

Have ICT changed the game for mobility and migration?

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11 December 2015

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1. Introduction

Migration is broadly defined as a permanent or semi-permanent relocation of residence, there are no restrictions placed upon the distance or voluntary or involuntary nature of moving (Lee 1966). In fact, few countries today are not affected by international migration (Martin 2014) few countries today are. For many years, the idea of international migration meant disconnecting with one's homeland. This meant the process of communication with friends and family left behind was a slow process, often via hand written letters. However, since the dawn the digital age at the start of the 20th century information and communication technology (ICT) has radically changed the speed and nature of interactions between people worldwide. New ICT such as mobile phones have facilitated instant communication by phone calls, text messages, e-mail, and other social platforms. Cheap international telephone calls function as the 'social glue' binding migrants to their friends and families in their home country by creating constant involvement and engagement in their life (Vetrovec 2004). Castells (2009) argues that the digital age has drastically changed the speed of communication within transnational populations. Since the introduction of the Internet to the masses, it has developed into a globally diverse web of opportunities for gathering information, interacting globally and effectively producing new forms of media and content for consumption.

Presently, the digital era has transformed how people live their lives, how they interact with one another and how they learn and gather new information. There is no doubt that ICT have had a monumental impact on the world in which we live, fundamentally changing the way individuals communicate, entertain and learn. With the increase accessibility to ICTs and the existing state of mobility between people around the world, it is easy to envision an existing relationship between increased access to communication and information and the results of migration. Social media developed on the Internet has become one of the most popular channels of communication. These new communication devices created by the Internet and mobile phones are important for migrants who frequently remain in contact with friends or family members in their original locations. New innovation in digital technologies allows people to think beyond borders and it is reinforced by both digital and societal developments (Castles 2010).

Furthermore, with the advent of ICT in all components of everyday life, it is important and yet interesting to observe the how the relationship between ICT and migration has developed. This empirical analysis seeks to observe if the increase use of technologies such as the Internet and mobile phones impacted the flow of emigration? With the beginning of globalization, we aim to observe the changes in the context of migration around the world. One driving factor increasingly put forward in recent years is the use of technology. According to Hiller and Franz (2004), 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.

As such, this paper will be organized as follows. Section 2 will provide a theoretical foundation for the analysis, as to set the scene for subsequent discussion. Section 3 will be a literature review to identify the converging ideas and understand contemporary studies on the topic. Section 4 will provide the basis for our empirical analysis, by explaining the data and methodology. Section 5 will provide the results of the analysis, followed by a discussion.

3. Understanding Migration: A Theoretical Foundation

Migration is one of the three main determinants of a country's population development (Lee 1966). Every act of migration involves an origin, a destination and intervening set of obstacles and opportunities. The idea of human mobility is that individuals are always in constant circulation. Humans are constantly moving throughout their lives, which could be seen on varying degrees. Whether it is a college student returning home every summer, or a family permanently moving to another country. In existing literature, the factors that influence an individual's decision to migrate, more specifically to emigrate from their origin country to another location are multifold and are described as a combination of social, ethnic, and politically related factors that can be categorized as either Push or Pull factors that are divided into three categories: Economic and demographic, political, and social and cultural (Gold 2013).

Push factors are reasons that are generally forced and negative. In particular, these factors are associated with the country of origin. When considering the three categories, people are 'pushed' to leave their homeland for a number of varying reasons. Social push factors include discrimination, for example, those facing religious or racial discrimination will be negatively influenced to leave their country of origin to seek a new location that does not have leave them socially oppressed. Also, political push factors play a role as to why people leave. Often people living in countries with on going war, conflict, government instability or corruption are forced to flee to avoid harm. Furthermore, economic push factors play a large role in emigration. Countries with low unemployment, rampant poverty or a high cost of living may force individuals to seek more reasonable and opportunistic locations to settle. Moreover, people will move for more employment opportunities

Pull factors on the other hand are the positive traits that positively affect the movement of people. Often people are drawn to move to places to escape the negative factors pushing them out. To escape the issue of social discrimination, people are pulled to countries with high levels of personal freedom or equality. Migrants seeking alleviation from political push factors will be drawn to locations with well-established individual rights or a well functioning justice system. Moreover, people will move to find more economically stable reasons such as employment opportunities or high standard of living.

Another theory common among the literature is the *Neo-classical theory*, which affirms that the market allocates labor depending on demand and supply. In most cases, the demand of employment will automatically provide a supply of persons willing to do the labor in order for the market to reach equilibrium. The determinants of the individual decision will be based on the wage differentials among two geographical areas. To illustrate, a person will be more willing to move to another for labor and employment if the offering wage is higher and more competitive than in their home market.

Motivations for migration	Push factors	Pull factors
Economic and demographic	Poverty Unemployment Low wages High fertility rates Lack of basic health and education	Prospects of higher wages Potential for improved standard of living Personal or professional development
Political	Conflict, insecurity, violence Poor governance Corruption Human rights abuses	Safety and security Political freedom
Social and cultural	Discrimination based on ethnicity, gender, religion	Family reunification Ethnic (diaspora migration) homeland Freedom from discrimination

Source: The World Bank retrived from Mansoon (2007)

4. ICT as a Determinant

ICT plays an important role in many stages of the migration process. Wood also argues that different modes of communicating information such as news, films and advertisements are important sources of information for people considering migration Wood (2001). Moreover, new ICT may have created the image of wealth and prosperity of more developed countries in those living in developing regions (Hamel 2009). Information is crucial in the final decision making process of migration. However, this information flows both ways. Simultaneously, accessibility to ICT have fostered a negative perception of migrants (Wood 2001). Castells argues that being interconnected through a ‘network society’ has changed the nature of international migration, ICT has increased the rate at which people gather information and communication transnationally (Castles 2010). Additionally, (Vetrovec 2004) argued that the reduction of the cost of communication has drastically changed how information is collected and perceived. Similarly, mobile phone technologies have made information and knowledge more readily accessible, thus creating realistic and more informed expectations for potential migrants (Panagakos 2004).

Castells (2009) argues of a new ‘network society’ where information is made a valuable resource through ICT. Technology allows for information to flow quickly and efficiently, providing opportunities for people to interact with one another (Barney 2004). Migration is increasing in spite of more restricted border controls because of the development of “networks of connectivity” between societies through channels like the Internet, which offer opportunities for the an expansion of information (Castles 2010). Being connected online offers perpetual connectivity and allows individuals to foster a ‘network’ outside and within the borders of their origin country. Information constitutes a core of the social process associated with migration. The circulation of information through networks creates ‘strong ties’ (Granovetter 1983).

Another relevant theory associated with the focus of this analysis is *Globalization theory*. According to Castles, Haas, and Miller (2014), Globalization can be defined as as the process in which world wide interconnections have not only expanded but have deepened the speed of connectivity, and time of all aspects of social life. This theory suggest that globalization has very inconclusive effects on migration flows. On one hand, globalization has strengthened migration since it has fostered new developments in transport and communications. However, on the other hand, it is argued that these new developments have also changed the way in which people work and interact with each other. For example, it has increased outsourcing, commuting and teleworking. Although it sounds like a positive innovation, this has also made migration to another location less attractive, as all the resources are so readily available.

5 Method

5.1 Data Selection

To capture the movement and flow of people data was gathered from The International Migrant Stock produced from the United Nations, which provides estimate for the years 1990, 2000, 2010, and 2013. This data will measure emigration between countries. Two proxy variables collected from World Bank Indicators were used to measure the impact of ICT. First, Internet users (per 100 people) captures individuals who have used the Internet (from any location) in the last 12 months, the Internet can be used through a number of mediums via computer, mobile phone, personal tablet, game consoles, digital TV etc. Mobile cellular subscriptions (per 100 people) data represent the number of subscriptions to a public mobile telephone service that provides acces to public switched telephone network (PSTN) technology. This proxy indicator applies to all mobile cellular subscriptions that offers voice communications.

Additionally, we gather aggregate data from the World Bank Indicators as there are other determinates of migration that needed to be accounted for. These indicators are used to measure push factors.

Fertility rate captures demographic push factors and represents the number of children that would be born to a woman if she were to live to the end of her childbearing years and bear children in accordance with current age-specific fertility rates. Employment Probability

- **Employment Probability:** Using the Employment Rate indicator from the world bank, we calculated the employment probability by using the following equation.

$$1 - \frac{EmploymentRate}{100}$$

Higher unemployment employment opportunities should motivate individuals to stay in their country of origin, this equation is controlling.

- **Gross Domestic Product Per Capita:** To avoid reverse causality that is likely to bias the estimates towards zero. Outflow of the population are likely to increase wages in the origin country and immigrant flows are likely to decrease the wages of the destination country. To address the reverse causality and endogeneity we *lagged* the values of GDP and expressed them in a *log*.
- **Political Stability:** Political Stability and Absence of Violence/Terrorism measures perceptions of the likelihood of political instability and/or politically-motivated violence, including terrorism. This variable interprets the political push factors that influence migration flows.

Furthermore, we focus on the years 2000, 2010 and 2013. We omitted the year 1990 as a whole since was a lack of information available in the control variables.

5.2 Empirical Strategy

We conducted a cross panel analysis to examine the hypothesized effect of technology. Our dependent variable of interest (Y) is the total number of immigrants by country. The independent variable (X) is captured by Internet and mobile cellular subscriptions per country. We used panel data methods to address the research question, this includes panel data regression, fixed effects and random effects.

Model 1: Cellphone Users

$$I_{\frac{Migration_{it}}{Pop_{total}}} = \beta_i + \beta_1 Cell_{it} + \beta_2 FertRate_{it} + \beta_3 PoliStab_{it} + \beta_4 EmployProb_{it} + \epsilon_{it}$$

Model 2: Internet Users

$$I_{\frac{Migration_{it}}{Pop_{total}}} = \beta_i + \beta_1 Net_{it} + \beta_2 FertRate_{it} + \beta_3 PoliStab_{it} + \beta_4 EmployProb_{it} + \epsilon_{it}$$

5.2 Emperical Strategy

Emperical Methods

Descriptive Statistics

Dependent Variables

Summary Statistics

Patterns of Emmigration

Figure 4 Emigrantion per capita 2000

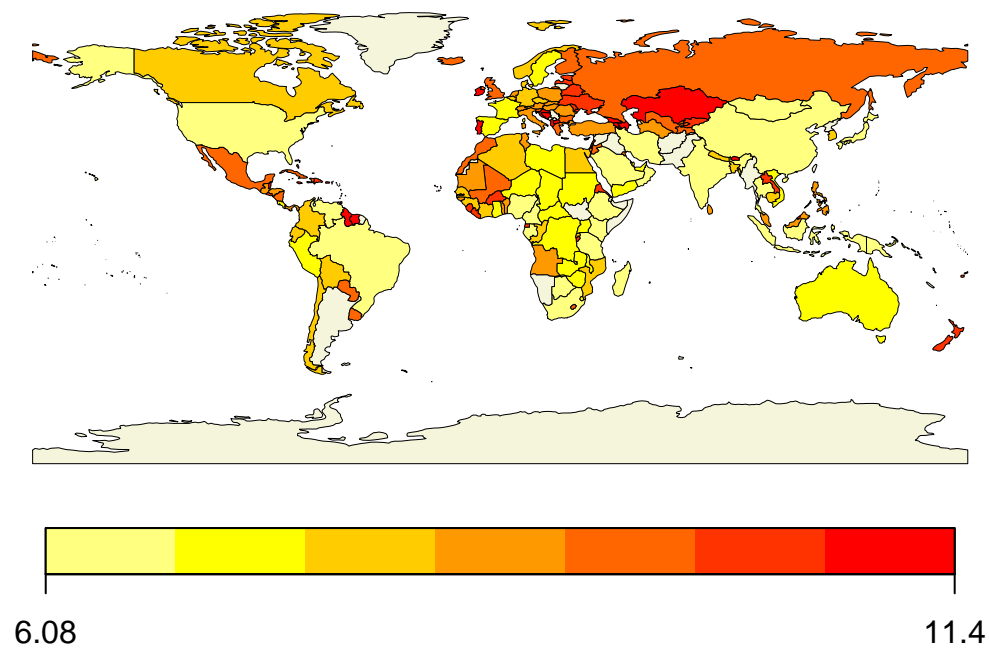


Figure 5. Emigration per capita 2010

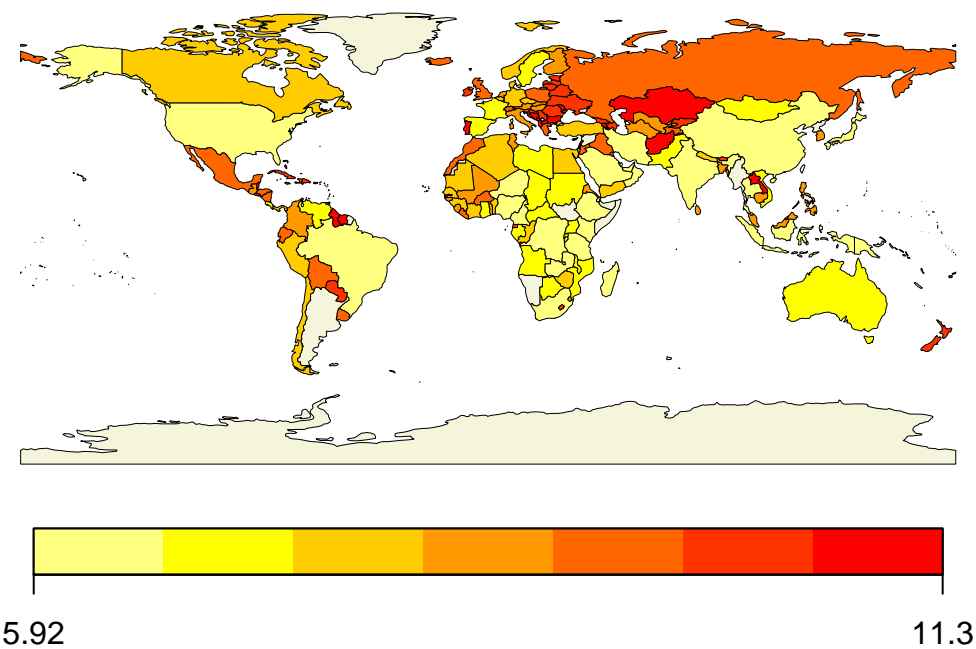
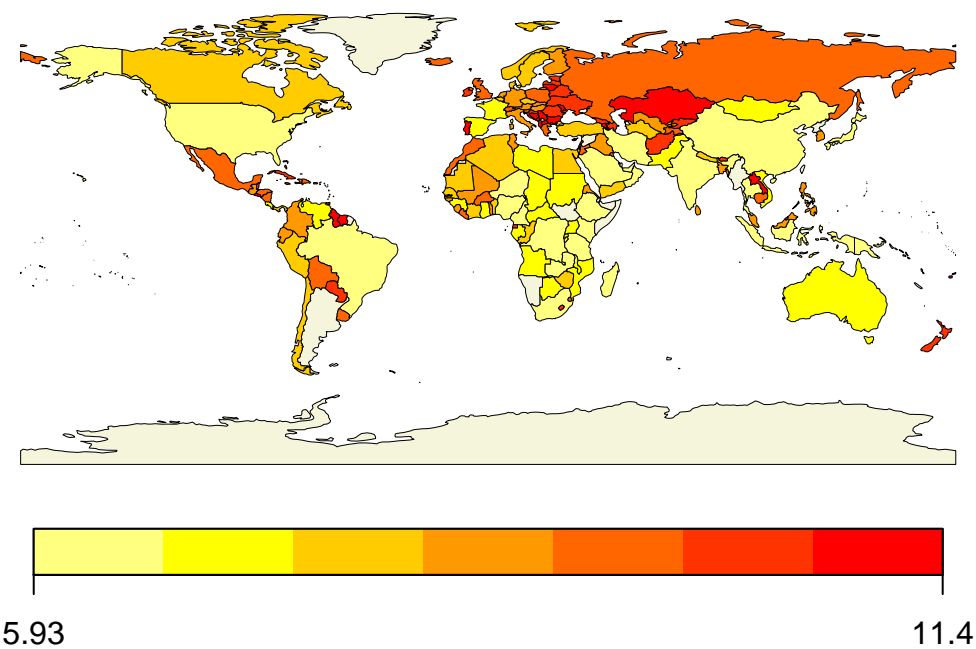


Figure 6. Emigration per capita 2013



Independent Variables

Emperical Results

Results

Table 2: Table 1 Panel Regression of emigration rate using Cellphone Users

	Emigration rate per cap (log)					
	logemigrationpercap					
	(1)	(2)	(3)	(4)	(5)	(6)
CellphoneUsers	0.0012*** (0.0002)	0.0011*** (0.0002)	0.0011*** (0.0002)	0.0012*** (0.0002)	0.0008* (0.0004)	0.0059*** (0.0019)
logGDPpp-1					0.0781 (0.0572)	0.0576 (0.0571)
Fertility Rate				0.0395 (0.0325)	0.0451 (0.0327)	0.0826** (0.0352)
Political Stability			-0.0615** (0.0288)	-0.0591** (0.0288)	-0.0698** (0.0298)	-0.0717** (0.0296)
Employment prob		1.3560*** (0.4640)	1.5410*** (0.4696)	1.4784*** (0.4721)	1.4353*** (0.4725)	1.3306*** (0.4695)
CellphoneUsersXlogGDPpp-1						-0.0005*** (0.0002)
Observations	498	498	498	498	498	498
R ²	0.0989	0.1219	0.1339	0.1379	0.1428	0.1620
Adjusted R ²	0.0652	0.0800	0.0877	0.0900	0.0929	0.1051

Note:

*p<0.1; **p<0.05; ***p<0.01

Table 3. Yearly regressions

Limitations

One of the major limitations on migration studies is the difficulty of accessing good and reliable datasets. The United Nations (UN) have compiled a large amount of statistical evidence on the topic of migration, however, the database does not have a large number of year observations. This will limit the resarch because the results will not yield year to year analysis, which of course will rely mostly on between country effects.

Table 3: Table 2 Panel Regression of emigration rate using Internet Users

	Emigration rate per cap (log)					
	logemigrationpercap					
	(1)	(2)	(3)	(4)	(5)	(6)
InternetUsers	0.0022*** (0.0005)	0.0022*** (0.0005)	0.0021*** (0.0005)	0.0020*** (0.0005)	0.0003 (0.0008)	0.0246*** (0.0065)
logGDPpp-1					0.1555*** (0.0510)	0.0941* (0.0525)
Fertility Rate				-0.0102 (0.0300)	0.0315 (0.0326)	0.0519 (0.0324)
Political Stability			-0.0610** (0.0293)	-0.0615** (0.0294)	-0.0826*** (0.0298)	-0.0851*** (0.0292)
Employment prob		1.8370*** (0.4620)	2.0092*** (0.4670)	2.0091*** (0.4676)	1.5465*** (0.4860)	1.5449*** (0.4762)
InternetUsersXlogGDPpp-1						-0.0023*** (0.0006)
Observations	498	498	498	498	498	498
R ²	0.0521	0.0959	0.1077	0.1081	0.1330	0.1701
Adjusted R ²	0.0343	0.0629	0.0705	0.0705	0.0865	0.1103

Note:

*p<0.1; **p<0.05; ***p<0.01

Table 4: Yearly OLS Regression of emigration

	Emigration rate per cap (log)					
	logemigrationpercap					
	2000 (1)	2010 (2)	2013 (3)	2000 (4)	2010 (5)	2013 (6)
CellphoneUsers	0.0108 (0.0857)	0.0263 (0.0166)	0.0111 (0.0138)			
InternetUsers				0.1528 (0.1750)	0.1069** (0.0424)	0.0758** (0.0331)
logGDPpp-1	-0.1305 (0.1415)	-0.0817 (0.1838)	-0.1820 (0.1815)	-0.0572 (0.1320)	-0.0917 (0.1465)	-0.1253 (0.1626)
Fertility Rate	-0.2215*** (0.0783)	-0.2732*** (0.0875)	-0.3447*** (0.0910)	-0.2016*** (0.0771)	-0.2029** (0.0944)	-0.2489** (0.1000)
Political Stability	0.0569 (0.1272)	0.1687 (0.1047)	0.1619 (0.1057)	0.0936 (0.1286)	0.2044* (0.1085)	0.2035* (0.1098)
Employment prob	-1.3258 (1.4697)	-3.3622** (1.3842)	-3.8563*** (1.3247)	-0.7432 (1.4475)	-2.6571* (1.4255)	-3.0844** (1.3515)
CellphoneUsersXlogGDPpp-1	-0.0012 (0.0084)	-0.0026 (0.0017)	-0.0010 (0.0014)			
InternetUsersXlogGDPpp-1				-0.0163 (0.0172)	-0.0102** (0.0041)	-0.0071** (0.0032)
Constant	11.6176*** (2.0009)	13.1017*** (2.3398)	14.7094*** (2.3239)	10.4509*** (1.9072)	12.3324*** (2.1692)	13.1255*** (2.1946)
Observations	159	169	169	159	169	169
R ²	0.0886	0.1905	0.2020	0.1033	0.2082	0.2239
Adjusted R ²	0.0526	0.1605	0.1725	0.0679	0.1789	0.1952

Note:

*p<0.1; **p<0.05; ***p<0.01

Appendix

Table 5: Panel Regressions fro cellphoneUsers using all models

	Emigration rate per cap (log)			
	Pool OLS	logemigrationpercap Within	Between	Random
	(1)	(2)	(3)	(4)
CellphoneUsers	0.0078 (0.0069)	0.0059*** (0.0019)	0.0136 (0.0218)	0.0038** (0.0018)
logGDPpp-1	-0.2037** (0.0831)	0.0576 (0.0571)	-0.1795 (0.1850)	0.0908* (0.0495)
Fertility Rate	-0.2796*** (0.0464)	0.0826** (0.0352)	-0.2955*** (0.0862)	0.0025 (0.0316)
Political Stability	0.1285** (0.0626)	-0.0717** (0.0296)	0.1488 (0.1158)	-0.0519* (0.0297)
Employment prob	-3.0873*** (0.7695)	1.3306*** (0.4695)	-3.5051** (1.4336)	0.7886* (0.4604)
CellphoneUsersXlogGDPpp-1	-0.0006 (0.0007)	-0.0005*** (0.0002)	-0.0013 (0.0022)	-0.0003* (0.0002)
Constant	14.0010*** (1.0867)		14.2756*** (2.3785)	7.0251*** (0.6063)
Observations	498	498	169	498
R ²	0.1506	0.1620	0.1664	0.1300
Adjusted R ²	0.1485	0.1051	0.1595	0.1282

Note:

*p<0.1; **p<0.05; ***p<0.01

Table 6: Panel Regressions for InternetUsers using all models

	Emigration rate per cap (log)			
	Pool OLS	logemigrationpercap		Random
		Within	Between	
	(1)	(2)	(3)	(4)
InternetUsers	0.0722*** (0.0209)	0.0246*** (0.0065)	0.1073* (0.0557)	0.0236*** (0.0062)
logGDPpp-1	-0.1538** (0.0763)	0.0941* (0.0525)	-0.1310 (0.1565)	0.0934* (0.0480)
Fertility Rate	-0.2324*** (0.0479)	0.0519 (0.0324)	-0.2130** (0.0959)	-0.0067 (0.0305)
Political Stability	0.1480** (0.0627)	-0.0851*** (0.0292)	0.1769 (0.1221)	-0.0602** (0.0291)
Employment prob	-2.6174*** (0.7769)	1.5449*** (0.4762)	-2.7278* (1.4850)	0.9200** (0.4603)
CellphoneUsersXlogGDPpp-1	-0.0067*** (0.0020)	-0.0023*** (0.0006)	-0.0101* (0.0053)	-0.0022*** (0.0006)
Constant	12.9627*** (1.0725)		12.7544*** (2.2911)	6.9146*** (0.5478)
Observations	498	498	169	498
R ²	0.1666	0.1701	0.1833	0.1444
Adjusted R ²	0.1643	0.1103	0.1757	0.1423

Note:

*p<0.1; **p<0.05; ***p<0.01

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