

# An analysis of the effects of internet and mobile usage on migration

*Ayra Rowena Reyla and Ana Cecilia Montes*

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## Contents

<b>Introduction</b>	<b>2</b>
The Research Question . . . . .	2
<b>Methodology</b>	<b>2</b>
<b>Data Gathering</b>	<b>3</b>
International Migration Stock, Total . . . . .	3
World Bank Indicators . . . . .	3
Final Data Gathering . . . . .	3
<b>Descriptive Statistics</b>	<b>3</b>
Dependent Variables . . . . .	3
Patterns of Emmigration . . . . .	5
<b>Results</b>	<b>8</b>
<b>Limitations and Further Research</b>	<b>8</b>

# Introduction

Migration is one of the three main determinants of a country's population development. The other two - the birth and death rate - are generally believed to be easier to forecast [Castles2014]. However, the literature has associated migration to factors that have classically been seen as drivers for migration between two countries such as [a] conditions in the sending country driving out inhabitants, including political troubles, persecution, conflict and other "push factors", [b] conditions in the receiving country attracting migrants, such as higher wages, better know as "pull factors", and [c] factors which facilitate or authorize the migration process itself, such as the receiving country's immigration politics.

One driving factor increasingly put forward in recent years is the use of technology. According to Hiller2004, computer mediated communication has created new possibilities for migrants to maintain strong linkages and ties with their home nations. Not only has new technology improved and heightened communication, it has also bridged cultural gap between countries as it allows people to easily gathering new information and knowledge about other cultures. This of course has made a large impact on people's perception on other cultures and their worldviews. Overall, technology has changed the landscape for communicating, and gathering knowledge and information. These revolutions that have transformed society are making travel and telecommunications cheaper and easier than ever. Moreover, Technology has enhanced the aspects of interaction as it is transforming the way individuals communicate.

## The Research Question

This primary analysis will attempt to answer the following question using empirical methods:

Has the increase use of technologies such as internet and mobile phones affected the flow of emigration?

## Methodology

In order to examine the flows of migration, we intend to use data on trends in *International Migrant Stock* produced by the United Nations. The data contains information from 232 countries and provides the number of migrants by destination and country of origin for four periods of time; 1990, 2000, 2010, and 2013. Moreover, to account for technology diffusion we will use *World Bank indicators* on the number of Internet users and the number of cellular mobile subscriptions for each country.

The *International Migrant Stock Total* indicates the number of people born in a country other than the country in which they currently reside in, this includes refugees as well. The data set estimates the international migrant stock at a particular time and are mainly collect from population censuses. Also, the data set presents the estimates of : (1) international migrant stock at mid-year; (2) total population at mid-year (thousands); (3) international migrant stock as a percentage of the total population; (4) annual rate of change of migrant stock (percentage); and (5) estimated number of refugees. The estimates are based on official statistics on the foreign-born or the foreign population.

This analysis will focus on the estimates for the years 1990, 2000, 2010 and 2013.

Additionally, in order to conduct a more thorough analysis we will include a number of aggregate metadata collected from *The World Bank indicators*. There are many other determinants of migration, that is why this analysis chooses to include a wide variety of World Bank indicators. The chosen indicators are used to measure certain push factors.

To measure economic and demographic determinants this analysis includes the *fertility rate* indicator. Indicators such as *poverty* and *unemployment* have been removed from the analysis, as there are many missing values in the data set.

To account for political factors the this analysis used *World Bank Governance indicators*, which includes *government effectiveness*, *regulatory quality*, *rule of law*, and *voice and accountability*. We have omitted

*intentional homicides, political stability, and control of corruption* indicators because there was a lack of observations in the data set to conduct a complete analysis.

## Data Gathering

This section of the analysis will go into deep detail on our data gathering methods.

### International Migration Stock, Total

The original data was obtained through the United Nations Population Division, and downloaded through our repository as a Microsoft Excel file. The Excel datasheet had a matrix that described the population outflows and inflows for each country and for several time periods. This analysis focuses four time series; 1990, 2000, 2010 and 2013.

Gather the data using the **import** command, afterwards we used a loop to import the file to R Studio. Since this analysis is only interested in migration, we only extracted the Migration column from all the countries in the data set, and created a vector. From each matrix, we only selected the years of interest for this analysis. Afterwards we transposed the data to transform it into a more usable and readable format, and then we declared it as a data frame. Using the command **colnames**, we renamed each column appropriately. We ended the loop by assigned each year to a specific data frame. Using the command **cbind** we combined all the extracted data from above, thus creating combined year in a singular data frame. In order to reshape the new data frame, we used the command **gather**. This takes multiple columns and collapses them into key value pairs, this created two new variables called *emmigration* and *year*. Finally, we included the corresponding year names to the specific year variables.

### World Bank Indicators

To import the indicators we used **install.packages ('WDI')**, afterwards we imported it into our library using **library("WDI")**. Then, we specified which indicators we wanted to include in our analysis by using the specific codes available on the metadata set of the World Bank. We then properly renamed the variables using the **rename** command. Once the data was loaded, we used **Merged <- merge(emigrationtotal, WDI\_indi, by = c('iso2c','year'))** to combine the WDI indicators with the International Migration Stock.

### Final Data Gathering

how After importing and merging all the data into a singular data frame, a lot of missing values (NAs) were observed. To properly clean the data and omit the NAs the **is.na** command was used. However, in this process a total of ten countries were committed from the data frame, due to the lack of relevant information in our control variables.

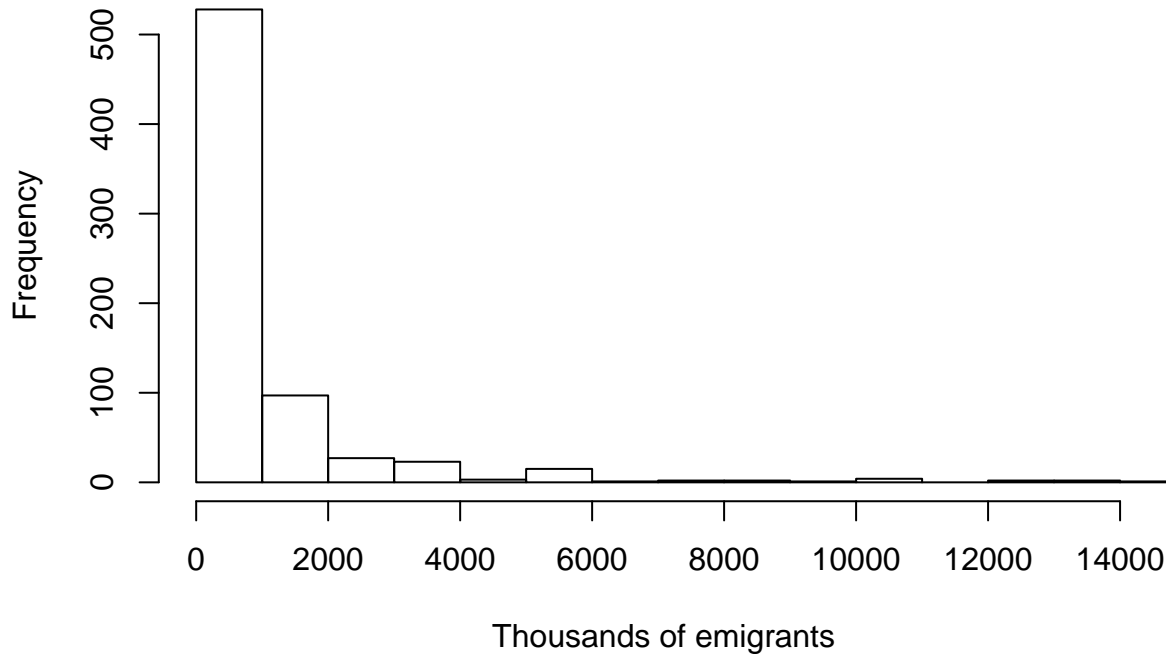
## Descriptive Statistics

### Dependent Variables

Our dependent variable is the total migrant stock at mid-year by country of origin, which we retrived from the United Nations Population division. It collected census data from 232 countries in 1990, 2000, 2010 and 2013.

The Figure 1 below shows the distribution of the dependent variable. Since the statistics accounts for the number of emigrants, it can be considered as count data. It is also vey rightly skewed, because there is a large amount countries that both have low emmigration and low population.

**Figure 1. Histogram for Emigration**

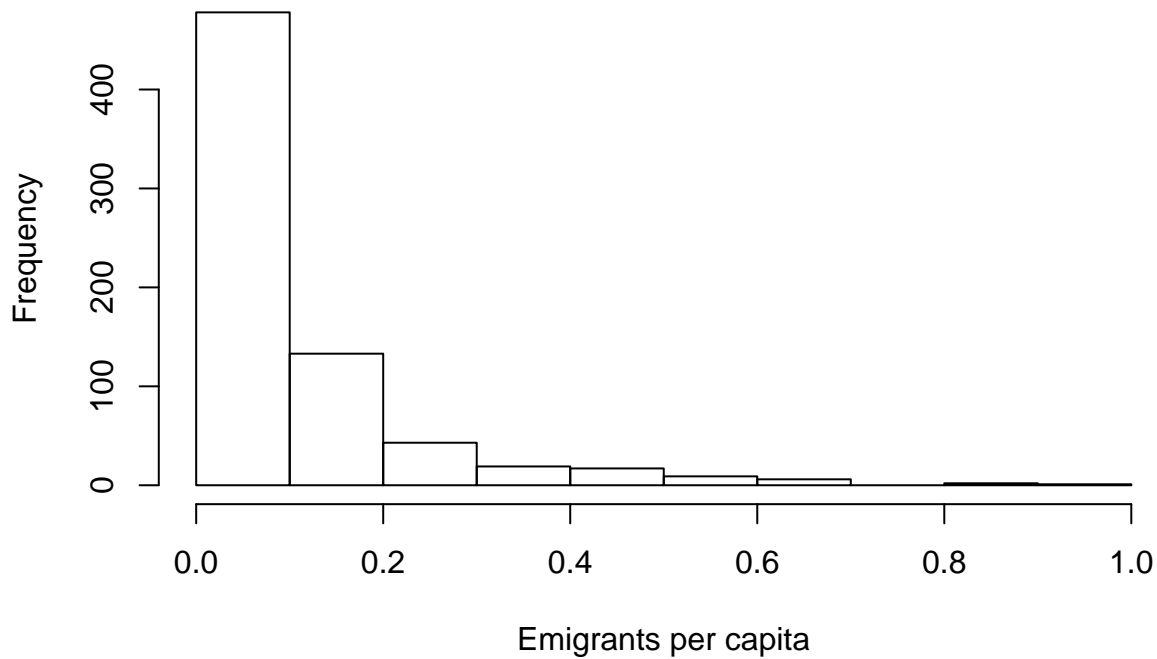


Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
1.242	131.300	437.700	1001.000	1021.000	14170.000

Figure 2 expresses emigration in per capita terms in order to account for population differences between countries. The shape of the destribution is not as not made a visual change, which means that emigration is quite low in a large number of countries.

Among all the years, the country with the largest emigration per capita is the West Bank snd Gaza. One can infer that the conflict in this region over time has affected the population movements drastically. The country with the lowest emigration per capita is Western Sahara. Even though there is a strong conflict in the region, free mobility in and our of the country is heavily guarded and limited by a 2,700 kilometer sand wall, also known as the Moroccon Wall. This can account for the lack of emigration throughout the region.

**Figure 2. Histogram for Emigrants per capita**



Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
0.0001053	0.0282700	0.0557800	0.1051000	0.1233000	0.9202000

### Patterns of Emmigration

The following figures illustrate the eveolution of the per capita emmigration stock totals for each country in the years 1990, 2000, 2010 and 2013.

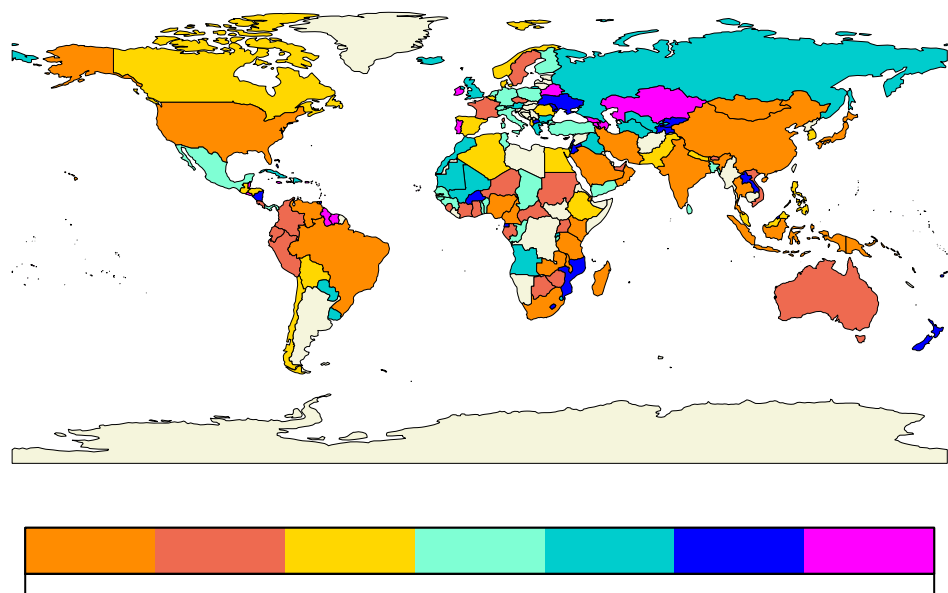
Observing the figures indicates the important population movements, particularly in Africa. For example, between the years of 1990-2000, Mozambique and Burina Faso has reduced the number of people exiting the country. Also, Chad has experienced similar paterns, but not the the extent to which the previous examples faced. When comparing 2010 and 2013, there is not a visually observable difference. This can possibly be attributed to the stabalization of migration patterns.

While Africa has experienced a decrease in emigration, Latin America has the opposite pattern. For example, countries such as Mexico, Colombia, Educador, Peru, Bolivia, and Guatemala have experience a large increase in total emigration during the last decade.

In Europe, the situation is quite mixed since many factors, such as the creation of European Union (EU) and the enlargemet of EU over the years could have played a large role the heterogenity of the migration paterns in the past decade. There is migration movement, but there is no overall patern of movements within the EU region.

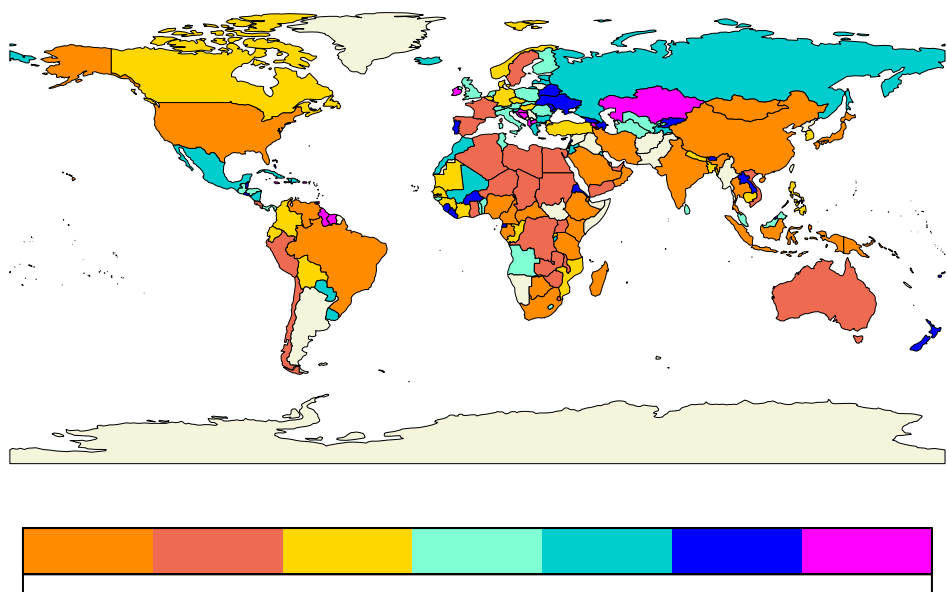
156 codes from your data successfully matched countries in the map 4 codes from your data failed to match with a country code in the map 87 codes from the map weren't represented

Figure 3. Number of emigrants per capita 1990



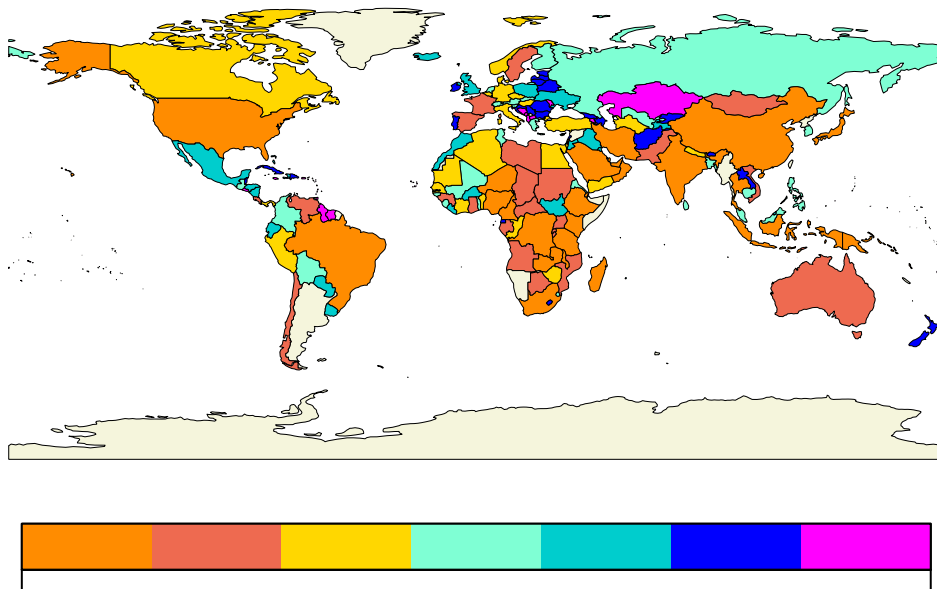
in your data 0.00328 0.48  
172 codes from your data successfully matched countries in the map 4 codes from your data failed to match with a country code in the map 70 codes from the map weren't represented in

Figure 4 Number of emigrants per capita 2000



your data 0.00435 0.92 182  
codes from your data successfully matched countries in the map 4 codes from your data failed to match with a country code in the map 60 codes from the map weren't represented in your

**Figure 5. Number of emigrants per capita 2010**

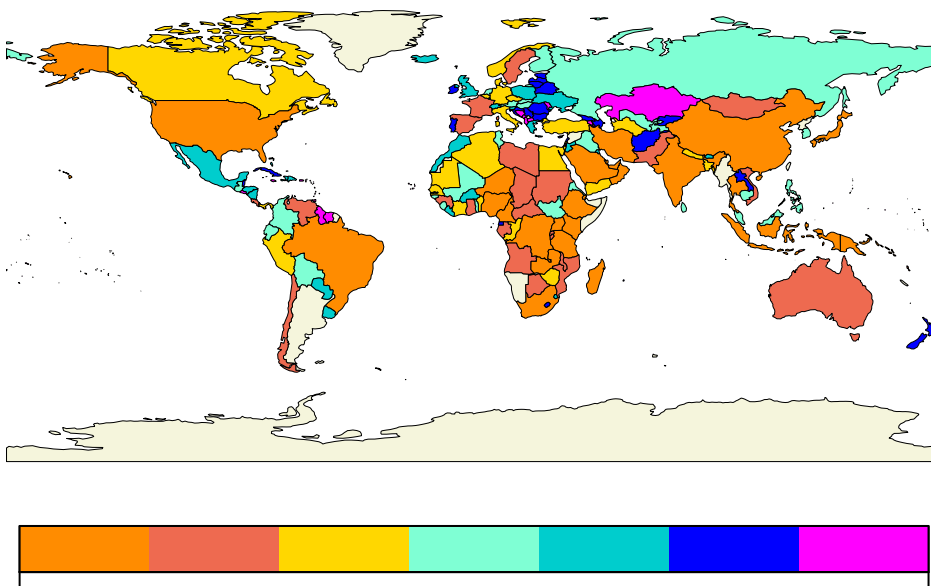


data 0.00373

0.847 182 codes

from your data successfully matched countries in the map 4 codes from your data failed to match with a country code in the map 60 codes from the map weren't represented in your data

**Figure 6. Number of emigrants per capita 2013**



0.00378

0.873

## Results

Panel regression using within estimators and separate random effect estimators are used when analyzing the research question at hand.

*Table 1* illustrates the regression results of a *panel regression*. The results show that cellphone usage is significant to explain the change in immigration inside a country. Additionally, the within estimations indicate that cellphone users do not explain the immigration pattern across countries.

Furthermore, the comparison between the same countries within the same year indicates that the more cellphone users in a country, the more migration occurs. Coincidentally, when comparing between countries, there is no effect on the cellphone users.

It's the effect within the country and the year that is significant. The more technology is introduced in the country, the more it will incentivize or "push" immigration in the country. This suggests that the differences across the countries are not a relevant factor to explain immigration across countries.

## Limitations and Further Research

The next step to this analysis will be to estimate our dependent variable using a *Poisson* distribution. We intend to combine panel data techniques with count data.