Political Rights and Civil Liberty measures came from the Human Freedom Index. This is an index that presents measurements to reflect the state of human freedom in the world based on personal, civil and economic freedoms. The Index covers 195 countries. Because data in the human freedom index is only available beginning in 2008, the measures for each year were inputted as an average of the score for each country from 2008-2013. This introduces a certain bias in the data but because the index is measured as a ranking based on a 1 to 7 scale and most of the scores do not change by more than one or two points per year, the average of the years from 2008-2013 should be a relatively accurate portrayal of a country's score. Underlying each of these ratings are more detailed country assessments of country situations based on a 40-point scale for political rights and a 60-point scale for civil liberties.

In examining the data, some things become very clear. The few countries that produce the most refugees account for a large majority of the total number of refugees. The top ten refugee-producing countries are, in order, Afghanistan, Iraq, Somalia, Sudan, Vietnam, Burundi, Syria, Eritrea, Croatia and Azerbaijan. These countries account for 92.3% of the total number of refugees. The following table shows each of the countries and the total number of refugees to each's top three asylum destinations from 2001-2013.

| **Country** | **Number of Refugees** |
|---|---|
| 1.Afghanistan | 13,557,819 |
| 2. Iraq | 11,208,290 |
| 3. Somalia | 6,269,188 |

| | |
|---|---|
| 4. Sudan | 5,552,576 |
| 5. Vietnam | 4,260,960 |
| 6. Burundi | 3,608,974 |
| 7. Syria | 2,841,887 |
| 8. Eritrea | 2,322,329 |
| 9. Croatia | 1,601,592 |
| 10. Azerbaijan | 1,427,430 |

Below, one can also see the sharp increase in the total number of refugees beginning in 2010. This can be explained by a number of new and on-going international and domestic conflicts including the Syrian Civil War, the Afghan conflict and drought and violence in Somalia and Sudan. These numbers continue to rise today as more and more Syrians are displaced by the civil war there.



**Econometric Model**

In order to analyze the impact of trade relations on refugee flows, a linear regression of the aggregated panel data set was carried out closely resembling James Hatton's adaptation of the Gravity Model of Immigration. In the model, refugee flows as a percentage of the origin country's total population, the dependent variable, are related to import and export values for 169 countries from 2001-2013 for which data was available. The model is as follows:

(1) $$\text{Log}(R_{ij}/P_i) = B_0 + a_c + a_t + B_1\log(IM_{ji}) + B_2\log(EX_{ij}) + B_3\log(D_{ij}) + B_4\log(GDP_i) + B_5\log(GDP_j) + B_6(PR_j) + B_7(CL_j)$$

Where $R_{ij}$ represents the number of refugees registered in the country of asylum from the country of origin divided by the population of the country of origin. The country fixed effects are represented by $a_c$ and the time fixed effects are represented by $a_t$. $IM_{ij}$ indicates the value of imports in thousands of US dollars from the country of asylum to the country of origin. $EX_{ij}$ represents the value of exports in thousands of US dollars from the country of origin to the country of asylum. $D_{ij}$ represents the distance between capital cities of the country of origin and the country of asylum in kilometers. $GDP_i$ is the GDP per capita of the country of origin while $GDP_j$ is the GDP per capita of the country of asylum. $PR_j$ is the Freedom House Index political rights measure for the country of asylum and $CL_j$ is the Freedom House Index civil liberties measure for the country of asylum.

A second model was tested, closely resembling the first, but in which only observations for the ten countries with the most refugees were included. As stated earlier, these countries represent 92.3% of the total number of refugees and therefore will serve to measure the robustness of the model. The countries as mentioned earlier are: Afghanistan, Iraq, Somalia, Sudan, Vietnam, Burundi, Syria, Eritrea, Croatia and Azerbaijan. In this case, because all of the observations for the number of refugees are so large and there are only 230 observations in the data set, the dependent variable was the logged number of refugees, rather than the number of refugees as a percentage of origin country population. This model appears the same as the first with the independent variable denoted differently as follows:

(2) $\text{Log}(R_{ij}) = B_0 + a_c + a_t + B_1\log(IM_{ij}) + B_2\log(EX_{ij}) + B_3\log(D_{ij}) + B_4\log(GDP_i) + B_5\log(GDP_j) + B_6(PR_j) + B_7(CL_j)$

There also another iteration of the same model carried out with a different dependent variable. The dependent variable was composed of all observations that had values for the number of refugees as a percentage of origin population that were greater than .01%. This dependent variable is not as extreme as only including the top ten refugee-producing countries but it also represents countries which had a flow of refugees rather than a few a year. The results for this dependent variable were not as important as the other two iterations and therefore can be found in Appendix 2.

**Results**

The results of the empirical analysis are highly significant, and for the most part match what economic theory and previous research would suggest. As seen below in Table 1, three OLS regressions were carried out on the panel data set, the first without fixed effects, the second with country fixed effects for both the origin and destination country and the third with both country and time fixed effects. As previous studies suggest, distance is a highly significant explanatory variable when fixed effects are not included in the model as seen in regression 1. When fixed effects are included distance drops out as it is not changing over time or within the same countries. Distance is negatively correlated with refugee flows indicating that the smaller the distance between a country of asylum and a country of origin, the more refugees are likely to flee to that country of asylum from the country of origin. Considering that the variable is logged, the distance coefficient has a very large magnitude, indicating that with a small decrease in the distance between two countries, one would expect a large increase in the number of refugees that flee to that asylum country.

Table 1: Coefficients and standard error, without threshold (including Political Rights)

| | Dependent Variable: Refugees/Origin Population | | |
|---|---|---|---|
| | (1) | (2) | (3) |
| Log Distance (km) | -0.810*** | | |
| | (0.042) | | |
| Log Imports (US$) | 0.056** | 0.078*** | 0.075*** |
| | (0.023) | (0.021) | (0.020) |
| Log Exports (US$) | -0.237*** | 0.0 | 0.001 |
| | (0.018) | (0.015) | (0.015) |
| Log Per Capita GDP Origin (US$) | -0.489*** | -0.211** | -0.437*** |
| | (0.026) | (0.070) | (.092) |
| Log Per Capita GDP Asylum (US$) | 0.096* | 0.673*** | 0.390*** |
| | (0.053) | (0.111) | (0.145) |
| Political Rights | 0.113** | -2.172*** | -17.745*** |
| | (0.048) | (0.296) | (4.959) |
| Constant | 2.271*** | | |
| | (0.634) | | |
| Fixed Effects | None | Origin + Asylum | Origin + Asylum + Time |
| | R^2: .2999<br>Adjusted R^2: .299<br>Observations: 4952 | R^2: 0.9897<br>Adjusted R^2: 0.9892<br>Observations: 4952 | R^2: 0.9899<br>Adjusted R^2: 0.9893<br>Observations 4952 |

Robust standard errors are reported in parenthesis under the coefficients. The absolute values of the t-statistics for each estimator are reported. The symbols *, **, and *** following the coefficients denote that the estimator is significant at a 10, 5, and 1% significance level, respectively. Country and Time dummies not reported.

Perhaps the most important result is the positive and significant relationship between imports and refugee flows per population. In each of the three regressions in Table 1, imports to the country of origin from the country of asylum is significant at the 5% level and then at the 1% level when country and time fixed effects are included in the model. This indicates that the more the country of origin imports from the country of asylum, the more likely there is a larger refugee flow from that country of origin to that country of asylum, providing support for the original hypothesis of this study. With country and time fixed effects, the import coefficient increases in both magnitude and significance,

indicating that when controlling for heterogeneity across countries and time, the impact of imports on refugee flows appears even greater.

Exports, however, do not provide evidence to support the initial hypothesis that greater trade between two countries should lead to greater refugee flows. With no fixed effects, exports are negatively correlated with refugee flows albeit significant at the 1% level. This would suggest that the greater the amount of exports from a country of origin to any one potential country of asylum, the smaller the number of refugees that flee to that country of asylum. This runs counter to the initial hypothesis but could be explained by the fact that the countries with the largest refugee flows are also some of the poorest countries which can be concluded by looking at the table containing the top ten refugee-producing countries. Poorer countries are less likely to be equipped to deal with events that produce large refugee flows such as war, natural disaster and other forms of violence and therefore will likely produce larger refugee flows. Poorer countries are also likely to have weaker economies and therefore export less overall than more developed countries. In this case, a country's economic condition may be confounding the results concerning exports as poorer countries are likely to have larger refugee flows and export less overall than their more developed counterparts. When country and time fixed effects are added, however, the coefficient on exports becomes insignificant.

As far as the other explanatory variables, they behave as would be expected. The coefficient on GDP per capita in the origin country is negative and highly significant in all three regressions. Considering that most of the countries that produce the largest number of refugees are developing countries with lower GDP per capitas, it makes sense that the coefficient indicates that as the GDP per capita in the country of origin decreases, the number of refugees from that country of origin increases, again confirming that refugees disproportionately come from poorer countries. Wealthier countries are better able to take in refugees and refugees would also prefer to flee to a country with a higher GDP per capita, which reflects a healthy economy. The coefficient on GDP per capita in the country of asylum is positive and increasing in significance as fixed effects are introduced to the model. Lastly, the variable for political rights is at first positive which would be counterintuitive but when fixed effects are added, it becomes negative and highly significant. Because political rights are measured on an index from one through seven, with

one representing the most political rights and seven representing a measure of the least amount of political rights, a negative coefficient indicates an increase in political rights in the asylum country as the number of refugees to that asylum country increases. Appendix 1 contains the same regressions carried out with a variable for civil liberties rather than political rights. They could not both be included in the same regression due to multicollinearity issues, however, political rights seemed to be a more significant explanatory variable.

A separate set of regressions was run with an adjusted dependent variable to try and better reflect true refugee flows. In the original data set, there were many countries of origin that had less than 20 refugees each year, which is not reflective of the types of flows that displace thousands of people. When there are that few refugees they are more likely fleeing under very specific, isolated circumstances. The new data set includes all observations for the top ten refugee-producing countries. This left 230 observations, far less than the original 4956 although these observations account for 92.3% of the total number of refugees in the full dataset. The results from this set of regressions are shown below:

Table 2: Coefficients and Standard Error, Top 10 Refugee-Producing Countries

| | Dependent Variable: Refugees | | |
|---|---|---|---|
| | (1) | (2) | (3) |
| Log Distance (km) | -1.409***<br>(0.215) | | |
| Log Imports (US$) | 0.532***<br>(0.099) | 0.298**<br>(0.137) | 0.299**<br>(0.142) |
| Log Exports (US$) | -0.217***<br>(0.067) | -0.409***<br>(0.075) | -.444***<br>(0.079) |
| Log Per Capita GDP Origin (US$) | 0.323*<br>(0.164) | -0.001<br>(0.175) | -0.099<br>(0.187) |
| Log Per Capita GDP Asylum (US$) | -1.022***<br>(0.194) | 0.979**<br>(0.448) | 0.223*<br>(0.750) |
| Political Rights | 0.156<br>(0.030) | 1.309**<br>(0.545) | 2.144**<br>(0.984) |

| | | | |
|---|---|---|---|
| Constant | -1.272<br>(2.160) | | |
| Fixed Effects | None | Origin + Destination | Origin + Destination + Time |
| | R^2: .3258<br>Adjusted R^2: .3076<br>Observations: 230 | R^2: 0.977<br>Adjusted R^2: 0.9739<br>Observations: 230 | R^2: .9777<br>Adjusted R^2: .9732<br>Observations: 230 |
| Robust standard errors are reported in parenthesis under the coefficients. The absolute values of the t-statistics for each estimator are reported. The symbols *, **, and *** following the coefficients denote that the estimator is significant at a 10, 5, and 1% significance level, respectively. Country and Time dummies not reported. | | | |

Comparing the results in Table 2 to the results from Table 1 yields some interesting findings. Distance is once again significant and negative when fixed effects are not included. It is not possible to compare the magnitudes of the variables because the dependent variables are not represented in the same way, therefore it is difficult to make any conclusion about the magnitude of these coefficients in comparison with Table 1.

Imports, in this table, continue to be positive and highly significant indicating that these few countries with a large number of refugees could be having a big impact on the results that included all of the observations. However, in this iteration, exports are also highly significant albeit negative indicating that for these countries producing a large number of refugees, the more the country of origin exports to a country, the fewer refugees are likely to flee there. This could be explained by the large number of developing countries that are included here and an inability to control for distance with fixed effects. If refugees are fleeing to nearby countries, these countries are likely to also be developing countries. It is probable that developing countries export much more to developed countries than they do to other developing countries.

In this regression, GDP per capita in the country of origin loses its significance while GDP per capita in the country of asylum maintains its significance and is still positive when fixed effects are included. This provides further evidence that refugees, although distance is so important, do not flee completely randomly to asylum countries, but rather choose, to some extent, to flee to countries in which there is more economic opportunity than in the country they are leaving. Interestingly, political rights are positive which indicates that the more refugees flee to a specific asylum country, the worse that country is on the political

rights index. Again, this may be because, with such a few number of observations and an inability to control for distance with fixed effects, refugees are fleeing to nearby countries which may also happen to be developing countries that tend to score higher, which means worse, on the political rights scale.

## Conclusions

It appears that imports could be a good indicator of refugee flight patterns during a period of conflict. That is to say, those countries from which a country imports the most are likely to be the first and most important asylum countries if a refugee crisis breaks out. As mentioned earlier, this is likely because a strong trade relationship reduces certain costs of fleeing from a country of origin to a country of asylum. This has important crisis management implications. When the Syrian Civil War broke out, Syrians first fled to neighboring countries, however, as the war went on and the number of refugees increased, Syrians started trying to get to Europe by the thousands. This is surely because they understand that Europe offers benefits such as security and economic opportunity that other nearby countries do not offer. Europe, however, was not prepared for the multitude of refugees that came searching for asylum. Perhaps, if these trade correlations could be used to predict which countries should expect to receive refugees in a crisis, those countries could be better prepared. These findings also support the hypothesis that refugees do not randomly flee to countries of asylum. They, too, make a similar decision as migrants in trying to maximize their utility.

However, these findings also open up many doors for further study. It would be interesting to add other explanatory variables to the model to see how the results change. For example, a dummy could be added to represent whether the origin and asylum country share a common language. A lagged variable could be added to understand if past migrations affect future migrations. Variables could be added to reflect asylum policies in receiving countries as well as a variable to reflect existing ethnic linkages between origin and asylum countries. All of these things could impact the model and reveal new, important findings. In addition, it would be interesting to look at other indicators of trade. In this study, the trade of goods was used in the form of imports and exports to model trade. However, a variable could also be added that reflects the trade of services. Investments

would be another interesting variable to consider along with foreign aid. Lastly, it would be valuable to try and understand why there is this association between trade and refugee flows by testing certain links between trade and costs associated with migration to understand, if in fact, trade does lower those costs.

Scholars are just cracking the surface of empirical studies on global refugee flows. It is an area that would benefit from more analysis as new findings provide more insight into why these flows occur and where refugees tend to go when they do flee. Internal conflicts are much more prevalent today than they were a century ago and these internal conflicts produce many more refugees than inter-state wars. Therefore, it is our responsibility to understand how to better provide for the innocent civilians that get caught in the cross-fire, forced to flee their home fearing for their lives and often shuttled into camps that do not provide for their basic needs. International trade is just one of the many tools we may be able to harness to fight the current European refugee crisis along with others that are sure to come in the future.

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# Appendix 1

Table 3: Coefficients and standard error, all observations (with Civil Liberties)

| | Dependent Variable: Refugees/Origin Population | | |
|---|---|---|---|
| | (1) | (2) | (3) |
| Log Distance (km) | -0.807***<br>(0.041) | | |
| Log Imports (US$) | 0.058**<br>(0.023) | 0.077***<br>(0.021) | 0.074***<br>(0.020) |
| Log Exports (US$) | -0.239***<br>(0.018) | 0.0008<br>(0.015) | 0.002<br>(0.015) |
| Log Per Capita GDP Origin (US$) | -0.488***<br>(0.026) | -0.211***<br>(0.070) | -0.437***<br>(.092) |
| Log Per Capita GDP Asylum (US$) | 0.128**<br>(0.055) | 0.673***<br>(0.111) | 0.390***<br>(0.145) |
| Civil Liberties | 0.167***<br>(0.055) | -0.232<br>(0.164) | -0.232<br>(0.162) |
| Constant | 1.841***<br>(0.655) | | |
| Fixed Effects | None | Origin + Asylum | Origin + Asylum + Time |
| | R^2: .3004<br>Adjusted R^2: .2995<br>Observations: 4952 | R^2: 0.9898<br>Adjusted R^2: 0.9892<br>Observations: 4952 | R^2: 0.9899<br>Adjusted R^2: 0.9893<br>Observations 4952 |
| Robust standard errors are reported in parenthesis under the coefficients. The absolute values of the t-statistics for each estimator are reported. The symbols *, **, and *** following the coefficients denote that the estimator is significant at a 10, 5, and 1% significance level, respectively. Country and Time dummies not reported. | | | |

# Appendix 2

Table 4: Coefficients and standard error, Top 10 Refugee-producing countries (with Civil Liberties)

| | Dependent Variable: Refugees/Origin Population | | |
|---|---|---|---|
| | (1) | (2) | (3) |
| Log Distance (km) | 1.43***<br>(0.213) | | |
| Log Imports (US$) | 0.503**<br>(0.097) | 0.298**<br>(0.137) | 0.299**<br>(0.142) |
| Log Exports (US$) | -0.224***<br>(0.066) | -0.409***<br>(0.075) | -0.444***<br>(0.079) |
| Log Per Capita GDP Origin (US$) | 0.311***<br>(0.162) | -0.001<br>(0.175) | -0.099<br>(.187) |
| Log Per Capita GDP Asylum (US$) | -0.885**<br>(0.189) | 0.979**<br>(0.448) | 0.223<br>(0.750) |
| Civil Liberties | 0.335***<br>(0.055) | 1.348**<br>(0.561) | 1.229<br>(1.033) |
| Constant | -2.324***<br>(2.127) | | |
| Fixed Effects | None | Origin + Asylum | Origin + Asylum + Time |
| | R^2: .3382<br>Adjusted R^2: .3204<br>Observations: 230 | R^2: 0.977<br>Adjusted R^2: 0.9739<br>Observations: 230 | R^2: 0.9777<br>Adjusted R^2: 0.9732<br>Observations 230 |

Robust standard errors are reported in parenthesis under the coefficients. The absolute values of the t-statistics for each estimator are reported. The symbols *, **, and *** following the coefficients denote that the estimator is significant at a 10, 5, and 1% significance level, respectively. Country and Time dummies not reported.

# Appendix 3

Table 5: Coefficients and Standard Error, with .01% cutoff (including Political Rights)

| | Dependent Variable: (Refugees/Origin Population) >.01% | | |
|---|---|---|---|
| | (1) | (2) | (3) |
| Log Distance (km) | -0.204***<br>(0.041) | | |
| Log Imports (US$) | 0.097***<br>(0.018) | 0.010<br>(0.024) | 0.005<br>(0.024) |
| Log Exports (US$) | -0.092***<br>(0.014) | 0.045***<br>(0.016) | 0.046***<br>(0.016) |
| Log Per Capita GDP Origin (US$) | -0.016<br>(0.033) | -0.210 ***<br>(0.074) | -0.536***<br>(.103) |
| Log Per Capita GDP Asylum (US$) | -0.276***<br>(0.039) | 0.080<br>(0.114) | -0.234*<br>(0.133) |
| Political Rights | -0.002<br>(0.030) | -1.378***<br>(0.196) | -0.021<br>(0.242) |
| Constant | -3.239***<br>(0.470) | | |
| Fixed Effects | None | Origin + Destination | Origin + Destination + Time |
| | R^2: .2388<br>Adjusted R^2: .2356<br>Observations: 1468 | R^2: 0.9932<br>Adjusted R^2: 0.9924<br>Observations: 1468 | R^2: .9933<br>Adjusted R^2: .9925<br>Observations: 1468 |
| Robust standard errors are reported in parenthesis under the coefficients. The absolute values of the t-statistics for each estimator are reported. The symbols *, **, and *** following the coefficients denote that the estimator is significant at a 10, 5, and 1% significance level, respectively. Country and Time dummies not reported. | | | |

Table 6: Coefficients and Standard Error, with .01% cutoff (including Civil Liberties)

| | Dependent Variable: Refugees/Origin Population >.01% per year | | |
|---|---|---|---|
| | (1) | (2) | (3) |
| Log Distance (km) | -0.201***<br>(0.041) | -0.204***<br>(0.068) | -0.213***<br>(0.067) |
| Log Imports (US$) | 0.098***<br>(0.018) | -0.016<br>(0.026) | -0.022<br>(0.026) |
| Log Exports (US$) | -0.092***<br>(0.018) | 0.035**<br>(0.016) | 0.035**<br>(0.016) |
| Log Per Capita GDP Origin (US$) | -0.020<br>(0.033) | -0.182 **<br>(0.075) | -0.512***<br>(.103) |
| Log Per Capita GDP Asylum (US$) | -0.232***<br>(0.041) | 0.097<br>(0.114) | -0.220*<br>(0.132) |
| Civil Liberties | 0.054<br>(0.036) | 11.140**<br>(4.886) | 10.963**<br>(4.855) |
| Constant | -3.784***<br>(0.480) | | |
| Fixed Effects | None | Origin + Asylum | Origin + Asylum + Time |
| | R^2: .24<br>Adjusted R^2: .2369<br>Observations: 1468 | R^2: 0.9932<br>Adjusted R^2: 0.9924<br>Observations: 1468 | R^2: .9934<br>Adjusted R^2: .9925<br>Observations: 1468 |

Robust standard errors are reported in parenthesis under the coefficients. The absolute values of the t-statistics for each estimator are reported. The symbols *, **, and *** following the coefficients denote that the estimator is significant at a 10, 5, and 1% significance level, respectively. Country and Time dummies not reported.