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Examining regional asymmetries in drivers of international migration flows

(accepted version at *The Manchester School*)

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Abstract:

Migration is key to economic development, with varying implications and uneven impacts on origin and destination regions. This paper examines the variation in the major drivers of migration within and across continental blocs and the OECD in a gravity framework. The empirical model uses bilateral migration flow data for 182 countries over a 25-year period (1990–2015) while controlling for push and pull drivers of migration. The novelty of the study rests in the added dimension of the variation in the impact of migration drivers that is based on the direction of migration flow. The results suggest that migration drivers vary significantly across several economic blocs based in different regions and OECD countries. We find that the weight and significance of the impact of migration drivers vary significantly based on the direction of flow across continental blocs and the OECD, although some similarities exist in some regions regardless of the direction of migration flow. The results specifically show that economic and socio-cultural drivers of migration are strongest when migration originates in continents dominated by developing countries and terminates in other continents, compared to migration that originates and terminates within the continents. This raises some anomalies and several issues of potential policy intervention.

Keywords: migration flow, economic blocs, Poisson pseudo-maximum likelihood model, continental migration channels;

Conflict of Interest statement:

There are no conflicts of interests to declare.

1. Introduction

International migration is driven by the dynamics of economic geography, demographic compositions and societal structures at national and continental levels. Migration is by no means a random occurrence; it is driven by systematic mechanisms, engineered by several complex pull and push factors that often leave socio-economic, demographic, political and environmental footprints in the originating and destination countries and continental regions. This often raises massive economic and social issues and fuels political furore, as seen in recent times; thus, scholars and policymakers are interested in improving the understanding of how historical migration patterns can provide insight on future trends, and how these trends can affect global and regional development.

Several countries around the world belong to regional, political and economic blocs, and this can serve as an indication of their geopolitical and economic affiliation. Past studies show that migration drivers and patterns may differ across geopolitical and economic blocs. Further descriptive evidence has also shown that studying the direction of migration flow may offer even deeper insight into the drivers and impact of global migration flows. The circular plot of migration in Abel and Sander (2014) provides an excellent visualisation of the migration flow variation across world regions based on the direction of flow.

Abel and Sander (2014) show that the immigrants in Africa moved a lot more within the continent, whereas the immigrants from Europe moved to more diverse destinations. It can also be observed that the most intense migration occurred within Sub-Saharan Africa, between West and South Asia, and from Central America to North America. Providing empirical evidence that supports this circular plot, particularly the key drivers for these trends will therefore be a valuable addition to a robust empirical analysis. This necessitates a robust analysis of the core drivers of global migration across world regions and blocs in the context of the dynamics in the direction of flow. To our knowledge, there is no evidence that the regional asymmetries were explored in previous literature. Our study, therefore, attempts to address this knowledge gap by analysing the variation in the impact of global migration drivers across the world's continental blocs and the OECD bloc. The OECD countries are by far the largest destinations of global immigrants (OECD, 2017); this has thus attracted scholarly interest in recent times, and our study adds to the growing literature in this area.

Our study investigates two inter-related questions: a) whether there are significant differences in the drivers of migration depending on the origin and destination blocs; and b) whether migration between blocs is driven by the same factors as migration within blocs. Examining these variations can serve as the basis for policy formulation as well as planning, projecting and forecasting future migration patterns. Our study covers bilateral migration flows across 182 countries over a time period of 1990–2015. This time period is of immense economic and political significance in terms of landmark events and reforms across major parts of the world (e.g., 2008 Global Financial Crisis, Eurozone crisis, civil unrests, wars and security concerns). We use a unique dataset compiled from multiple sources, namely data from the World Bank databank, CEPII (Centre d'Etudes Prospectives et d'Informations Internationales[1]) and the UN database, and employ Poisson pseudo-maximum likelihood (PML) models to control for econometric biases. We estimate economic gravitational forces on global bilateral migration flow[2], and then compare these estimates across continents and economic blocs, based on the direction of flow. In addition to these, we also examine the variations in the effects of other pull and push factors of migration.

Our results show that indeed, drivers of migration within the same bloc have a different size and significance from the migration flows between one bloc and another bloc. Our paper generally contributes to the existing literature in at least two profound ways: first, we add to the literature on the key drivers of global migration by introducing the dimension of the direction of migration flows through empirical analysis. Some of the related studies in this respect (such as Abel and Sander, 2014 and Azose and Raftery, 2019) are generally descriptive, focusing on the flows rather than the drivers. Second, we show that the effects of the economic forces of migration and other push and pull forces vary in impact based on the direction of flow, providing estimates of the various economic, geographic, demographic, social, historic and cultural factors. Previous studies in this area (such as Ramos and Suriñach, 2016, de Jong and de Valk, 2020, Borderon et. al., 2019, Mueller et. al., 2020, Ramos, 2019, and Fong and Shibuya, 2020) cover a narrower geographical scope, while the study of Arif (2019), though

[1] Translated from French to English "Research Centre in International Economics".
[2]This is a function of the population sizes of both the origination and destination countries and the distance between the two countries.

having a much broader scope with 103 countries, does not account for the variation in the direction of flow.

The remainder of the paper is organised as follows: Section 2 provides an overview of the relevant literature and theoretical considerations, while Section 3 introduces the data and discusses the empirical approach in the study. In Section 4, the results of the empirical models are analysed, and further robustness tests are discussed. Section 5 provides the summary and conclusion of the paper.

2. Relevant Literature: Economics of Migration and Gravity Model Framework

2.1 The Application of the Gravity Model Framework in Migration

The gravity model has been used in several studies to analyse the mechanism through which migration occurs. Empirical estimation using the gravity model framework is an offshoot of Newton's law of gravity, which emphasises the importance of distance and size in estimating a gravity equation. This framework is popular for analysing economic phenomena relating to international trade, technological advancement, capital flows, and real estate investment flows (see Santos Silva and Tenreyro, 2006; Yakop and van Bergeijk, 2011; and McAllister and Nanda, 2016). This framework has also been used in recent studies to analyse migration trends (see Ramos and Suriñach, 2016; White and Buehler, 2018; Bang and MacDermott, 2019; and Arif, 2020). The model predicts that, ceteris paribus, two countries with larger population sizes and shorter distances may have more migration interactions than countries with a smaller population that are farther apart geographically, and this becomes the measure of the economic gravitational force for migration. The population component of the gravity framework accounts for the effect that a large population may have on the allocation of scarce national resources in the origin country, which may serve as a push force, while a robust economy in the destination may serve as a pull factor. The distance component is a proxy for transportation and psychological cost (Greenwood, 1975), as individuals generally have less information about more distant locations and are less likely to migrate to locations about which they have minimal information.

Previous studies that have adopted the gravity framework for migration analysis have several limitations, ranging from limited geographical scope (see Kim and Cohen, 2010; Ramos and Suriñach, 2016), econometric and methodological strategies, particularly in relation to the quality and availability of data on cross-country migration flows with time-series properties (Abel, 2018; Kim and Cohen, 2010). Some studies have also questioned the effect of geographical distance on global economic flows (see Brakman and van Marrewijk, 2008; Linders, Burger and Van Oort, 2008). Both studies observed that despite the role of several confounding factors, geographic distance is still significant. In contrast, a more recent study (Kohl, 2019) contends that infrastructure development can reduce the impact of geographical distance on the global economy; this implies that a global phenomenon such as migration may be driven by other socioeconomic factors rather than just physical distance.Within a country, Stillwell et al. (2016) show mean migration distances vary widely, being highest in large, low-density countries and positively associated with urbanisation, HDI and GDP per capita, implying a positive link between development and migration distance. It is also worth noting that geographical distance can act as a portmanteau variable in a gravity framework, capturing several aspects of migration dynamics. It is therefore important to have sufficient controls for confounding factors and appropriate econometric techniques to identify and delineate the individual effects. Examination of these issues requires large-scale and long-run data analysis that we undertake in this paper.

2.2 Primary Drivers of Migration

Migration is the result of individuals' innate desire and ability to move to other places in pursuit of opportunities and other benefits that they may not have access to in their present places of residence. The primary drivers of migration are typically categorised as demographic (e.g. population growth), geographic (e.g. distance and contiguity), economic (e.g. GDP, employment/unemployment rate, wages), political (e.g. violence, poor governance, corruption, safety), historical (e.g. colonial relationship) or cultural factors (e.g. human rights abuse, family reunification, common language). All these can be effectively brought in as measures of differences between two countries within the gravity model, which we demonstrate in the empirical section.

Literature provides evidence on the specific effects of the factors highlighted above on migration. For instance, Clark, Hatton and Williamson (2007) reveal that the bilateral migration between a country pair may be higher if the countries share a common language. Clark et al. (2007) and Pedersen, Pytlikova, and Smith (2008) note that mutual colonial links significantly increase international migration between a country pair. Furthermore, Reidpath and Allotey (2003) and Kim and Cohen (2010) find that quality of life (measured by infant mortality rate (IMR) and life expectancy at birth), age structure, and the presence of global cities can impact bilateral migration. These factors have been largely analysed in homogenous (global) models (see Abel, 2018 and Arif, 2019) and other sub-categorical (country/bloc) models (see Clark et al., 2007), with little or no focus on the direction of flow. Our study will thus be a valuable contribution to the literature on how the effects of these factors on migration flow vary with the direction of flow.

Following empirical evidence in past studies that migration drivers and impacts vary by regional and economic affiliation and further descriptive evidence that significant variations exist in migration trends based on the direction of flow, we hypothesise that the drivers of migration will also vary based on the direction of flow in continental blocs and the OECD. Our empirical strategy is therefore to examine this proposition by comparing the weights and significance of the coefficients of migration drivers across continental blocs and the OECD in the different flow directions. For instance, we expect that the weights and significance of the coefficients of the drivers of migration, when migration originates and terminates in Africa will be different from the coefficients of the weights and significance of these factors when migration originates in Africa and terminates in Asia. Furthermore, we expect that these will also be different when migration originates in Asia and terminates in Africa.

3. Data and Empirical Framework

3.1 Data Sources

It is challenging to access reliable and harmonised data on homogenous global international migration (Ramos and Suriñach, 2016; Abel and Sander, 2014). Some migration studies (such as Ozden *et al.*, 2011; Ramos and Suriñach, 2016) have used migration data from the World

Bank Bilateral Migration Database, which has extensive coverage. Despite containing data for more than 200 countries from 1960 to 2010, it still has several limitations. First, the 10-year series makes it difficult to observe variations in shorter time periods. Second, the last data point recorded (2000 to 2010) creates a lag of approximately nine years; and third, the dataset measures migration using migration stock rather than migration flows. The use of migration stock data is particularly inappropriate because variations in migration stock are influenced by return migration or third-country migration (Ramos, 2016). Where possible, migration flow data is preferred for estimating migration patterns; thus, bilateral migration flow is the key outcome variable in this study, and it has been sourced from the United Nations Population Division[3] containing 5-yearly periods 1990-2015. The key explanatory and control variables have been pooled from two sources: geographic, social, historical and cultural factors were sourced from CEPII; while demographic and economic data were sourced from the World Bank databank[4].

3.2 Data: Variable Construction and Transformation

The migration flow variable is the outcome variable, while the distance and population size are the key explanatory variables in the gravity framework. The models are enhanced by the other economic and non-economic variables related to different migration push and pull forces. By analysing the variation in the magnitude of the coefficients and the statistical significance of the explanatory variables on migration flow, we are able to identify the key differences in the drivers of migration based on the direction of flow and across blocs. Appendix 1 shows the explanatory and control variables' categories, while the description and summary statistics are shown in table 1.

[INSERT TABLE 1]

The study is limited to the variables mentioned above because of the lack of global data for other control variables and the poor quality of data in some cases. For instance, data on

[3] This dataset is the supplementary in Abel (2018).
[4]This has been aggregated from the annual time-series to 5-yearly time series in a bid to unify the explanatory and control variables with the outcome variable (migration flow) which is in 5 yearly time-series format.

transparency, corruption rating, remittances, literacy rate, educational attainment, the legal system, accountability, political stability and the rule of law, either have short time series or/and a lot of missing cells (in the World Bank databank). Other variables are further omitted due to multicollinearity. Another issue that is worthy of note relates to variation in the composition of the country of origin of the different datasets. For instance, the UN data on migration flows captures the migration flows across 198 countries, while the CEPII and World Bank Databank have data for 224 and 265 countries, respectively. There are, therefore, some countries that are not represented in all three datasets. After reconciling the country list across the three datasets, a total of 182 countries are common across the three datasets (33,124 annual pairs and 165,621 pairs for the five time periods). A total of 912 unilateral pairs were also dropped, which leaves a total of 164,710 observations.

3.3 Empirical Framework

Incentives and constraints drive migration; thus, potential migrants aim to maximise their utility, which usually leads them to migrate whenever the pay-off in a foreign country is greater than that in their country of residence. Therefore, the model of migration adopted in this paper is theoretically represented by a random utility maximisation (RUM) model. The RUM estimates the utility that a migrant (*m*) derives from migrating to a specific country ($j=1$) compared to the utility derived from migrating to a different country ($j=2 \ldots. j$). The migrant obtains some level of utility from each choice, and, as a random utility maximiser, may select the country with the highest perceived utility. Because utility is an ordinal measure, there is a need to know which choices derive more utility, and the measure of utility that is derived from each country choice is determined by the characteristics of the migrant's country of origin.

$$U_{mj} = U(\boldsymbol{x}_{im}), \forall\ j \text{ in } J \tag{1}$$

where U_{mj} is the utility from alternative j for migrant m and x_i a set of drivers which influence the migration choices of the migrant m.

As often commented by studies using gravity modelling framework (see, for example, McAllister and Nanda, 2016, who have discussed the issues within a property market context), there are several estimation issues needing careful considerations. First, physical distance is widely acknowledged as a portmanteau variable that can be highly associated with omitted variables such as cultural differences, information costs and other idiosyncratic factors. These are difficult to capture in standard data collection process and commonly available data. Another perennial issue is the likelihood of heteroscedasticity, which can be dealt with reasonable success through econometric adjustments in standard errors. However, the issues of zero flow is very typical to gravity modelling and it involves years or country pairs with no economic flows, which can cause estimates to be greatly skewed (see Linders and De Groot, 2006). Eliminating the zero flow observations are not ideal as relevant data may be left out of the model, resulting in a smaller sample size. A popular and effective solution is to simply add a positive constant to all data, which transform zero flows into non-zero observations. This is a purely mechanical solution but it prevents loss of valuable signals in the data. However, Santos Silva and Tenreyro (2006) warn that these approaches may also bias the estimates and lead to irregularities. The fourth issue is an important one and specific to the bilateral and multi-lateral nature of flows, which is often noted as multilateral trade resistance (MTR) factors in the gravity modelling literature (see Bertoli and Moraga,, 2013). MTR entails from the fact that within a group of nations, bilateral trade flows are influenced not only by bilateral resistance or constraints, but also by the level of shared constraints to multilateral exchanges across all other countries. Therefore, models must control for MTR to avoid overestimation of the parameters. This is typical addressed by incorporating a combination of both origin-year and destination-year fixed effects.

The empirical analysis begins with the use of the traditional method in previous literature, which usually entails the transformation of the measure of migration, taking the natural logarithms, and estimating the log-linear model using Ordinary Least Squares (OLS) estimation (see Silva and Tenreyro, 2006). A positive number of 1.5 is therefore added to all the values of the country pair's bilateral migration flow, from which the natural logarithms of the new variables are derived. There are problems with zero values and heteroscedasticity, especially with 55% of our dataset having zero values when there was no migration between two countries. This method solves both of these problems.

An alternative approach is also adopted, the Poisson pseudo-maximum-likelihood (PPML), and this becomes the primary empirical estimation. The Poisson specification is built around the observed volume of migration between two countries, with a conditional mean that is a function of multiple characteristics. In this way, the efficiency of the PPML estimator comes close to that of the log-linear link function, which is good at estimating models with a high level of heteroscedasticity.

Equations 2-5 below are taken and adapted from Hill et al. (2018, page 438) and refer to Hill et al. (2018) for detailed discussion on maximum likelihood estimation. In an OLS regression, the migrants' flow *E(Y)* is represented as a function of a set of explanatory variables:

$$E(Y) = \lambda = \exp(\beta_1 + \beta_2 x) \qquad (2)$$

and the destination choice defines the Poisson regression model. The parameters β_1 and β_2 are maximum likelihood estimations. In practice, the estimation is carried out by maximizing the logarithm of the likelihood function

$$\ln L(\beta_1, \beta_2) = \ln P(Y = y_1) + \ln P(Y = y_2) + \ln P(Y = y_3) \ldots\ldots + \ln P(Y = y_n) \qquad (3)$$

Using eqn (2) for λ, the log of the probability function is

$$\ln[P(Y = y)] = \ln\left[\frac{e^{-\lambda}\,\lambda^{y}}{y!}\right] = -\lambda + y\ln(\lambda) - \ln(y!) = -\exp(\beta_1 + \beta_2 x) + y \times (\beta_1 + \beta_2 x) - \ln(y!) \qquad (4)$$

Given a sample of *N*, the log-likelihood function becomes,

$$\ln L\left(\beta_1, \beta_2\right) = \sum_{i=1}^{N}\{-\exp(\beta 1 + \beta_2 x_i) + y_i \times (\beta 1 + \beta_2 x_i) - \ln(y_i!)\} \qquad (5)$$

The log-likelihood function becomes a product of only β_1 and β_2 when the data values (*y* and *x*) are substituted, and this function is still a non-linear function of the unknown parameters. The maximum likelihood estimates will therefore have to be obtained by using numerical methods.

To control for time-variant unobserved heterogeneity and multilateral resistance to migration, migration country (both origin and destination) and time fixed effects (five yearly periods) are included. The first approach incorporates country and time fixed effects separately. And, the second approach replaces the country and time fixed effects with migration origin-year and destination-year fixed effects to mean-difference out the multilateral resistance to migration.[5] The second approach is also able to control for other unobserved factors (such as civil unrest, economic booms and recessions in some countries).

Therefore, the full specification using the Poisson maximum likelihood estimation is,

$$Log(Migration\ Flow_{ijt}) = \beta 0 + \beta_1\ Log(Distance_{ijt}) + \beta_2\ Log(Population\ size_{it}) + \beta_3\ Log(Population\ size_{jt}) + \beta_4\ Log(GDP_{jt}/GDP_{it}) + \beta_5\ (Employment\ rate_{it}) + \beta_6\ (Employment\ rate_{jt}) + \beta_7\ (Male/female\ ratio_{it}) + \beta_8\ (Male/female\ ratio_{jt}) + \beta_9\ (Life\ expectancy_{it}) + \beta_{10}\ (Life\ expectancy_{jt}) + \beta_{11}\ (Contiguous) + \beta_{12}\ (Common\ language) + \beta_{13}\ (Colonial\ history) + fixed\ effects + u_{ijt} \quad (6)$$

4. Results and Analysis

In this section, we discuss the results from the base models for global migration flow, which is then followed by the results across economic and trade blocs. We also analyse the major variations in migration drivers based on the direction of flows and present a set of robustness tests.

4.1 Global Migration

Our first analysis focuses on establishing key relationships in terms of push and pull factors behind global migration trends. Table 2 show the effects of gravity and other migration drivers on global bilateral migration. Columns 1-4 show the results using OLS estimators with the outcome variable being the log of the sum of the migration flow and 1.5 (log [flow +1.5]). Column 1 presents the OLS results without fixed effects; column 2 controls for country-fixed effects; and column 3 controls for time fixed effects. The interaction of country and time fixed effects replaces the previous country and time fixed effects to control for multilateral resistance to migration in column-3. In column 5, the Poisson model PPML estimator, which is our

[5] This controls for common shocks in origin and destination country while also accounting for unobserved heterogeneity. The second approach takes the form of interacting the countries with the year indicators (*i.e.* migration origin*time dummies; and migration destination*time dummies) which accounts for the possibility that any positive or negative changes in the bilateral barriers may generally pull immigrants to certain countries or discourage them from choosing some countries as destinations.

preferred estimation method, replaces the OLS based on the base model in column 4, and the outcome variable becomes the sum of the migration flow and 1.5 (i.e., flow+1.5).

[INSERT TABLE 2]

The parameter estimates in Table 2 show that, regardless of the model specification, distance between two nations tends to reduce migration, and this is consistent and statistically significant across all models. The findings also demonstrate that having a larger population in the origin and destination nations boosts global bilateral migration, which is consistent across all models. It is worth noting, however, that while this effect is positive in the first model specification for the destination country, it becomes negative when country and time fixed effects are incorporated separately. The results become positive and statistically significant when multilateral resistance to migration (column 4) is controlled for, indicating the importance of the need to control for unobserved heterogeneity. It also lends support to the concerns of omitted variable bias, which can be somewhat captured by the multilateral resistance to migration. Overall, these results are broadly consistent with studies by Kim and Cohen (2010) and Grogger and Hanson (2011). However, the positive coefficient for the population of the destination country contradicts with findings from Ramos and Suriñach (2016). As such, the control variables show mixed feedback.

The results show that migration is higher between nations that share a physical border i.e. contiguous, as can be expected. In terms of demographics, a larger male to female ratio in both the origin and destination countries enhances migration; however, this is statistically insignificant in the origin country. The effect of greater life expectancy rate in the origin country is not significant, while there is some support for a higher life expectancy rate in the destination country boosting immigration. To some extent, the life expectancy rate assesses a country's quality of life (Kim and Cohen, 2010) and hence, we may expect a better quality of life in the origin country reducing the level of emigration while higher life expectancy can boost immigration in the destination country. Since the push factors are statistically insignificant and the pull factors are statistically significant, demographic pull forces (destination) appear to be stronger than demographic push factors (origin). However, it is important to note that situations such as civil unrest, war, natural disasters etc. that can severely disrupt the way of life and reduce quality of life can make push forces significant.

Historical and socio-cultural factors appear to be consistent with theoretical expectations (see Clark et al., 2007; Mayda, 2005). The findings demonstrate that having a common official language and colonial history between two countries can encourage migration between them. Other results appear to be compatible with theory in terms of economic factors: the larger the economy of the destination country, the higher the bilateral migration between the two countries. In a similar vein, a migration origin country with a higher employment rate is more likely to experience reduced emigration, whereas a destination country with a higher employment rate is more likely to experience an increased level of immigration. Although some results are inconclusive, these findings lends some support to intuitions and theoretical expectations.

4.2 Continental and OECD Channels of Migration and Direction of Flow

After establishing a global view in Table 2, we now focus on the drivers of continental and OECD-related bilateral migration channels. This is to examine inter-continental dynamics and intra-continental trends. In Table 3, the continental model estimations (columns 2-7) are identical in terms of specification as the global/base model estimations (columns 2-7), but with continental sample sub-sets. The OECD-related migration is also shown in Column 8 of Table 3, which will be further explored in the next sub-section. Panel A's models estimate the economic gravitational forces of migration for bilateral movement inside each of the world's continents. For example, migration between two countries within the same continent (for example, France to Germany in Europe) is referred to as migration within the continent (and reported in column 4, panel A). Panels B and C also show the estimates of migration that started in one continent and ended in a different continent. In panel B, the focus is the origination continent[6]; while the focus is the destination continent in panel C[7].

[INSERT TABLE 3]

[6] i.e. Column 2 of Panel B shows bilateral migration that originated from countries within Africa and ended outside Africa.
[7] i.e. Column 2 of Panel C shows migration that originated from countries in other continents outside Africa, and the destination was in countries within Africa.

The results show both the common elements across the continents as well as some remarkable divergence in some of the factors. Specifically, the results in Table 3, Panel A, generally point to negative and statistically significant effects of distance and a positive and statistically significant effect of both the origin and destination countries' population sizes on migration. The distance effect appears to be strongest for migration that originated and terminated within Oceania and Asia, and it is the weakest and statistically insignificant for migration that originated and terminated within North America. However, Contiguity consistently played a positive and statistically significant role in driving within-continent migration. While in some sense, continuity does not play a big role, for example European migration into North America, but it is still a strong aspect of flow dynamics. The effect of population size within continents appears strongest in Africa and Europe and weakest in Oceania, where both origin and destination population sizes are statistically insignificant.

The demographic factors, however, have different effects across the continents. For the male-to-female ratio is mostly statistically insignificant. For life expectancy, the results are also mixed for both origin and destination-related drivers, while statistically insignificant in Europe and Oceania, Americas show positive and statistically significant effects. For the destination country, the effect is also consistently positive across continents (though not significant in Europe), apart from Africa and South America, where the effect is negative and statistically significant. An interesting finding from this exercise is that the effects of demographic factors are weakest in Europe. While the history of migration in Europe is complex, this may be linked to the liberalised migration policy within the EU and similar demographics, which suggests that demographic factors are perhaps less of a concern for EU migrants than economic and geographic factors.

A dominant binding factor for migration is common language. Due to a plethora of historical and socio-cultural factors, which are intertwined and have been shaped by various geo-political events of the past, having a common official language maintains the positive effect across most continents. However, there are some oddities – it is statistically insignificant in Africa and Asia and it takes significant and negative sign in North America. Statistically insignificant results for Africa and Asia could be driven by the fact that there are many local official languages other than English. A plausible explanation behind negative effects in North America may be the presence of a powerful migration dynamics between Mexico and United States, who do not have a common official language.

We also find that having a common colonial history positively drives migration within continents apart from Africa, where it is negative and insignificant. It suffices to note that the historical factors, specifically common official language and common colonial history, do not matter for migration within Africa. This may be because colonial territories were split within tribal groups, with different colonial masters controlling different parts of the same tribe.

For economic factors, the GDP share remains positive and significant across most continents, apart from Oceania, where it is negative, and Africa, where it is statistically insignificant. In general, employment rates in both origin and destination countries have a different impact on intracontinental migration than the effects observed in the global model. This pattern suggests that economic factors are not as influential in driving migration within Africa as in other continents, which may be somewhat attributed (although not tested here) to civil wars and other political crises experienced across some of the countries in Africa.

Generally, the results indicate that, apart from geographically related variables, other variables have varying degrees of impact on intracontinental migration; these generally vary from the world migration drivers. Note that these differences are more noticeable when it comes to economic factors compared to other types of factors. Several variables also show noticeable similarities with the global model e.g. distance (being negative), male-to-female ratio (being mostly insignificant) and life expectancy (being a mixed bag).

The results in panel C of Table 3 show consistency in the effects of distance and population. Historical and socio-cultural factors are also generally consistent and in tandem with global patterns, although a variation can be observed in South America. Economic factors are generally mixed and largely inconsistent with global patterns. The results show that compared to the model on global migration, migration relating to continental blocs show some variations. Apart from contiguity, which remains positive and statistically significant across all the regions (it also remains the variable with the strongest coefficient), there are significant variations across continental blocs. A look at the regions with a higher concentration of developing countries (Africa, Asia and South America) shows that economic forces significantly influence migration that originates and terminates within all three continents. This pattern suggests that migration within continents dominated by developing countries may not be driven by economic factors but more by geographic and demographic factors.

The trends in the continents with a concentration of developed countries (Europe and Oceania) are different. Some of these factors may relate to the EU's free movement arrangement, which other continents do not have at that scale and complexity. Migration within Europe is generally driven by geographic and socio-cultural factors. The factors in North America also show that distance is not significant. This may be because of key migrant preferences for the US, Canada and other countries on these continents. Regardless of their proximity to the United States and Canada, people may want to migrate there. It can, however, be observed that countries that share borders still experience higher migration within them. It is also important to note that economic factors are generally not as strong for migration within the continent. Migration in North America is driven by a variety of factors, but more strongly by the socio-cultural factors.

4.3 OECD-related Migration

The OECD (Organisation for Economic Co-operation and Development) is a unique global bloc that consists mainly of economically wealthy countries around the world. An important requirement of OECD membership is that the members have to be democracies. Therefore, economic and democratic empowerments make OECD countries attractive destinations and those have received a significant proportion of global migrants. It is estimated that approximately 10% of the adult population in OECD countries are immigrants (see Docquier, Ozden and Peri, 2014), compared to 3% for the general immigration proportion in other countries. Yakop and van Bergeijk (2011) particularly underscore the importance of conducting OECD/non-OECD analysis in analysing global economic phenomena. Therefore, it would be valuable to examine the issues and extend the scope of application of the model to OECD and non-OECD countries.

The results (reported in column 8 of Table 3[8] show that OECD-related migration is somewhat consistent regardless of the direction of flow. The results also show that sharing a common border increases OECD-related migration. However, some variations exist in the effects of

[8] Panel A shows bilateral migration within OECD countries, and Panel B shows bilateral migration that originated in OECD countries and terminated in non-OECD countries. Panel C shows bilateral migration that originated from non-OECD countries and terminated in OECD countries.

other demographic, historical and economic factors based on the direction of the migration. We particularly observe that the geographical drivers of migration within the OECD are strong. However, other factors such as demographics, socio-cultural and economic factors are not as strong and significant. This may be because the countries in OECD are already developed and have robust institutional framework and, thus, migration from one to the other may not be significantly influenced by the economic factors among them. Furthermore, most developed countries have similar demographic structures with an ageing population and life expectancy, which suggests that this factor may not have statistically significant variations. People who migrate from the OECD to non-OECD countries only go to places with better economic opportunities and places closer to them. Their destination factors are somewhat stronger than origin factors, suggesting that they are possibly driven more by pull factors, than push factors. However, other continents show remarkable differences in this regard, for example, in South America, both push and pull forces are equally strong in terms of statistical significance, while in Africa, push forces are stronger and in Asia, pull forces are stronger.

4.4 Robustness Tests

We carry out further tests to examine the robustness of the results. First, some of the variables are not available for the full set of countries and/or across the full sample period. Therefore, we test the robustness of the results and identify the most significant factors by estimating the models using all variables, including those with limited availability. Appendix 1 reports the estimations. Due to limited availability, we have a smaller sample size and a shorter reference period. The results are generally consistent with the base results in terms of the size, magnitude and signs of the coefficients and their statistical significance. The few exceptions from the base results are the male to female ratio in the origin country (becomes negative and significant) and the life expectancy in the destination country (becomes negative). The only deviation from the base model is the life expectancy in the origin country (which becomes positive and statistically insignificant).

The second robustness tests examine the potential impact of major immigration and emigration countries by excluding these countries from the global model in steps (see Appendix 3). The first five countries receiving the highest number of global immigrants are first excluded (Panel A, Columns 2–6), and the first five countries with the highest emigration rates are excluded from the world model next (Panel B, Columns 2–6). Panel B, Column 7, further reports the estimate of the World model, where countries that have experienced some level of violence in the last 20 years are excluded. In general, the results are very similar to those found in the base model, but there are some differences in the control variables.

In the third robustness test, we make allowance for a more granular variation in the time series. This entails a reconstruction of the data to account for the yearly variation in migration. The bilateral migration flow variable is converted into annual flow averages, while the explanatory and control variables are reverted to the original annual time-series. The results (Appendix 4) are generally consistent with the results from the base model.

After excluding the top five immigrant destination countries, contiguity remains the significant and strongest factor, and it actually gets stronger as the additional destination countries are added. Social factors are still strong, along with geographical and demographic factors. Excluding the top five emigrant and war-affected countries, contiguity remains strong. Social factors are strong, but economic factors are not as strong. The geographical factors are also strong.

4.5 Policy Implications

The results and findings of this research have several policy implications. The insights from the gravity framework suggest that there is a tendency for developing countries that are geographically contiguous or close to developed countries to experience a high level of emigration. This may cause a disproportionate movement of high-skilled migrants from developing countries to developed countries, which may be detrimental to the development of the origin countries (Bhagwati and Hamada, 1974), further exacerbating global inequality. While there is currently very strong political rhetoric (e.g., nationalist and protectionist perspectives) around the world, the issues can also be addressed if developing countries tackle the economic and political issues that are mainly responsible for the desperation of emigrants to risk their lives and livelihoods while seeking better economic opportunities outside their countries of origin. Addressing these issues potentially minimises the current exodus of immigration to the OECD countries. Considering that destination countries' migration factors appear to be stronger, there is a need for key migration-destination countries to build stronger partnerships with key migration-origin countries in order to develop sustainable solutions to their economic and political challenges.

Addressing some of the issues that drive the current global migration patterns, emigration from developing countries and immigration to more developed countries, is vital for comprehending the current direction of migration. Therefore, the insights obtained from this study are valuable for forecasting and projecting the direction of future migration, which is vital for planning global development, urban and regional growth, and the provision of infrastructure and amenities. It may also aid in policy formulation for managing international migration across multiple countries. For example, Chen (2006) analyses the impact of international migration on a source country's economic growth in a stochastic setting and finds that economic growth crucially depends on international migration since the possibility of migration will affect fertility decisions and school expenditures. Based on such insights, it is further recommended that countries and continental blocs approach migration through close bilateral and multilateral co-operation to avoid and manage migration crises. These measures will facilitate orderly, safe, healthy and efficient migration and mobility, which will significantly contribute to achieving the Global Sustainable Development Goals (SDGs).

5. Concluding remarks

Global migration trends and patterns have constantly featured in recent debates and research. With the steady rise in global migration, understanding the drivers of migration is crucial for forecasts and decision making (Ramos and Suriñach, 2016). This study investigates global migration in a gravity framework in a form and scale not previously investigated in the literature. Furthermore, based on the direction of flow, the study provides unique perspectives on the variation in migration drivers across regional blocs and OECD countries.

Migration is a very complex area. Standard socio-economic variables cannot fully reflect all the information, which restricts the ability of any econometric exercise to capture the dynamics. Ours is no different. While results for some migration factors are not clear and somewhat mixed, overall investigation generally suggests that the drivers of global bilateral migration vary in size and significance depending on the destination and origin countries, which can be explained effectively within a gravity modelling framework. In other words, the larger sizes of both origin and destination countries encourage migration between country pairs, and the shorter distance between them increases migration even further. The distance captures the costs associated with transportation and information, as individuals are usually more knowledgeable about places of closer proximity. Population size accounts for the potential issue that a larger mass of people may interact more. It is also argued that a larger population in the origination country may create issues such as the allocation of resources, especially in poorer countries, labour market oversupply, demographic imbalance, etc. Immigrants may also be more attracted to destination countries with bigger population sizes as these countries have a higher likelihood of immigrant and ethnic clusters, which may improve the prospects of acculturation for immigrants in the destination country. These effects are observed on a global scale, at a continental level, as well as for OECD-related migration, and the results are robust and generally consistent. The results further indicate that contiguity consistently plays a positive role in migration, which suggests that two countries that share the same geographical borders may likely experience a higher level of migration.

The results also indicate that non-economic factors are more consistent across global and continental models. These results are generally less volatile than economic factors (similar to the observations in Kim and Cohen, 2010). This is, however, with the exception to demographic factors, which have mostly inconsistent estimates. Nevertheless, these insights are a valuable contribution to the existing knowledge in the literature regarding the key economic and non-economic drivers of global migration patterns.

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Table 1: Summary and Descriptive Statistics/ Variable Construction

	Variable name	Variable Description	N	Mean	SD
Dependent variables	Migration flow	Bilateral migration flow+1.5. A total of 198 countries (39,204 pairs per year) with 5 yearly intervals (e.g. 1990-1995, 1995-2000, 2000-2005, 2005-2010 and 2010-2015), making a total of 196,816 bilateral migration pairs.	164,710	1093.201	17625
	Log Migration Flow	Log (migration flow+1.5).	164,710	1.57	2.28
Key Explanatory variables	Distance	Log of the distance between the origin and destination country. This measures the geographical distance (kilometers) between the capital cities of a pair of countries. The actual distance between two countries is transformed into logarithms in order to normalise the values due to the large variance.	164,710	8.77	0.77
	Log Population (Origin)	Log of the population of the origin country. The population data in the World Bank databank is collected annually; therefore, the annual population data transformed into 5-yearly aggregates after which logarithms are taken.	164,710	6.37	1.95
	Log Population (destination)	Log of the population of the destination with similar construction as the origin country.	164,710	6.37	1.95
Control variables	Contiguity	Binary variable: 1=if country pair share a common border; 0 =otherwise.	164,710	0.02	0.13
	Male/Female ratio (origin)	The percentage of males compared to females in the origin country.	164,710	49.92	2.91
	Male/Female ratio (destination)	The percentage of males compared to females in the destination country.	164,710	49.92	2.91
	Life expectancy (origin)	Measures the number of years that individuals in the origin country are expected to live at birth.	164,710	67.88	9.67
	Life expectancy (destination)	Measures the number of years that individuals in the destination country are expected to live at birth.	164,710	67.88	9.67
	Common Official Language	Binary variable: 1=if country pair share a common language; 0 =otherwise.	164,710	0.15	0.36
	Common Colonial History	Binary variable: 1=if country pair share a common coloniasl history; 0 =otherwise.	164,710	0.11	0.11
	GDP share	Weighing the real GDP per capita of the destination country as a fraction of the GDP per capita of the origin country and taking the logarithms of the product.	164,710	-9.00	2.95
	Employment rate (origin)	The employment rate in the origin country.	159,280	57.66	11.66
	Employment rate (destination)	The employment rate in the destination country	159,280	57.66	11.66

Table 2: Base Models (bilateral migration): OLS and PML

	OLS				PPML
	(1)	(2)	(3)	(4)	(5)
VARIABLES	All Controls	Countries FE	Time FE	MRM	MRM
Log Distance	-0.705***	-0.826***	-0.826***	-0.762***	-0.986***
Log Population (Origin)	0.287***	0.980***	1.000***	0.293***	0.683***
Log Population (destination)	0.254***	-0.744***	-0.722***	0.275***	0.719***
Contiguity	1.798***	1.764***	1.764***	1.773***	1.222***
Male/Female ratio (origin)	0.048***	-0.013***	-0.014***	0.049***	0.009
Male/Female ratio (destination)	-0.042***	0.019***	0.018***	-0.066***	0.086***
Life expectancy (origin)	0.031***	0.009***	0.012***	0.038***	-0.006
Life expectancy (destination)	0.055***	-0.017***	-0.014***	0.063***	0.017***
Common Official Language	0.780***	0.571***	0.571***	0.714***	0.541***
Common Colonial History	1.965***	1.025***	1.025***	1.550***	1.472***
GDP share	0.085***	-0.004*	-0.004*	0.111***	0.189***
Employment rate (origin)	-0.001***	-0.012***	-0.012***	-0.001**	-0.014**
Employment rate (destination)	0.005***	0.019***	0.019***	0.012***	0.026***
Observations	154,000	154,000	154,000	154,000	154,000
R-squared	0.300	0.524	0.524	0.468	0.586
Country of origin FE	NO	YES	YES	NO	NO
Country of destination FE	NO	YES	YES	NO	NO
Year FE	NO	NO	YES	NO	NO
Country of origin x year FE	NO	NO	NO	YES	YES
Country of destination x year FE	NO	NO	NO	YES	YES

*Note: Robust Standard errors in parentheses; *** p<0.01, **; p<0.05, * p<0.1. MRM: controls for Multilateral resistance to migration models*

Table 3: Continental Variation in Drivers of Bilateral Migration Flow (PPML)

Panel A: Migration within continents

VARIABLES	(1) World	(2) Africa	(3) Asia	(4) Europe	(5) North America	(6) Oceania	(7) South America	(8) OECD to OECD
Log Distance	-0.986***	-1.181***	-1.404***	-0.978***	<-0.001	-1.820***	-0.885***	-0.494***
Log Population (Origin)	0.683***	0.478***	0.210	0.505***	0.751***	0.233	0.731**	1.226***
Log Population (destination)	0.719***	0.748***	0.872***	0.986***	-0.359*	0.0891	-0.575	0.948***
Contiguity	1.222***	2.170***	1.663***	0.576***	2.403***	#	1.106***	1.439***
Male/Female ratio (origin)	0.009	0.492**	0.278**	0.539**	-0.139	-2.056***	-0.718	-0.113
Male/Female ratio (destination)	0.086**	-0.202	-0.137**	0.201	0.124	0.607	-3.319***	-0.776
Life expectancy (origin)	-0.006	-0.095***	-0.232**	-0.119	0.276***	-0.081	0.349***	-0.039
Life expectancy (destination)	0.018**	-0.165***	0.110*	0.093	0.112***	0.260**	-0.326*	-0.194**
Common Official Language	0.541***	0.173	0.128	0.836***	-0.528***	3.639***	2.616***	-0.045
Common Colonial History	1.472***	-0.051	4.498***	0.954***	1.553***	1.101***	#	0.552***
GDP share	0.189***	-0.029	0.627***	0.572***	0.896***	-0.666**	4.718***	0.309
Employment rate (origin)	-0.014**	0.018	0.144***	0.082***	-0.054*	-0.124***	0.049	0.090
Employment rate (destination)	0.026***	-0.051***	-0.039	-0.083***	0.006	-0.455***	0.177	0.115
Observations	154,000	12,250	9,460	7,410	1,900	450	660	6,300
R-squared	0.586	0.755	0.841	0.692	0.998	0.985	0.857	0.864

Panel B: Migration from countries in a continent (origin) to other countries outside the Continent

VARIABLES	(1) World	(2) Africa	(3) Asia	(4) Europe	(5) North America	(6) Oceania	(7) South America	(8) OECD to non-OECD
Log Distance	-0.986***	-1.320***	-1.048***	-0.733***	-0.586***	-1.091***	-0.747***	-0.411***
Log Population (Origin)	0.683***	0.702***	0.377***	0.734***	0.941***	0.672**	0.729***	1.351***
Log Population (destination)	0.719***	0.645***	0.787***	0.596***	0.472***	0.699***	1.000***	0.568***
Contiguity	1.222***	1.644***	1.495***	0.331**	0.872***	-0.259	1.172***	1.404***
Male/Female ratio (origin)	0.009	0.351**	0.058	0.787***	0.240	-0.642*	2.747**	-0.434
Male/Female ratio (destination)	0.086**	0.015	0.082***	-0.378***	-0.371***	-0.161	-0.706***	-0.327***
Life expectancy (origin)	-0.006	-0.102***	-0.086	-0.157***	0.158*	0.022	0.152***	-0.174
Life expectancy (destination)	0.018**	0.014*	0.085***	0.039***	0.053***	0.092***	0.146***	0.038***
Common Official Language	0.541***	0.942***	0.364***	1.266***	-0.171	1.700***	2.092***	0.247*
Common Colonial History	1.472***	1.266***	1.397***	1.481***	0.750**	-0.391	0.065	0.691***
GDP share	0.189***	0.051	0.275***	0.221***	0.189***	0.136*	0.367***	0.225***
Employment rate (origin)	-0.014**	-0.039***	0.069**	0.024	-0.044	0.003	-0.059	0.141**
Employment rate (destination)	0.026***	0.032***	0.041***	0.011	0.040***	-0.0007	0.071***	0.0169*
Observations	154,000	43,750	38,500	34,125	17,500	8,750	10,500	31,500
R-squared	0.586	0.529	0.673	0.591	0.964	0.952	0.720	0.815

Panel C: Migration from other world continents to the continents (destination)

VARIABLES	World	Africa	Asia	Europe	North America	Oceania	South America	Non-OECD to OECD
Log Distance	-0.986***	-1.230***	-1.386***	-0.760***	-0.299	-1.525***	-0.907***	-0.751***
Log Population (Origin)	0.683***	0.633***	0.995***	0.705***	0.545***	0.589***	0.583***	0.672***
Log Population (destination)	0.719***	0.741***	0.690***	0.890***	1.090***	-0.002	1.540***	1.019***
Contiguity	1.222***	2.079***	1.307***	0.432***	2.097***	0.198	0.926***	0.712***

Male/Female ratio (origin)	0.009	0.052***	0.047	-0.004	0.094***	0.127***	0.030	0.056***
Male/Female ratio (destination)	0.086**	-0.238	0.066	-0.116	1.381***	0.362	0.632	-0.001
Life expectancy (origin)	-0.006	-0.029**	-0.013	0.069***	0.106***	0.110***	0.084***	0.077***
Life expectancy (destination)	0.018**	-0.201***	0.053	0.179***	0.137***	0.291***	0.064	-0.220***
Common Official Language	0.541***	0.538***	0.400**	1.020***	0.274*	1.246***	2.147***	0.628***
Common Colonial History	1.472***	1.471***	3.039***	1.168***	0.535*	1.477***	-0.390	1.126***
GDP share	0.189***	-0.298***	0.075	0.263***	0.555***	0.105	-0.258***	0.319***
Employment rate (origin)	-0.014**	0.061***	-0.026**	-0.018***	-0.010	-0.012	0.029***	-0.011**
Employment rate (destination)	0.026***	-0.068***	-0.077	-0.026*	0.125***	-0.166***	-0.247***	0.171***
Observations	154,000	43,750	38,500	34,125	17,500	8,750	10,500	31,500
R-squared	0.586	0.673	0.738	0.623	0.963	0.985	0.782	0.768

*Note: Robust Standard errors in parentheses; *** p<0.01, **; p<0.05, * p<0.1; All models contain multilateral resistance to migration controls; #Panel A: Contiguity: Most of the countries in Oceania (column 6) are Islands hence they do not share a common border; Common colonial history: None of the countries in South America (column 7) have a shared colonial link.*

Appendix 1: Categories of Explanatory and Control Variables

Factors	Push Forces	Pull forces
Economic Gravity indicators	-	Distance
	Population size (origin)	Population size (destination)
Geographic	-	*Contiguity (common border)*
Demographic	*Male/female ratio (origin)*	*Male/female ratio (destination)*
	Life expectancy (origin)	*Life expectancy (destination)*
Social, Historic and Cultural	-	*Common official language*
	-	*Common colonial history*
Economic	*GDP (Origin)*	*GDP (destination)*
	Employment rate (origin)	*Employment rate (destination)*

Source: *Authors' Computation (2019), adapted from Ramos and Surinach (2013); Gamso and Yuldashev (2018); and Krieger, Renner and Ruhose (2018).*

Appendix 2: Showing Robustness test with full specification estimation coefficients

VARIABLES	(1) Base model	(2) Secondary controls	(3) All controls
Log Distance	-0.986***	-1.042***	-1.068***
Log Population (Origin)	0.683***	0.980***	1.201***
Log Population (destination)	0.719***	0.580***	0.557***
Contiguity	1.222***	1.500***	1.447***
Male/Female ratio (origin)	0.00890	-0.125*	0.144
Male/Female ratio (destination)	0.0864***	0.123***	0.299**
Life expectancy (origin)	-0.00635	-0.0262*	0.0427
Life expectancy (destination)	0.0177***	-0.0822***	-0.151***
Common Official Language	0.541***	0.543***	0.514***
Common Colonial History	1.472***	1.377***	1.469***
GDP share	0.189***	0.0316	0.198**
Employment rate (origin)	-0.0138**	-0.0400**	-0.0437**
Employment rate (destination)	0.0259***	0.0369***	0.0501***
Log of share of land area (destination/origin)	NO	0.227***	0.263***
Have a common colonial relationship after 1945	NO	0.348	0.344
Uncertainty score (origin)	NO	0.578	2.217
Uncertainty score (destination)	NO	2.760*	1.426
Transparency & accountability score (origin)	NO	0.175*	0.250
Transparency & accountability score (destination)	NO	-0.245	0.0797
Corruption score (origin)	NO	-0.214	0.0672
Corruption score (destination)	NO	1.227***	0.765***
Population growth rate (origin)	NO	NO	-0.832***
Population growth rate (destination)	NO	NO	0.635***
Fertility rate (origin)	NO	NO	0.609*
Fertility rate (destination)	NO	NO	-0.732***
Economic development (origin)	NO	NO	-0.325
Economic development (destination)	NO	NO	0.916**
Observations	154,000	61,600	37,264
R-squared	0.586	0.674	0.694
Country of origin x year FE	YES	YES	YES
Country of destination x year FE	YES	YES	YES

*Note: Robust Standard errors in parentheses; *** p<0.01, **; p<0.05, * p<0.1.*

Appendix 3: Base (World) Models Excluding Top Immigrant, Emigrant and War Affected Countries

Panel A: PPML Models excluding top-5 Immigrant Destination Countries

VARIABLES	(1) World	(2)	(3)	(4)	(5)	(6)
Log Distance	-0.986***	-1.105***	-1.118***	-1.120***	-1.113***	-1.184***
Log Population (Origin)	0.683***	0.722***	0.723***	0.712***	0.738***	0.729***
Log Population (destination)	0.719***	0.677***	0.705***	0.701***	0.681***	0.685***
Contiguity	1.222***	1.152***	1.349***	1.418***	1.508***	1.547***
Male/Female ratio (origin)	0.009	0.005	0.007	0.003	0.002	0.002
Male/Female ratio (destination)	0.086***	0.0840***	0.092***	0.101***	0.0944***	0.096***
Life expectancy (origin)	-0.006	-0.009	-0.014	-0.015	-0.021**	-0.028**
Life expectancy (destination)	0.017***	0.0318***	0.032***	0.040***	0.044***	0.048***
Common Official Language	0.541***	0.718***	0.673***	0.711***	0.700***	0.663***
Common Colonial History	1.472***	1.533***	1.667***	1.629***	1.358***	1.388***
GDP share	0.189***	0.149***	0.139***	0.137***	0.131***	0.164***
Employment rate (origin)	-0.014**	-0.006	-0.004	-0.007	-0.004	-0.009*
Employment rate (destination)	0.026***	0.021***	0.027***	0.034***	0.035***	0.034***
Observations	154,000	152,250	150,510	148,780	147,060	145,350
R-squared	0.586	0.520	0.559	0.566	0.564	0.620
Excluded Countries		*USA*	*USA Germany*	*USA Germany Saudi Arabia*	*USA Germany Saudi Arabia Russia*	*USA Germany Saudi Arabia Russia UK*
Country of origin x year FE	YES	YES	YES	YES	YES	YES
Country of destination x year FE	YES	YES	YES	YES	YES	YES

Panel B: PPML Models excluding top-5 Emigrant Origin and War-affected Countries

VARIABLES	(1) World	(2)	(3)	(4)	(5)	(6)	(7)
Log Distance	-0.986***	-0.976***	-0.989***	-0.961***	-0.949***	-0.959***	-1.050***
Log Population (Origin)	0.683***	0.673***	0.671***	0.679***	0.698***	0.685***	0.679***
Log Population (destination)	0.719***	0.728***	0.724***	0.795***	0.801***	0.792***	0.724***
Contiguity	1.222***	1.164***	0.989***	1.073***	1.141***	1.080***	1.075***
Male/Female ratio (origin)	0.009	0.010	0.010	0.012	0.012	0.013	0.036*
Male/Female ratio (destination)	0.086***	0.076***	0.075***	0.091***	0.089***	0.088***	0.106***
Life expectancy (origin)	-0.006	-0.005	-0.004	-0.004	-0.007	-0.006	0.071***
Life expectancy (destination)	0.017***	0.014***	0.015***	0.011**	0.012**	0.012**	-0.062***
Common Official Language	0.541***	0.592***	0.695***	0.672***	0.655***	0.673***	0.482***
Common Colonial History	1.472***	1.435***	1.453***	1.470***	1.291***	1.270***	1.480***
GDP share	0.189***	0.180***	0.174***	0.164***	0.163***	0.166***	0.616***
Employment rate (origin)	-0.014**	-0.015***	-0.014***	-0.013**	-0.011*	-0.010*	-0.021***
Employment rate (destination)	0.026***	0.024***	0.024***	0.027***	0.028***	0.030***	-0.0005
Observations	154,000	152,250	150,510	148,780	147,060	145,350	122,460
R-squared	0.586	0.611	0.462	0.484	0.462	0.376	0.656
Excluded Countries		*India*	*India Mexico*	*India Mexico China*	*India Mexico China Russia*	*India Mexico China*	*War-affected countries (only)*

						Russia Syria	
Country of origin x year FE	YES	YES	YES	YES	YES	YES	YES
Country of destination x year FE	YES	YES	YES	YES	YES	YES	YES

*Note: Robust Standard errors in parentheses; *** p<0.01, **; p<0.05, * p<0.1.*

Appendix 4: PPML Models using Yearly Time-series data

VARIABLES	**(1)** Five-yearly time-series	**(2)** Yearly time-series
Log Distance	-0.986***	-0.749***
Log Population (Origin)	0.683***	0.567***
Log Population (destination)	0.719***	0.587***
Contiguity	1.222***	1.534***
Male/Female ratio (origin)	0.009	0.059***
Male/Female ratio (destination)	0.086***	0.069***
Life expectancy (origin)	-0.006	0.082***
Life expectancy (destination)	0.017***	-0.049***
Common Official Language	0.541***	0.677***
Common Colonial History	1.472***	1.465***
GDP share	0.189***	0.728***
Employment rate (origin)	-0.014**	-0.006***
Employment rate (destination)	0.026***	0.014***
Observations	154,000	716,689
R-squared	0.586	0.546
Country of origin x year FE	YES	YES
Country of destination x year FE	YES	YES

*Note: Robust Standard errors in parentheses; *** p<0.01, **; p<0.05, * p<0.1.*