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The demographic and educational drivers of international emigration

Grapsa, E. (Centre of Expertise on Population and Migration)

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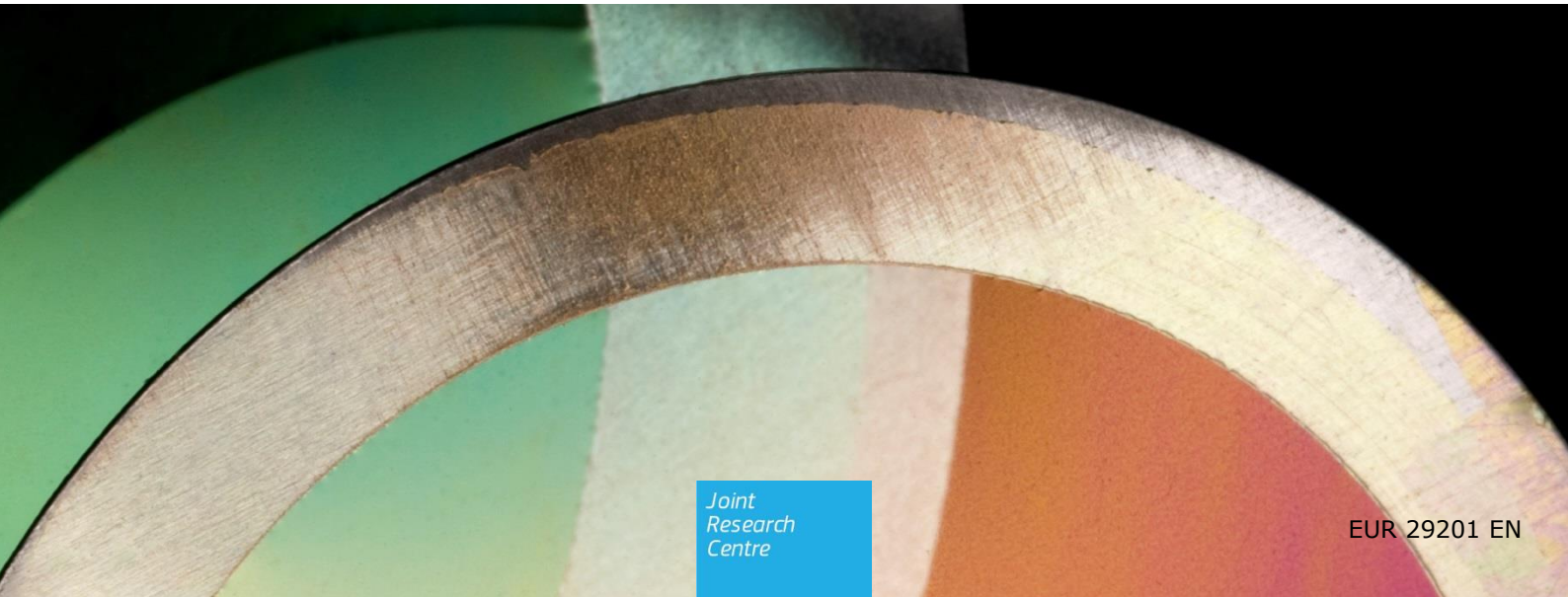

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Authors

Erofili Grapsa

Abstract

The focus of this report is to explore the link between demographic and education indicators and emigration at a global level. The relationship between demographic pressure and migration has been previously explored and findings have shown that population bulges may lead to increased emigration. Nevertheless, this study approaches the research question by challenging previous findings and discussing the interactions between economic growth and demographic pressure. In particular, findings show that demographic transition may or may not affect emigration patterns depending not only on the level of economic development of the country but also the rate of economic growth and the various other aspects of human development.

1 Introduction

This report investigates the relationship between demographic as well as education variables and emigration. It has been previously argued that demographic factors, such as population growth and dependency ratio, are linked to international migration when certain economic conditions are met. In particular, high fertility rates in developing countries lead to an increase of the share of young and working age population which then might lead to a rise in emigration rates of young people looking for jobs (De Haas 2010, 2011, Hatton & Williamson 2003, 2005, Kim & Cohen 2010). However, education is also an important factor that only lately has been included in demographic projections and is often ignored when exploring migration drivers. As education is linked to many demographic indicators, in particular fertility rates, and is crucial in changing population composition and dynamics, it may be important in explaining emigration patterns. In addition, demographic and education variables (KC & Lutz 2014) are used in population projections and their future uncertainty is low compared to other explanatory variables for migration such as GDP, labour market indicators or the presence of conflicts and natural disasters. Therefore, the goal of this report is firstly to provide a description of demographic and education trends globally, and then to explore the associations between emigration rates and demographic as well as education factors while controlling for several other variables such as GDP per capita and urbanisation. This work mainly explores associations employing regression techniques and does not intend to prove causality.

The association between demographic conditions and migration has been previously researched by including the share of young people or the dependency ratios as explanatory variables in gravity models. Most often the demographic indicators are used as controls in regressions where the variables of interest are economic, environmental or conflict indicators (Backhaus et al. 2015, Beine and Parsons 2015, Mayda 2010), while other studies focus more on the demographic pressure (Hatton & Williamson 2003, Kim & Cohen 2010). Beine and Parsons (2015) find a negative relationship between dependency ratio and migration. Hatton & Williamson (2003) investigate the effect of demographic and economic factors on African out-migration by including the share of 15-29 years old in the regression of African net out-migration and finding a positive effect. Kim & Cohen (2010) particularly explore the effect of demographic factors such as life expectancy, infant mortality and potential support ratio as proxies for economic and living conditions in a country. The authors argue that demographic indicators such as life expectancy at birth and infant mortality ratio often might be the only available measures of health or quality of life and that a country with higher mortality should be expected to have higher

emigration. On the other hand, the direct relationship between education and migration has been little explored with the exception of the study of Hatton and Williamson (2005). In addition, Grogger & Hanson (2011) look at migrant selectivity and income maximization by education, while Brabo & Mbaye (2015) examine the differences in migration determinants by education level in country of origin.

This analysis uses available data on demographic and educational indicators from two sources: World Bank Development Indicators and Wittgenstein centre. The migration stock data are obtained through the United Nations Department of Economic and Social Affairs, Population Division. The descriptive as well as the regression analysis in this report are performed and presented using R and the following R packages: countrycode, dplyr, tidyr, ggplot2 and stargazer (all data and software sources are included in the list of references).

2 Demographic and education trends in a global context

2.1 Demographic indicators

In this section, changes in the demographic indicators across the globe since 1960 are explored and discussed. The indicators are obtained from the World Bank World Development Indicators website. The main demographic indicators of interest in this analysis are: crude death rate (CRD), total fertility rate (TFR), population growth rate, and dependency ratio (see below for the definitions of these indicators). Most developed countries have been experiencing a common pattern in their demographic changes, i.e. undergoing demographic transition, with a decrease in mortality, fertility and population growth and an increase in old dependency ratio since 1960s. However, trends in fertility are no longer as strongly differentiated by developing status (developed versus developing) as before (Lutz et al. 2014). Persistent declines in fertility rates have also appeared in less developed countries although a couple decades later. In 2010, only certain countries in sub-Saharan Africa and Asia still had fertility rates above four births per woman, while some other like China have lower TFR than Sweden or France. The TFR graph in Figure 1 shows that the TFR has been decreasing more rapidly in low middle to high income countries rather in low income countries[1], for which the TFR in 2010 is still well above the TFR in 1960 for high income countries. In general, countries undergo demographic transition at different times and with different rates but the theory claims that the fertility decline should carry on to the replacement level and possibly below it worldwide in the future.

Low mortality is observed mostly in high and upper middle income countries while high mortality is prevalent in most sub-Saharan Africa and South Asia (India, Pakistan and Bangladesh). As presented in Figure 1, CDR tends to drop over time for all income groups. The rate of reduction is higher for low income countries and the opposite for high income countries. This is mostly because death rate starts from really low values already in the 1960s for developed countries and perhaps has reached its lowest values.

[1] Income groups are used as defined by World Bank in the World Development Indicators and are invariant in time.

Table 1. Definitions of demographic indicators.

Crude death rate (CDR). The number of deaths occurring during the year, per 1000 population estimated at midyear.
Infant mortality rate (IMR). Infant mortality rate is the number of infants dying before reaching one year of age, per 1000 live births in a given year.
Total fertility rate (TFR). It 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 age-specific fertility rates of the specified year.
Population growth (PG). The exponential rate of growth of midyear population from year t-1 to t, expressed as a percentage. Population is based on the de facto definition of population, which counts all residents regardless of legal status or citizenship[2].
Dependency ratio (DR). The ratio of people younger than 15 and older than 64 to those ages 15-64 (working-age population). Data are shown as the proportion of dependents per 100 working-age population.
Crude birth rate (CBR). Crude birth rate indicates the number of live births occurring during the year, per 1000 population estimated at midyear.

The combination of low fertility and low mortality leads to population ageing worldwide, with steady increases in the old age dependency ratio and the opposite for the young age dependency ratio (Figure 1). In high income countries the steep increase in the percentage of people above 65 years old and decline in the percentage of children below the age of 15 means that the former is almost equal or surpasses the latter in the last decades. In addition, the percentage of children under 15 years old in upper middle income countries has been declining very fast following the decline in fertility rates below replacement level. This means that the percentage of future 15-64 years old individuals will also decline substantially since the influx of young people shrinks. The changes in the age distribution in lower income countries have been slower but are expected to intensify in the next decades according to the demographic transition theory. Future population

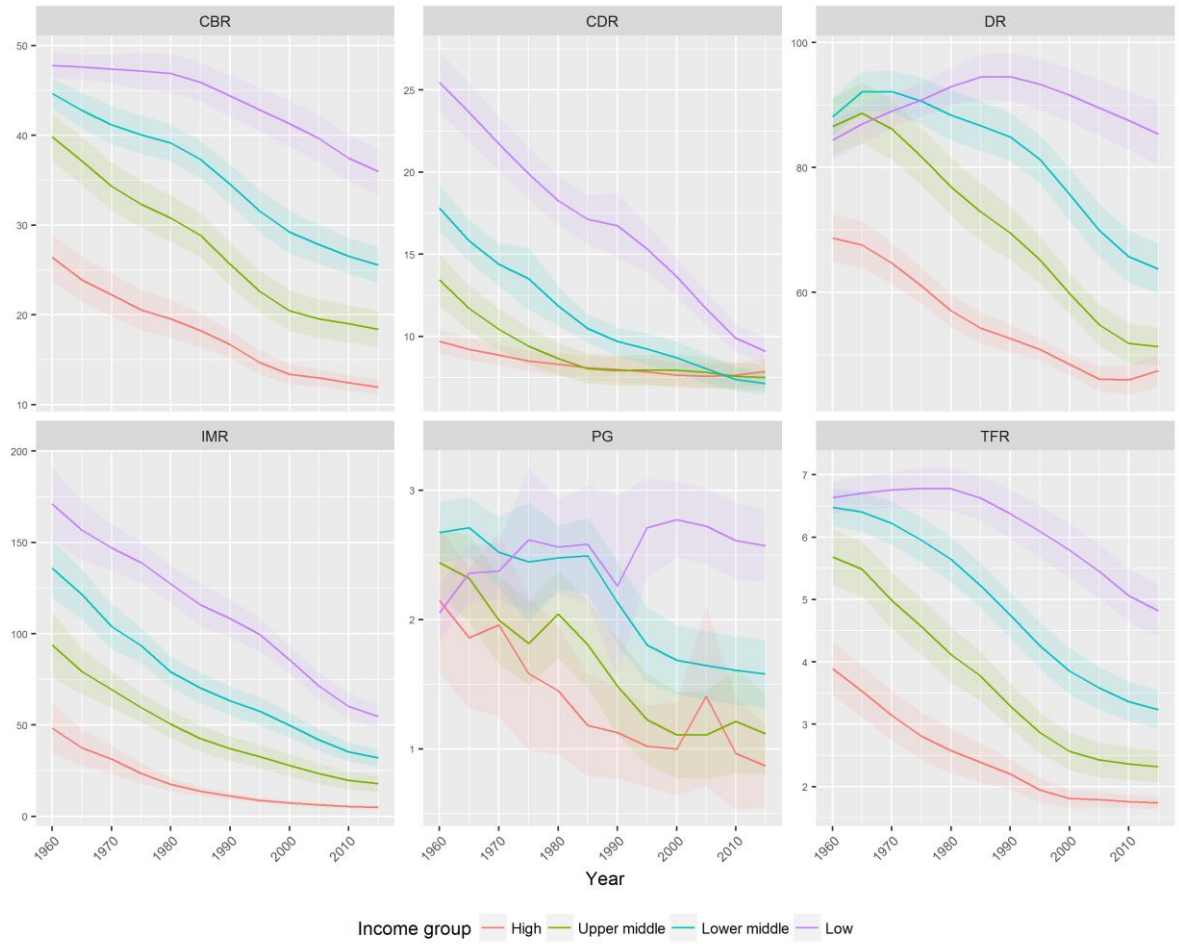
[2] Note that PG here is not natural growth but migration contributes to this rate.

projections show that population ageing will be prevalent in every country but its rate and extent will differ by groups of countries depending on cultural and socio-economic factors.

The patterns in crude death and birth rate show evidence of the demographic transition theory (Willekens, 2014) for all income groups. The differences lie in the timing as well as the speed of the transition. High income countries have been transitioning from the late expanding phase to low stationary and even declining population phase with very low death and birth rates in the last couple decades. Although perhaps the rate of transition might be faster nowadays for upper middle and lower middle income countries, on average both groups are in the late expanding phase in 2015. The death rate has been declining rapidly in the low income countries to reach levels of around 10 deaths per 1000 population while the birth rate is still high, which suggests that these countries are in the last phase of the early expanding phase, or perhaps the beginning of the late expanding phase. Infant mortality rate has also been decreasing which accounts for the increase in the world population according to the newest UN population projections.

Population growth appears to be dropping for all income groups but the low income, for which there is a more or less constant growth rate. Similarly, the trend in young dependency ratio shows that young population is on decline for all income groups reflecting the trend in birth rates. Even if it is still high for the low income countries, it appears it has reached its peak and it is also on decline. The opposite is observed for the old dependency ratio which is increasing rapidly for the high income countries showing the rapid population ageing.

Figure 1. Trends in demographic indicators by income group.



Source: Author's own calculations using the World Development Indicators, World Bank. Averages and their 95% confidence intervals are shown in solid lines and similarly shaded bands.

2.2 Education trends

3.2 Education trends

The impact of demographic factors should not be explored separately from education as it has been shown that education greatly affects mortality and fertility rates as well as desired family size (Lutz et al. 2014). In particular, better educated women have fewer children, and the children of better educated individuals have higher survival rates. However, the impact of education on demographic composition takes a long time before it can be observed: more girls at school now will have an effect on fertility in 15-20 years. Moreover, a drop in fertility rate will not immediately cause lower absolute number of births because of the large age-structural momentum of population growth (more young women moving into reproductive ages as consequence of past high fertility).

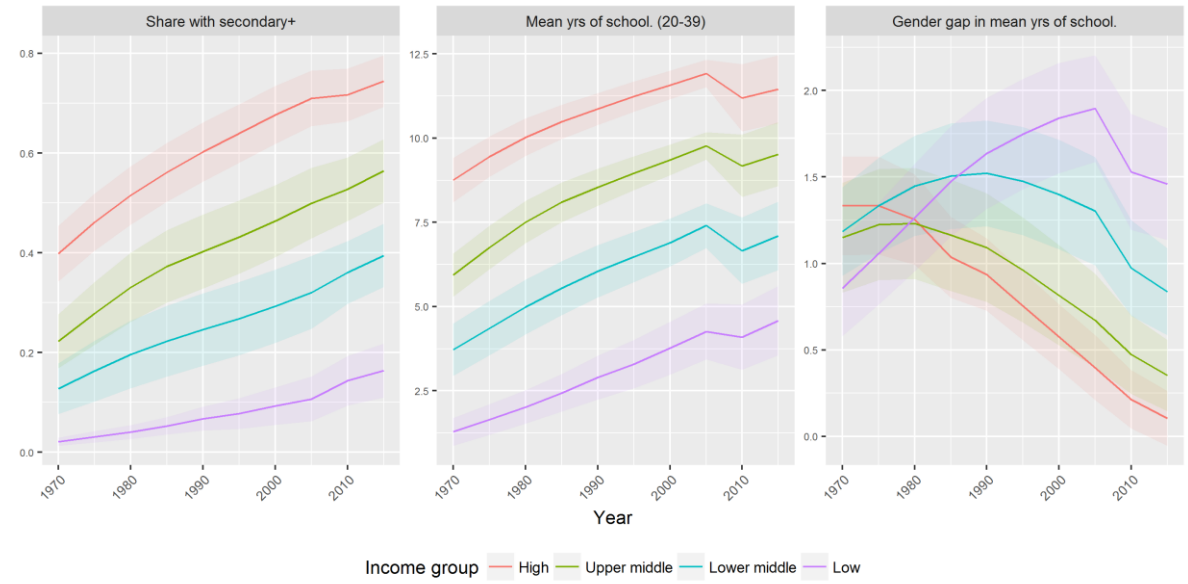
Education influences not only every aspect of an individual's life but also the structure of societies. Lutz et al. (2014) discuss in detail how alternative scenarios of future education expansion may affect population growth. Several measures of the education level at the country level exist, such as educational attainment by gender and age group, average years of schooling and gender gap in educational attainment and years of schooling. Data are obtained through the Wittgenstein Centre[3] data explorer and certain indicators have been projected backward to account for missing values in some countries and years.

Figure 2 presents trends in three education indicators: the share of population 20-39 years old with secondary or higher education, the mean years of schooling for individuals 20-39 years old, and the gender gap in mean years of schooling for people 25 years old and above. Nevertheless, as the trends for the first two indicators are very similar it is only the first one that is included in the regression analysis. The gender gap in mean years of schooling may be thought to be a proxy for gender equality and female empowerment in a specific country. Nevertheless, this theory is not valid for every country as there are exceptions where women of young cohorts have higher education than their male peers such as Saudi Arabia.

A general upwards trend is observed in educational attainment and mean years of schooling for males and females. The rate of increase in education is faster for high income countries and much slower for low income countries. The trend in schooling gender gap shows a steady decline for high income countries, while it firstly increases and then decreases for the other income groups[4]. This pattern is more obvious for the low and lower middle groups, perhaps due to the fact that men have better access to education than women in developing countries. It is worth noting that the gender gap in schooling was less different among income groups in the 70s and 80s, while after then the differences are more prominent in particular for low and lower middle income group countries.

[3] The link for this and other data websites are provided in the list of references.
[4] Defined as the difference between mean years of schooling for male 25 years old or older and mean years of schooling for female 25 years old or older.

Figure 2. Trends in education indicators by income group.



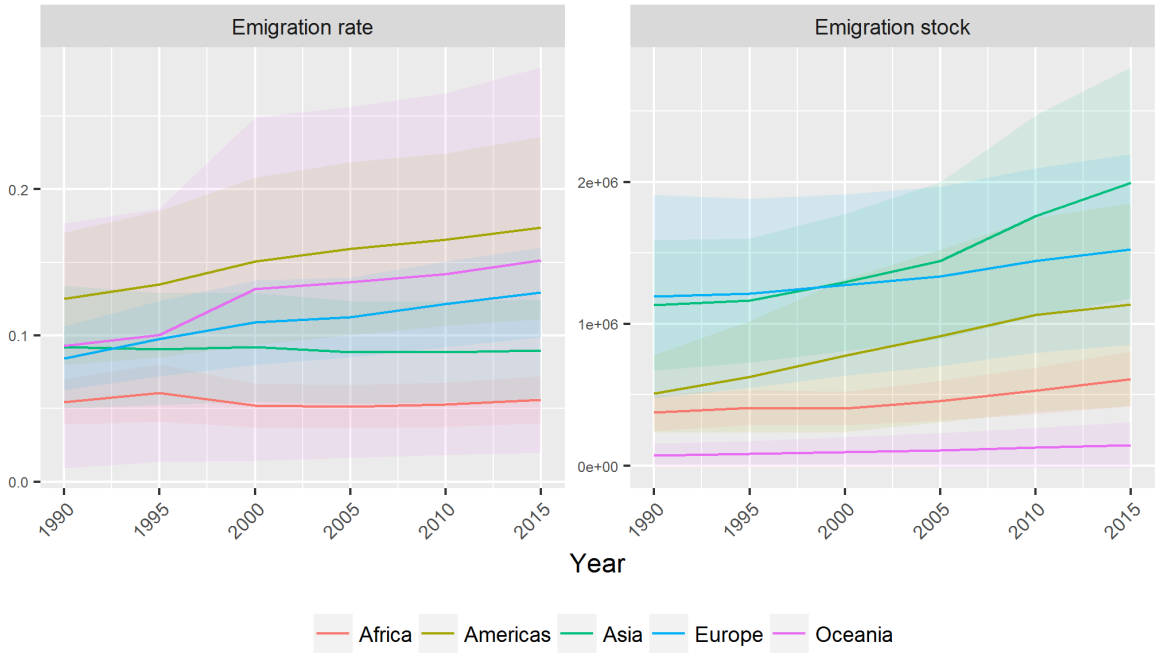
Source: Author's own calculations using data from Wittgenstein Centre data explorer. Averages and their 95% confidence intervals are shown in solid lines and similarly shaded bands.

2.3 Emigration trends

The following graphs show the average emigration trends together with their 95% confidence intervals by 5-year period and continent. The data is available through UNDESA website that provides estimates of the international migrant stock by age, sex and origin for the mid-point (1 July) of each year: 1990, 1995, 2000, 2005, 2010 and 2015. The migrant stocks are then aggregated over country of birth to obtain the total number of emigrants by country of birth. The highest emigration is observed for Asia in all time points and it appears to be steadily increasing. Emigration in Europe is the second highest and also shows an increase since 2000. Finally although emigration in the Americas and Africa were about the same in 1990, emigration in the Americas has been rising faster than emigration in Africa. Table 1 presents how the emigrant stock evolves over time for the top three emigrating countries by continent and by income[5]. The highest stock of emigrants for each continent is observed for Egypt in 2015, Mexico in 2015, India in 2015 and Russia in 1990. The top three emigrating countries are: Great Britain, Germany and Italy (high income), Russia, Mexico and China (upper middle income), India, Bangladesh and Ukraine (lower middle income), Afghanistan, Burkina Faso and Somalia (low income).

[5] Emigration for countries in Oceania is not shown in this table as it is considerably lower than emigration in the other continents.

Figure 3. Emigration by continent



Source: Author's own calculations using data from UNDESA. Averages and their 95% confidence intervals are shown in solid lines and similarly shaded bands.

Table 2. Emigrant stocks (1000s) for top three emigrating countries by continent.

	1990	1995	2000	2005	2010	2015
Africa						
Morocco	1587	1735	1947	2383	2779	2834
Egypt	1320	1488	1704	1898	2607	3268
Algeria	905	963	1024	1590	1633	1763
Asia						
India	6717	7209	7952	9617	13285	15574
China	4227	4901	5753	7192	8597	9545
Bangladesh	5449	5417	5432	5761	6748	7205
Americas						

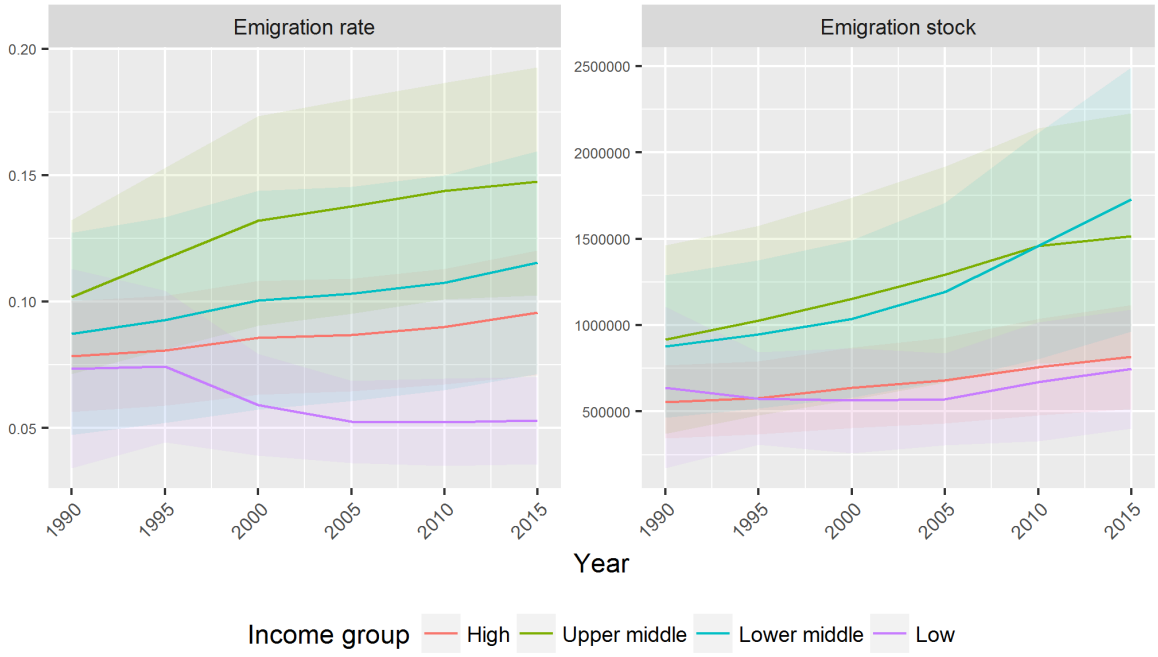
Mexico	4393	6722	9329	10515	11828	12339
USA	1735	1836	1988	2303	2721	3023
Colombia	1007	1199	1421	1865	2492	2638
Europe						
Russia	12696	11657	10812	10537	10430	10576
Ukraine	5549	5613	5607	5592	5497	5825
Great Britain	2684	2602	3849	4121	4555	4917

Source: Author's own calculations using data from UNDESA.

Evidence supports that emigration is highest in countries in upper middle income group, following by lower middle group (Figure 4) and thatemigration in high income countries is higher than in low income countries. Two theories regarding the relationship between economic indicators and migration exist in the literature and evidence appears to support both. The first claims that economic growth and development in sending countries will reduce international migration and it assumes an inversely proportional linear relationship between income differentials and migration. The second theory claims that economic and human development lead to higher levels of migration and that the relationship between them has an inverted U shape (De Haas, 2010). Hence, evidence from the literature finds both a negative relationship between GDP per capita at source country and emigration (Backhaus et al. 2015, Drabo & Mbaye 2015, Hatton & Williamson 2003), and a positive relationship (Docquier et al. 2014, De Haas 2010).

The findings in this report are in line with the theory that there is an inverted U relationship between a country's economic conditions and emigration (Hatton & Williamson 2003, Clemens 2014). Although low income can incentivise people to migrate, it also imposes certain financial constraints to those who might want to migrate. Therefore an increase in income (upper and lower middle income countries) will reduce the poverty trap and allow some potential emigrants to leave, but once they become richer a further increase in income might affect emigration negatively (high income countries).

Figure 4. Emigration by income group.



Source: Author's own calculations using data from UNDESA. Averages and their 95% confidence intervals are shown in solid lines and similarly shaded bands.

2.4 Additional variables

In addition to the main explanatory variables (demographic and education indicators), several other variables describing conditions and emigration pressure at country of origin are included in the regression analysis as controls[6]. Some of these were previously found to be associated with migration such as urbanisation (percentage of the population living in urban areas and urban population growth) and GDP per capita (constant 2010 US$). Urbanisation is rather high in high income countries with more than 70% of the population living in cities versus an average of 35% in low income countries for 2015. It has also been increasing globally, however the rate of urbanisation has been declining and more or less levelling out in the last three decades[7]. Regarding the GDP per capita, a large gap between the average GDP per capita (35552$ in 2015) is present in the high income group and in the immediate after upper middle income group (6894$ in 2015). It

[6] All predictors are averaged over the 5-year interval (t, t+4).

[7] Urban population refers to people living in urban areas as defined by national statistical offices. It is calculated using World Bank population estimates and urban ratios from the United Nations World Urbanization Prospects.

appears to have stopped rising for all income groups reflecting the stall in economic growth which has an important impact on emigration particularly for low income countries.

Moreover, I use the percentage of population with cell phone subscriptions as a proxy for access to mass media and technology in the country, a factor that has been known to facilitate emigration (Piotrowski 2013, Winkler 2017). The share of population with cell phone has increased dramatically since the 90s showing the rapid technological advances that occurred in the last two decades. Finally, I control for immigration rate defined as number of immigrants per 1000 persons as it appears that a country in a certain demographic transition phase may switch from being an emigration country to being an immigration country (Zelinsky 1971). High income countries have the highest immigration rate that has been steadily increasing and is more than three times higher than the immigration rate in upper middle income countries. Although immigration rate has been increasing for high and upper middle income groups, the opposite is observed for lower middle and low income groups.

Table 3. Descriptive statistics for control variables.

	1990	**1995**	**2000**	**2005**	**2010**	**2015**
High income						
Pop. with cellphone subscriptions	2 (0.29)	15 (1.38)	61 (2.91)	105 (2.87)	128 (4.47)	133 (5.21)
GDP per capita	16095 (1299.4)	18271 (1482.3)	21203 (1587.8)	33215 (2490.6)	38404 (2970.2)	35552 (2736.8)
Immigration rate	157 (22.25)	166 (22.93)	171 (22.34)	183 (23)	197 (24.68)	207 (25.44)
Urban population	74 (2.25)	75 (2.26)	76 (2.28)	76 (2.32)	77 (2.36)	78 (2.39)
Urban population growth	1.4 (0.2)	1.2 (0.17)	1.2 (0.2)	1.6 (0.37)	1.1 (0.24)	1 (0.17)
Upper middle income						
Pop. with cellphone subscriptions	0 (0.03)	2 (0.34)	20 (1.93)	69 (3.87)	111 (4.47)	118 (5.02)

GDP per capita	2330 (258.3)	2593 (219.8)	2909 (200.9)	5444 (342.8)	7622 (435.3)	6894 (346.1)
Immigration rate	47 (9.09)	48 (9.09)	51 (9.83)	52 (10.27)	58 (10.37)	63 (11.55)
Urban population	54 (2.3)	56 (2.32)	57 (2.33)	59 (2.34)	61 (2.35)	62 (2.35)
Urban population growth	2.4 (0.27)	1.9 (0.24)	1.8 (0.24)	1.7 (0.25)	1.8 (0.23)	1.7 (0.19)
Lower middle income						
Pop. with cellphone subscriptions	0 (0)	0 (0.08)	6 (0.73)	37 (2.95)	82 (4.1)	94 (4.07)
GDP per capita	755 (59.8)	873 (78.3)	922 (83.4)	1544 (118.9)	2284 (146.2)	2323 (144.1)
Immigration rate	39 (7)	32 (6.26)	29 (5.8)	25 (4.75)	23 (4.17)	21 (3.87)
Urban population	36 (2.32)	38 (2.34)	39 (2.37)	41 (2.41)	43 (2.46)	44 (2.5)
Urban population growth	3.2 (0.27)	2.7 (0.27)	2.7 (0.24)	2.6 (0.22)	2.5 (0.2)	2.5 (0.18)
Low income						
Pop. with cellphone subscriptions	0 (0)	0 (0.02)	2 (0.29)	15 (1.86)	48 (4.26)	66 (5.46)
GDP per capita	309 (32)	294 (29.6)	296 (21.9)	451 (32.9)	608 (36.4)	602 (35.6)
Immigration rate	31 (5.67)	29 (5.58)	23 (4.98)	21 (4.15)	18 (3.7)	17 (3.28)
Urban population	25 (2.32)	27 (2.19)	29 (2.22)	31 (2.29)	33 (2.37)	35 (2.48)
Urban population growth	4.2 (0.38)	4.2 (0.42)	4.2 (0.27)	4.1 (0.26)	4 (0.24)	4 (0.22)

Source: Author's own calculations using data from WDI, Wold Bank and UNDESA. Standard errors in parentheses.

3 Results

To model the emigration rate, I employ a quasi-Poisson or pseudo-likelihood Poisson model that accounts for over-dispersion by estimating the dispersion parameter (Silva and Tenreyro, 2006). This specification does not assume that the variance is equal to the mean as the classic Poisson model does. The Poisson distribution is suitable for count data such as the emigrant stock used in this analysis. In this setting the outcome *Y* (emigrant stock) has a Poisson distribution and the logarithm of its expected value is linearly linked to the explanatory variables:

$$\log\big(E(\boldsymbol{y}|\boldsymbol{x})\big) = \boldsymbol{b}'\boldsymbol{X}$$

which means that the predicted mean of this model is

$$E(\boldsymbol{y}|\boldsymbol{x}) = e^{\boldsymbol{b}'\boldsymbol{X}}$$

This is the main difference with the typical log-normal gravity equation used by economists to model the migrant stock or flows, in particular that it estimates $E(\log(Y)|x)$ instead of $E(Y|x)$ and therefore no bias from the logarithmic transformation is introduced in the model (see Burger et al. 2009 for further elaboration). The quasi-Poisson regression produces the same coefficient estimates as the standard Poisson model but inference is adjusted for over-dispersion.

In order to identify the most relevant factors capturing demographic pressure I have used the following indicators: share of 15-29 years old in the population (model 1), 5-year lagged population growth (model 2) and 20-year lagged birth rate (model 3)[8]. The regressions are run for the pooled data set and by country income group (tables in the appendix).

Table 4 presents the estimated regression coefficients, CI and p-values for the pooled data regressions. In general it is evident that the coefficients of the common variables across models have the same sign although the magnitude of the effect or its significance may be slightly different. Population size is positively associated with emigration and countries with high infant mortality rate are more likely to have more people emigrating,

[8] Note that caution has been exercised in order to avoid including variables with high correlation in the same regression, therefore not all discussed demographic variables are selected as covariates in the regressions.

which is the expected effect direction according to Kim & Cohen (2010). Urbanisation as well as the rate of urbanisation is positively associated with emigration. The results for GDP per capita show that better economic conditions are associated with higher emigration in the source country; however this effect is lessened as the GDP increases as we see from the squared term of GDP per capita. The majority of previous findings suggest a negative relation between GDP and migration, mostly in line with the theory that economic growth reduces out-migration.

In all three regressions higher share of well-educated 20-39 years old individuals (secondary or higher education) is associated with higher emigration showing that better capabilities and aspirations increase emigration. The coefficient of gender gap in schooling as proxy for gender equality implies that countries with higher gender inequality in education tend to have higher emigration but a gender analysis to identify whether men or women emigrated more is not performed in this report. In addition, the coefficient of population share with cell phone subscriptions does not agree with previous hypotheses in the literature that discuss how access to mass media and technology may facilitate emigration (Piotrowski 2013). Finally, countries with high immigration tend to have lower emigration than those with low immigration.

As far as the variables describing demographic pressure, model 1 shows that the coefficient of share of youth in the population is not statistically significant, however, both population growth and birth rate are negatively associated with emigration (model 2 and 3). These results suggest that demographic pressure is linked to less emigration but they need to be interpreted with caution. Although it may be true that population growth does not lead to higher emigration, it is also not wise to assume that it leads to lower emigration. When high population growth occurs in countries with very low income and stalled economic growth, then the emigration will be indeed lower and this is perhaps what drives these coefficients. To further disentangle these effects, regressions by income group are run and presented in the appendix.

Table 4. Quasi-Poisson regression of emigration (pooled model).

	Emigrant stock		
	(1)	(2)	(3)
Log(population)	0.693***	0.930***	0.772***
	(0.486, 0.900)	(0.736, 1.124)	(0.565, 0.980)

IMR	0.012***	0.011***	0.014***
	(0.010, 0.015)	(0.008, 0.013)	(0.011, 0.017)
Share of 15-29 y.o.	-0.300		
	(-1.280, 0.680)		
Lagged pop. growth		-0.144***	
		(-0.169, -0.118)	
Lagged birth rate			-0.011***
			(-0.017, -0.004)
Urban population	0.673**	0.222	0.532**
	(0.130, 1.215)	(-0.276, 0.719)	(0.005, 1.058)
Urban population growth	0.024*	0.017	0.023*
	(0.000, 0.048)	(-0.004, 0.039)	(-0.0002, 0.047)
Log(GDP per capita)	0.510***	0.270**	0.499***
	(0.266, 0.754)	(0.042, 0.498)	(0.259, 0.740)
Log(GDP per capita sq.)	-0.020**	-0.004	-0.019**
	(-0.036, -0.004)	(-0.019, 0.010)	(-0.035, -0.004)
Share of 20-39 with secondary+	1.452***	1.266***	1.263***
	(1.003, 1.901)	(0.858, 1.675)	(0.796, 1.729)
Gender gap in schooling	0.081**	0.075**	0.059
	(0.003, 0.159)	(0.001, 0.149)	(-0.024, 0.142)
Share with cellphone subs.	-0.107**	-0.074*	-0.149***
	(-0.194, -0.021)	(-0.153, 0.005)	(-0.235, -0.063)
Immigration rate	-2.329***	-1.350***	-2.488***
	(-3.342, -1.316)	(-2.310, -0.390)	(-3.518, -1.457)
Year: 1995	0.049*	-0.006	0.047*
	(-0.004, 0.101)	(-0.055, 0.043)	(-0.004, 0.098)

Year: 2000	0.129***	0.028	0.129***
	(0.061, 0.196)	(-0.036, 0.093)	(0.064, 0.195)
Year: 2005	0.168***	0.018	0.183***
	(0.067, 0.268)	(-0.078, 0.114)	(0.085, 0.281)
Year: 2010	0.256***	0.084	0.273***
	(0.121, 0.391)	(-0.043, 0.211)	(0.142, 0.404)
Year: 2015	0.302***	0.133*	0.308***
	(0.149, 0.456)	(-0.009, 0.275)	(0.160, 0.456)
Observations	966	965	961

Country fixed effects included in the regression but not shown here. Significance thresholds are: <0.01 ***, <0.05 **, <0.1 *. 95% confidence intervals are in parentheses.

The results by income group show how the associations differ depending on the level of economic development of the country (tables A1-4). Moreover, certain coefficients change sign which means there is an interaction between the particular covariate and income group. For high income countries, population size appears to be positively and statistically significantly associated with emigration. A positive relationship is also found between IMR, share of young people, lagged birth rate, GDP per capita and emigration. A large share of highly educated individuals is linked to lower emigration for high income countries as opposed to the rest of income groups. The relationship between urbanisation and emigration is negative and statistically significant suggesting that perhaps some countries in this group have transitioned to the phase with very low international emigration but high immigration of low skilled workers and more urban-to-urban mobility.

Results for upper middle income countries show few statistically significant associations apart from the demographic pressure variables which all show that demographic pressure is associated with lower emigration. On the other hand, a high share of well-educated individuals in the population is linked to greater emigration. This is in agreement with De Haas (2010), who poses that youth or general population bulge does not necessarily mean an increase in out-migration unless these people have the means, as well as the potential to migrate which is often strengthened by education. None of the demographic pressure variables are statistically significant for the lower middle income group countries, while urbanisation is negatively associated with emigration. One can

hypothesize that this also links migration to demographic transition, as high urban-to-urban migration and low international migration is typically observed during early transition stages in societies (De Haas 2010).

The regression analysis for low income countries further reveals that the share of young people in the population is strongly related to lower emigration, as well as the lagged population growth but not the 20-year lagged birth rate. This result again confirms the hypothesis that population growth itself does not make people move but it has to be accompanied by economic growth and human development. Finally, it is evident that although the income group of the country is linked to its demographic transition, there are countries in grey areas with high income but also high fertility (such as Oman) and the opposite (such as Sri Lanka), which also have non-conforming emigration patterns.

4 Conclusions

Although demographic transition has been linked to migration transition in previous studies (Zelinsky 1971), it has since been argued that this theory is not adequate to explain migration patterns (De Haas 2010). According to migration transition theory, societies in the high stationary phase exhibit only circular migration, all types of migration increase for societies in the early expanding phase while the opposite starts to happen for societies in the late expanding phase. Finally, migration becomes very specific (urban-to-urban, immigration of unskilled and semi-skilled workers) in the low stationary and declining population phase. The theory is appealing as it appears to hold for many countries, but other factors need to be considered in order to account for global migration patterns. More specifically, economic conditions and in general the level of human development is as important as ever in order to explain migration.

This analysis suggests not only that most of the emigration drivers have a non-linear relationship with emigration but also that there is a strong interaction with the stage of economic development and demographic transition of the country. In addition, economic growth is strongly connected to the demographic transition and often results have to be interpreted by taking into account both (interaction)[9]. In other words, the effects of migration drivers are not monotonic or even one way. Evidence suggests that migration is complex phenomenon which cannot be explained by simple pooled regression analysis, but rather more sophisticated methods need to be employed to reveal and interpret particularly nuanced relationships. Moreover, certain countries exhibit characteristics that

[9] Work in progress focuses on exploring the interaction between demographic transition and economic growth and its effect on migration to EU patterns as well as investigating particular groups of countries with specific characteristics.

place them in contradictory phases of economic growth and demographic transitions and have to be examined separately as case studies or in groups by specific characteristics. In addition, as Willekens (2014) discuss demographic transition is not independent of other processes such as science and technology advances, epidemics, natural disasters and social or political changes and factors such these need to be controlled for.

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Annexes

Annex 1. Regressions by income group of the country

Table A 1. QP regression for high income countries.

	Emigrant stock		
	(1)	(2)	(3)
Log(population)	0.665***	0.857***	0.891***
	(0.324, 1.005)	(0.517, 1.196)	(0.563, 1.218)
IMR	0.033***	0.025**	0.027**
	(0.009, 0.057)	(0.001, 0.049)	(0.003, 0.051)
Share of 15-29 y.o.	1.980***		
	(0.745, 3.215)		
Lagged pop. growth		-0.008	
		(-0.051, 0.036)	
Lagged birth rate			0.016***
			(0.005, 0.027)
Urban population	-1.341***	-1.368***	-1.235**
	(-2.313, -0.369)	(-2.364, -0.372)	(-2.216, -0.254)
Urban population growth	0.002	0.017	0.012
	(-0.029, 0.034)	(-0.014, 0.048)	(-0.019, 0.042)
Log(GDP per capita)	1.319***	1.552***	1.606***
	(0.341, 2.298)	(0.561, 2.543)	(0.630, 2.581)
Log(GDP per capita sq.)	-0.055**	-0.067**	-0.068**
	(-0.108, -0.003)	(-0.119, -0.014)	(-0.120, -0.015)
Share of 20-39 with secondary+	-0.766***	-1.120***	-0.820***
	(-1.271, -0.260)	(-1.587, -0.653)	(-1.321, -0.320)
Gender gap schooling	0.131*	0.200***	0.117*

	(0.000, 0.262)	(0.072, 0.328)	(-0.019, 0.254)
Share with cellphone subs.	0.054	0.021	0.069
	(-0.081, 0.189)	(-0.116, 0.158)	(-0.069, 0.207)
Immigration rate	-2.680***	-2.705***	-3.043***
	(-3.871, -1.488)	(-3.939, -1.470)	(-4.259, -1.827)
Year: 1995	0.113***	0.088**	0.086**
	(0.040, 0.186)	(0.015, 0.161)	(0.015, 0.158)
Year: 2000	0.265***	0.239***	0.205***
	(0.142, 0.387)	(0.112, 0.365)	(0.080, 0.330)
Year: 2005	0.327***	0.303***	0.237**
	(0.136, 0.519)	(0.104, 0.501)	(0.038, 0.435)
Year: 2010	0.528***	0.505***	0.424***
	(0.304, 0.752)	(0.274, 0.737)	(0.191, 0.657)
Year: 2015	0.701***	0.663***	0.591***
	(0.471, 0.931)	(0.424, 0.902)	(0.354, 0.828)
Observations	273	273	273

Country fixed effects included in the regression but not shown here. Significance thresholds are: <0.01 ***, <0.05 **, <0.1 *. 95% confidence intervals are in parentheses.

Table A 2. QP regression for upper middle income countries.

		Emigrant stock	
	(1)	(2)	(3)
Log(population)	0.350*	0.308	0.051
	(-0.029, 0.730)	(-0.108, 0.724)	(-0.345, 0.447)
IMR	0.004	0.004	0.007*
	(-0.003, 0.011)	(-0.003, 0.012)	(-0.001, 0.014)
Share of 15-29 y.o.	-4.123***		

	(-5.704, -2.543)		
Lagged pop. growth		-0.052*	
		(-0.107, 0.004)	
Lagged birth rate			-0.019***
			(-0.030, -0.008)
Urban population	-0.202	0.080	0.228
	(-1.167, 0.763)	(-0.938, 1.098)	(-0.748, 1.204)
Urban population growth	-0.023	-0.006	-0.021
	(-0.075, 0.029)	(-0.061, 0.048)	(-0.076, 0.034)
Log(GDP per capita)	0.220	0.417	0.489
	(-0.370, 0.810)	(-0.198, 1.032)	(-0.121, 1.100)
Log(GDP per capita sq.)	-0.003	-0.015	-0.020
	(-0.042, 0.035)	(-0.055, 0.024)	(-0.059, 0.019)
Share of 20-39 with secondary+	3.329***	3.198***	2.925***
	(2.419, 4.240)	(2.231, 4.166)	(1.952, 3.899)
Gender gap schooling	0.409***	0.455***	0.428***
	(0.215, 0.603)	(0.252, 0.658)	(0.217, 0.639)
Share with cellphone subs.	0.024	-0.092	-0.108
	(-0.148, 0.196)	(-0.265, 0.080)	(-0.279, 0.063)
Immigration rate	-0.512	0.859	0.520
	(-2.930, 1.905)	(-1.772, 3.489)	(-1.951, 2.991)
Year: 1995	0.063	0.072	0.066
	(-0.027, 0.152)	(-0.024, 0.169)	(-0.028, 0.160)
Year: 2000	0.142**	0.157**	0.158**
	(0.017, 0.267)	(0.021, 0.293)	(0.028, 0.288)
Year: 2005	0.116	0.188*	0.205**

	(-0.079, 0.312)	(-0.020, 0.396)	(0.008, 0.402)
Year: 2010	0.063	0.223	0.205
	(-0.202, 0.327)	(-0.048, 0.494)	(-0.058, 0.468)
Year: 2015	-0.044	0.213	0.153
	(-0.355, 0.267)	(-0.094, 0.520)	(-0.151, 0.457)
Observations	279	279	277

Country fixed effects included in the regression but not shown here. Significance thresholds are: <0.01 ***, <0.05 **, <0.1 *. 95% confidence intervals are in parentheses.

Table A 3. QP regression for lower middle income countries.

		Emigrant stock	
	(1)	(2)	(3)
Log(population)	0.710***	0.701***	0.796***
	(0.442, 0.978)	(0.431, 0.970)	(0.520, 1.071)
IMR	0.0004	0.001	0.001
	(-0.003, 0.004)	(-0.003, 0.004)	(-0.002, 0.005)
Share of 15-29 y.o.	-0.337		
	(-1.857, 1.183)		
Lagged pop. growth		-0.034	
		(-0.092, 0.023)	
Lagged birth rate			0.007
			(-0.002, 0.016)
Urban population	-0.962**	-0.869**	-0.603
	(-1.742, -0.182)	(-1.640, -0.098)	(-1.392, 0.185)
Urban population growth	-0.076***	-0.072***	-0.067***
	(-0.114, -0.039)	(-0.111, -0.033)	(-0.105, -0.029)

Log(GDP per capita)	0.549**	0.544**	0.462*
	(0.067, 1.030)	(0.066, 1.023)	(-0.011, 0.934)
Log(GDP per capita sq.)	-0.028	-0.028	-0.024
	(-0.064, 0.008)	(-0.064, 0.008)	(-0.059, 0.012)
Share of 20-39 with secondary+	0.878**	0.950**	1.213***
	(0.151, 1.606)	(0.230, 1.670)	(0.485, 1.941)
Gender gap schooling	0.124***	0.138***	0.060
	(0.040, 0.208)	(0.045, 0.231)	(-0.036, 0.157)
Share with cellphone subs.	0.036	0.039	0.008
	(-0.096, 0.167)	(-0.092, 0.171)	(-0.124, 0.139)
Immigration rate	1.248	1.163	0.811
	(-0.249, 2.744)	(-0.412, 2.738)	(-0.782, 2.404)
Year: 1995	-0.052	-0.062*	-0.049
	(-0.117, 0.013)	(-0.129, 0.005)	(-0.113, 0.014)
Year: 2000	-0.045	-0.065	-0.051
	(-0.132, 0.042)	(-0.159, 0.028)	(-0.136, 0.035)
Year: 2005	-0.053	-0.084	-0.037
	(-0.194, 0.088)	(-0.235, 0.066)	(-0.178, 0.103)
Year: 2010	0.032	-0.005	0.074
	(-0.178, 0.242)	(-0.224, 0.215)	(-0.136, 0.284)
Year: 2015	0.098	0.064	0.141
	(-0.144, 0.340)	(-0.185, 0.313)	(-0.102, 0.384)
Observations	257	256	254

Country fixed effects included in the regression but not shown here. Significance thresholds are: <0.01 ***, <0.05 **, <0.1 *. 95% confidence intervals are in parentheses.

Table A 4. QP regression for low income countries.

	Emigrant stock		
	(1)	(2)	(3)
Log(population)	-2.540***	-0.345	-2.313***
	(-3.990, -1.089)	(-1.882, 1.192)	(-3.839, -0.786)
IMR	0.021***	0.017***	0.019***
	(0.015, 0.027)	(0.010, 0.024)	(0.013, 0.026)
Share of 15-29 y.o.	-11.283***		
	(-17.225, -5.341)		
Lagged pop. growth		-0.128***	
		(-0.190, -0.065)	
Lagged birth rate			0.046**
			(0.010, 0.082)
Urban population	-0.293	0.089	-0.604
	(-2.149, 1.563)	(-1.800, 1.977)	(-2.564, 1.355)
Urban population growth	0.115***	0.059**	0.090***
	(0.072, 0.158)	(0.012, 0.107)	(0.045, 0.135)
Log(GDP per capita)	0.802	0.300	-0.221
	(-1.752, 3.357)	(-2.246, 2.846)	(-2.846, 2.403)
Log(GDP per capita sq.)	-0.071	-0.027	0.018
	(-0.292, 0.150)	(-0.248, 0.193)	(-0.208, 0.245)
Share of 20-39 with secondary+	0.706	1.620	1.539
	(-1.507, 2.918)	(-0.648, 3.889)	(-0.782, 3.859)
Gender gap schooling	-0.151*	-0.266***	-0.276***
	(-0.317, 0.015)	(-0.437, -0.094)	(-0.455, -0.097)
Share with cellphone subs.	-0.104	0.188	0.120

	(-0.545, 0.336)	(-0.256, 0.632)	(-0.334, 0.574)
Immigration rate	-4.507*	-3.265	-5.551**
	(-9.659, 0.646)	(-8.686, 2.157)	(-10.863, -0.239)
Year: 1995	0.679***	0.252	0.553***
	(0.390, 0.968)	(-0.048, 0.553)	(0.263, 0.843)
Year: 2000	1.328***	0.516*	1.076***
	(0.775, 1.881)	(-0.043, 1.076)	(0.526, 1.626)
Year: 2005	2.167***	0.878**	1.817***
	(1.345, 2.990)	(0.039, 1.717)	(0.997, 2.637)
Year: 2010	2.876***	1.115*	2.438***
	(1.777, 3.974)	(-0.014, 2.244)	(1.337, 3.540)
Year: 2015	3.411***	1.260*	2.855***
	(2.103, 4.718)	(-0.081, 2.600)	(1.551, 4.159)
Observations	157	157	157

Country fixed effects included in the regression but not shown here. Significance thresholds are: <0.01 ***, <0.05 **, <0.1 *. 95% confidence intervals are in parentheses.

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