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ABSTRACT

Migration and Development: Dissecting the Anatomy of the Mobility Transition*

Emigration first increases before decreasing with economic development. This bell-shaped relationship between emigration and development was first hypothesized by the theory of the *mobility transition* (Zelinsky, 1971). Although several mechanisms have been proposed to explain the upward segment of the curve (the most common being the existence of financial constraints), they have not been examined in a systematic way. In this paper, we develop a novel migration accounting methodology and use it to quantify the main drivers of the mobility transition curve. Our analysis distinguishes between migration aspirations and realization rates of college-educated and less educated individuals at the bilateral level. Between one-third and one-half of the slope of the increasing segment is due to the changing skill composition of working-age populations, and another third is due to changing network size. The microeconomic channel (including financial incentives and constraints) only accounts for one fourth of the total effect in low-income countries, and for less than one fifth in lower-middle-income countries. Finally, our methodology sheds light on the microfoundations of migration decisions.

JEL Classification: F22, O15

Keywords: Migration, Development, Aspirations, Credit Constraints

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1 Introduction

Traditional neoclassical models of migration posit that narrowing wage gaps between country pairs monotonically reduce migration along specific corridors. In reality we rather observe an inverted-U, cross-sectional relationship between migration and development. This is perhaps best known as the *mobility transition* curve following the seminal work of Zelinsky (1971). Contrary to the neoclassical tradition therefore, economic development likely spurs additional emigration from origin countries in early stages of development (see de Haas, 2007, 2010a, 2010b) as shown in Figure 1.a.[1] Adults' emigration rates increase with economic development until an income per capita of around $6,000 and decrease thereafter. Figure 1.b shows the density of the world population by income level, disregarding within-country inequality. Approximately two thirds of the world population reside in countries characterized by incomes per capita of less than $6,000. Taken at face value, the *mobility transition curve* suggests that further global economic development should result in higher volumes of international migration from the poorest regions of the world. It is no surprise therefore that co-development policies based on neoclassical suppositions have largely proven unsuccessful (see Clemens, 2014; Parsons and Winters, 2014). While various explanations of the observed relationship have been conjectured in specific contexts, they have not been examined in a systematic way, such that we remain naive with regards the underlying mechanisms at play as well as the potential consequences of a change in the world distribution of income.[2]

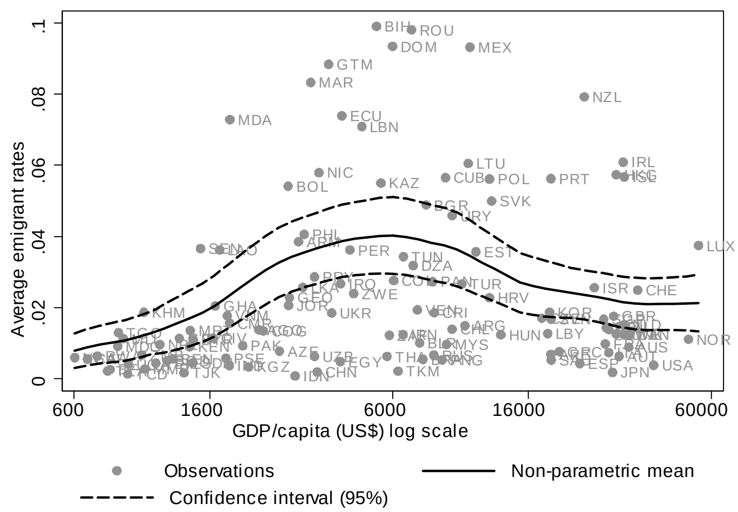
In this paper, we develop a novel migration accounting methodology to evaluate the competing theorems that are hypothesized to underpin the upward segment of the observed relationship, so as to provide an answer to the decades-old puzzle. Our methodology consists in (i) parameterizing a migration model using detailed cross-sectional data on skill-specific aspirations to emigrate and success rates, and then (ii) use counterfactual experiments to identify the root drivers of the *mobility transition curve* and quantify their role. A similar approach is used in the development accounting literature (see Jones, 2015). We proceed in three steps. We first decompose average emigration rates, distinguishing between bilateral migration aspirations and realization rates and between college-educated and less educated individuals; in order to provide a non-parametric analysis of the underlying data. Second, we run regressions to disentangle and quantify various potential drivers of aspirations and realization rates at the bilateral level. Third, we counterfactually simulate the capacity of each set of drivers to account for cross-country variations in emigration rates; specifically focusing on factors responsible for the increasing segment of mobility transition.

[1] Net emigration rates are proxied by the changes in emigration stocks between 2000 and 2010 as a percentage of the resident population in 2000. Note that we also find the same inverted-U shape pattern of emigration rates when emigration rates are weighted with the relative size of each country in the global population.

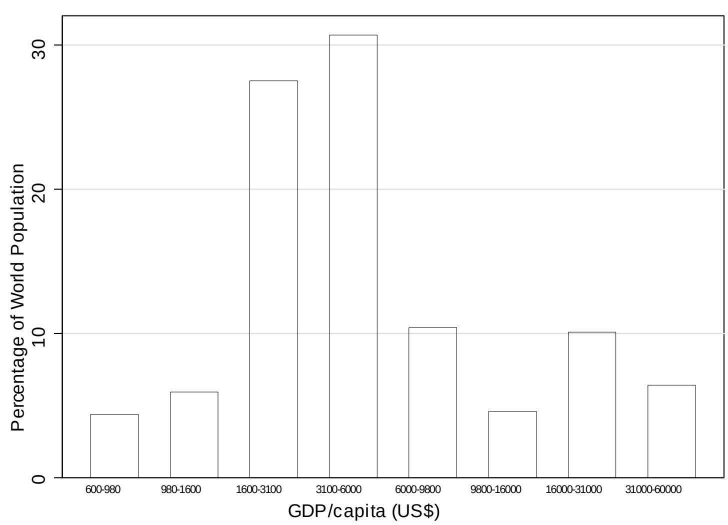
[2] As argued by Clemens (2014), *"We do not know enough about the mechanisms that create this observed pattern. Theories of the transition are well-developed, though they could benefit from more formalization and unification in a single framework that can explain patterns observed at both the macro- and micro-levels".*

Fig 1. Emigration rates and development

1.a. Nonparametric regressions of emigration rates on income per capita



1.b. Density of the world population by income level



Notes: Non-parametric regressions using Epanechnikov kernel (see Epanechnikov, 1969), local-mean smoothing, bandwidth 0.5. Our sample includes 123 countries with populations above 2.5 million. We omit small states that typically exhibit unusually large emigration rates as well as countries in war. Average migration rates are calculated as the difference between migrant stocks in 2000 and 2010 (we omit negative net flows), normalized by the population at origin. The migration data derive from the *OECD-DIOC database*. Data on GDP per capita at PPP in 2000 are taken from the *Penn World Tables 7.0*. Population data in 2000 are provided by the *UN-DESA World Population Prospects 2012.*

Our paper contributes to a 45 year-old literature on the link between development and emigration. Wilbur Zelinsky in his classic paper (Zelinsky, 1971), developed the theory of the *mobility transition.* This descriptive theory, combining insights from modernization theory and demographic transition analysis, hypothesizes that societies pass through five distinct phases of development, from pre-modern traditional societies to future super-advanced societies, which are accompanied by various forms of internal and international migration patterns. The theory predicts an inverted-U shape between average emigrate rates and levels of income per capita. This relationship, which we term the *mobility transition curve*, has since been empirically established in specific contexts and variously referred to as: *migration curve* (Akerman, 1976)), *migration transition* (Gould, 1979), *migration hump* (Martin, 1993), and *emigration life cycle* (Hatton and Williamson, 1994). The mobility transition curve has perhaps most recently been confirmed as a cross-country relationship. Using *aggregate* stock data for the years 1960 to 2000, Clemens (2014) shows that emigration increases with economic development at origin until a level of development commensurate with a per capita income of around $5,000 in PPP terms, while falling thereafter.[3,4]

The observed inverted-U relationship between emigration and development is not predicted by neoclassical models of migration, which, building upon Sjaastad (1962), place wage or income differentials at the heart of rational agents' decision as to whether to remain at home or migrate elsewhere, thereby predicting that narrowing income differentials between origins and destinations will (monotonically) reduce the intensity of international migration. In the neoclassical *tradition* however, the interplay between emigration incentives and constraints, what we term *microeconomic drivers*, may give rise to the mobility transition curve. Increases in personal income make migration more affordable while simultaneously reducing individual's willingness to migrate. The existence of credit constraints can therefore explain the paradox whereby emigration is limited from low-income regions in which many citizens would benefit the most from emigrating to higher-income regions. Along a similar line of argument, de Haas (2010b) proposes to incorporate the notions of agency and individual aspirations into transition theory, by conceptualizing migration at the microeconomic level as a function of aspirations (as characterized by an inverted-U shaped relationship) and capabilities (that increase monotonically with development). There is ample historical evidence on the role of liquidity constraints in the 18th and 19th centuries (Hatton and Williamson, 1994; Hatton and Williamson, 1998; Faini and Venturini, 2010; Covarrubias et al., 2015). More recently, using administrative data from Indonesia, Bazzi (2013) provides evidence that financial constraints limit international labor mobility, such that positive agricultural income shocks result in significant increases in international migration, particularly among villages with higher numbers of small landholders. Both mechanisms, emigration incentives and constraints (or aspirations and capabilities), are captured by income and are therefore difficult to distinguish.

Aside from *microeconomic drivers*, economists and geographers have, for almost half a century, proffered a number of complementary theories aimed at explaining the observed re-

[3]Comparisons between decades reveal that the turning point has only slightly increased over time.

[4]The difference in the estimate of the turning point of the Mobility Transition likely derives from the selection of destination countries included. We focus solely upon OECD destinations (due to the availability of data by skill group), while Clemens (2014) includes all destination countries of the world.

lationship between emigration and economic development. A recent survey (Clemens, 2014), lists five alternative classes of theory. (i) Demographic transitions for example may result in more youthful and economically-active populations, which might result in more emigration should they fail to be absorbed locally into the labour force (see Lee, 2003). (ii) Immigration barriers abroad, for example visas, are typically lower for citizens of wealthier nations and for high-skilled workers, meaning that they are more migratory than their lower-skilled compatriots. Education may stimulate migration aspirations of potential migrants, while selective immigration policies at destination favor educated migrants. The impact of development on the skill composition of migration remains ambiguous however. At early stages of development, improvements in education provision likely increase the success rate of potential migrants. Since education quality is endogenous with economic development however, further educational improvements likely reduce potential migrants' willingness to move, an effect which is likely compounded by the narrowing educational gaps between origins and potential destinations. (iii) Within-country income inequality since during initial stages of development that are characterized by rising inequality, worse-off individuals feel relatively deprived and seek other 'reference' frames. (iv) Structural transformation due to for example trade linkages that emerge concurrently with the formation of transportation and communication networks that may facilitate mobility (see Massey et al., 1993; Martin and Taylor, 1996; Faini and Venturini, 2010). (v) Information asymmetry whereby migrants for example, having settled, may provide information and send remittances to potential migrants thereby reducing migration costs (see Beine et al., 2010 and 2011).

Another plausible theoretical underpinning is provided by the role of 'gravity' or geographic variables on economic development and migration costs, which have been understudied in the literature in this context. Potential migrants from remote countries located near the tropics face greater migration costs in terms of greater geographic, linguistic and cultural distances, such that emigration is bounded by both financial and geographical constraints. The closer such countries are to major migrant-receiving nations (which are usually located in the farther ends of the two hemispheres), the higher their income levels and the lower the costs of migration. Thus absolute geography may explain why emigration rates and economic development are positively correlated, without implying a causal effect of development on emigration. Importantly, the roles of both geography and culture, which jointly affect both migration costs and economic development (see Gallup et al., 1999), need to be accounted for.

This paper quantifies the competing mechanisms that underpin the mobility transition for the first time. We dissect the anatomy of the mobility transition by simultaneously incorporating all relevant *aggregate* and *microeconomic* mechanisms into our empirical model. Distinguishing between skill groups proves key, since many of the underlying mechanisms affect individuals of various educational attainments differently.[5] Our migration accounting exercise reveals that *microeconomic drivers* (i.e. private incentives and migration constraints) while relevant, only have a limited effect on the aggregate. Overall, the contribution of *microeconomic drivers* accounts for around 25% of the slope of the increasing segment of

[5]For example, greater inequality in less developed nations, strongly affects the incentives and financial capabilities of less educated individuals. Alternatively, the effect of migrant networks on migration costs have been shown to be greater for the low-skilled (as shown in Beine et al., 2010 and 2011).

the *mobility transition curve* in low-income countries and for less than 20% in lower-middle-income countries. More starkly, between one-third and one-half of the rise in emigration in poor countries is due to the changing skill composition of working-age populations at origin, and another third is due to changing network size. The implications of our findings therefore are that going into the future emigrants will likely be more educated. If rather liquidity constraints were most binding rises in development would rather be associated with increases in low-skilled migration. Finally, our analysis also sheds light on the micro-foundations of migration decisions. It suggests that aspiration patterns are compatible with a model of relative deprivation, according to which decisions are based on the relative position of an individual in a social hierarchy, as opposed to the absolute level of their income. Conversely, realization rates are not only affected by migration policies but also depend upon the opportunity costs of preparing for migration.

The remainder of the paper is organized as follows. Section 2 describes our data and provides aggregate stylized facts on various components of the mobility transition. In Section 3, we estimate the determinants of (bilateral) migration aspirations and realization rates by education level. Section 4 uses counterfactual experiments to quantify the relative contribution of the various underlying mechanisms and identifies the residual effect of *microeconomic drivers*. Finally, in Section 5 we conclude.

2 Data and Stylized facts

To disentangle the various potential drivers of the mobility transition curve (as detailed in the previous section), we construct measures of migration intensity, by education level, over the 2000-2010 period. We further distinguish between actual and potential migration intensities. Actual migrants are those who have already left their country of origin. Potential migrants include those who live abroad (i.e. actual migrants) and those who have not yet migrated but express a desire to do so. We consider potential migration intensity as a proxy for migration aspirations. The ratio of actual to potential migration we term the realization or success rate. In this section we first describe the data sources used to compute our migration intensity measures before presenting some aggregate stylized facts.

2.1 Migration Data

Data on actual migration flows over the 2000-2010 period are derived from the Database on Immigrants in OECD Countries (*DIOC*, for the 2000 and 2010 census rounds . The *DIOC* database documents bilateral migration stocks by education level from all countries of origin ($i = 1, ..., I$) to OECD destinations ($j = 1, ..., J$). Data from the 2010 census round are described in Arslan et al. (2014), while the corresponding data for 2000 are presented in OECD (2008).[6]

[6] It is not possible to conduct our analysis using panel data due to the lack of an education dimension in the available migration data. Using data on population by skill level would result in difficulties separating out composition effects (whereby more educated individuals are more able to migrate) from incentive effects (in which potential migrants' desire to move are a function of the prevailing level of development at origin).

We only consider migrants aged 25 and above (as a proxy for the working-age population) and distinguish between migrants with college education (denoted by h and referred to as the highly skilled) and other levels of education (denoted by l and referred to as the low-skilled). For each country pair, net migration flows are proxied as the difference between the bilateral migrant stocks in 2000 and 2010. We denote the net flow of migrants from country i to country j of education level $s = (h, l)$ as M_{ij}^s. Aggregating these numbers across OECD destinations allows us to characterize the size and structure of net emigration flows to the OECD from all the countries of the world i.e. $\overline{M}_i^s = \sum_j M_{ij}^s$.

To compute actual migration *intensities*, we divide our net migration flows by the origin resident population in 2000. This requires data on the number and average education levels of working-age residents (proxied by the resident population aged 25 and above, which corresponds with our migration data) in each sending country in our sample. This variable, denoted by N_i^s, is taken from Artuç et al. (2015), which proxies the size of the native population in country i from which we can extract the proportion of college educated (σ_i^l) and low-skilled (σ_i^l). By definition, we have $\sigma_i^l + \sigma_i^h = 1$. Actual migration intensities can be measured as $m_{ij}^s \equiv M_{ij}^s / N_i^s$ at the bilateral level, and as $\overline{m}_i^s \equiv \overline{M}_i^s / N_i^s$ on the aggregate. It follows that the average emigration rate of each sending country is defined as:

$$\overline{m}_i \equiv \sigma_i^h \overline{m}_i^h + \sigma_i^l \overline{m}_i^l. \tag{1}$$

Existing studies of the migration transition curve have characterized the cross-sectional relationship between $\overline{m}_i$ and the development level of the origin country, proxied by its level of income per capita (y_i).

Our decomposition by education level allows us to examine how the skill composition of the native population affects the migration transition curve. In addition, distinguishing between actual and potential migrations lets us identify the effect of economic development on migration aspirations and realization rates. We rely upon the *Gallup World Poll surveys*, which identify the proportion of non-migrants expressing a desire to emigrate to another country. The Gallup survey has been canvassing opinions annually in more than 150 countries since 2005. As well as documenting various individual characteristics (such as age, gender and education), these surveys also include two relevant questions on emigration intentions. These questions, posed in 142 countries, which represent about 97% of the world population, were: (i) *Ideally, if you had the opportunity, would you like to move to another country, or would you prefer to continue living in this country?* (ii) *To which country would you like to move?* In line with actual migration and population data, we only consider respondents aged 25 and above and distinguish between individuals with college education or otherwise. As in Docquier et al. (2014) and Docquier et al. (2015), we aggregate four waves of the Gallup survey (i.e. the years 2007 to 2010) and consider that these four waves represent a single period of observation. Although the use of contingent valuation surveys to assess migration preferences is open to criticisms (see Clemens and Pritchett, 2016), there are reasons to believe that the Gallup surveys are a unique and relevant source of information about migration aspirations. First, Gallup is the most comprehensive source of data on

Furthermore, any panel study would need to account for the endogeneity between acquiring education and the prospect of migration, what is known as the *brain gain* effect.

migration aspirations worldwide or at the global scale. Second, empirical studies reveal that the reported aspirations are nicely correlated with the traditional divers of migration (Dustman and Okatenko, 2014; Docquier et al., 2014; Manchin et al., 2014, etc.). Third, there is a high correlation between migration aspirations at year t and actual migration flows at year $t+1$ (Bertoli and Ruyssen, 2016), although the size of actual flows is smaller.

Adding desiring migrants to actual migration flows, we define the concept of potential migration flows P_{ij}^s, i.e. the total migration flows that would have been observed between 2000 and 2010 if all desiring migrants had been able or allowed to emigrate. Aggregating bilateral stocks give $\overline{P}_i^s = \sum_j P_{ij}^s$. Thus, potential migration intensity, which captures emigration aspirations can be measured as $p_{ij}^s \equiv P_{ij}^s/N_i^s$ at the bilateral level and as $\overline{p}_i^s \equiv \overline{P}_i^s/N_i^s$ on the aggregate. For reasons that will be explored later, desiring migrants can fail to realize their migration aspirations, such that we define bilateral and aggregate realization rates as $r_{ij}^s \equiv m_{ij}^s/p_{ij}^s$ and $\overline{r}_i^s \equiv \overline{m}_i^s/\overline{p}_i^s$. Our decomposition of emigration rates by skill level, allows us to investigate whether the effect of economic development on emigration is skill specific and whether it is driven by migration aspirations or else by realization rates.

2.2 Stylized Facts

In this section, we provide stylized facts based upon overall migration rates, disaggregated by skill level, which elucidate the need for more detailed migration data to explain the existence of the mobility transition, when moving beyond traditional neoclassical explanations. We examine the relationship between aggregate migration rates and economic development as measured by the level of income per capita (y_i). The databases described above allow us to identify skill differences in emigration rates and distinguish between migration aspirations and realization rates. The average emigration rate of country i ($i = 1, ..., I$) can be decomposed as:

$$\overline{m}_i = \sigma_i^h \overline{p}_i^h \overline{r}_i^h + \sigma_i^l \overline{p}_i^l \overline{r}_i^l \tag{2}$$

where $\overline{p}_i^s$ is the proportion of potential migrants and $\overline{r}_i^s$ is the average realization rate. The product of these two variables give the proportion of natives who have already realized their migration aspirations. This corresponds to the observed migration rates by skill groups.

Figure 2 shows the relationship between each component $\overline{m}^s(y)$, $\overline{p}^s(y)$, $\overline{r}^s(y)$ and $\sigma^s(y)$, and the level of GDP per capita in US dollars. We consider a sample of 123 countries, excluding small states with populations lower than 2.5 million inhabitants as well as those experiencing episodes of conflict. The results are estimated using the non-parametric Epanechnikov kernel density estimation (see Epanechnikov, 1969). The skill compositions of populations vary with economic development.

Education levels, taken in isolation, likely prove crucial in understanding the foundations of the mobility transition curve since the hypothesized drivers underpinning the relationship likely affect individuals of various educational attainments differently. Taking the derivative of the average migration rate in (1) with respect to income per capita, we have:

$$\frac{d\overline{m}}{dy} \equiv \frac{d\sigma^h}{dy}(\overline{m}^h - \overline{m}^l) + \sigma^h \frac{d\overline{m}^h}{dy} + \sigma_i^l \frac{d\overline{m}^l}{dy}$$

As shown in figure 2.a., the share of high-skilled in the population σ^h rises constantly with development, which is greater by a factor of more than 20 in rich, as when compared with the poorest countries. In addition, the average migration rates $\overline{m}^s$ are always greater among college graduates than among the less educated, as depicted in figure 2.b. At low levels of income per capita, positive selection is strong ($\overline{m}^h \simeq 30\overline{m}^l$). In the richest countries, positive selection is much weaker ($\overline{m}^h \simeq 3\overline{m}^l$). Overall, the emigration rates of the college-educated $\left(\overline{m}^h\right)$ decrease with development, while those of the less-educated $\left(\overline{m}^l\right)$ are inverted-U shaped. The first term in the derivative above is always positive therefore. If poor countries were counterfactually endowed with the same share of college graduates as in the richest countries, they would therefore exhibit very large emigration rates other factors held constant. Note that an increasing segment of the mobility transition curve would be observed when the effect of the first term dominates, even if the emigration rates of each skill group decreased with development, i.e. $d\overline{m}^s/dy$ are jointly negative.

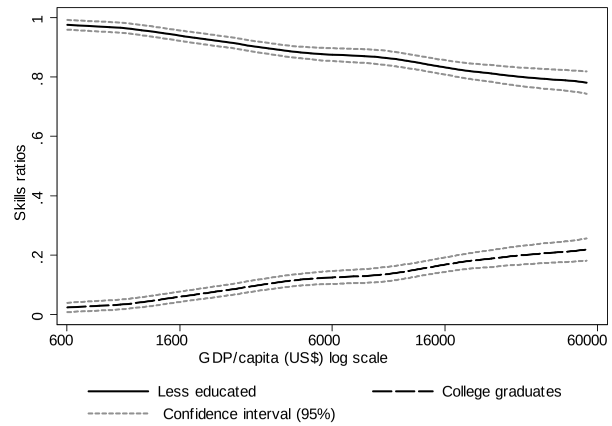
The observed emigration rates are the products of migration aspirations and realization rates. Figure 2.c. shows that migration aspirations decrease with development for both college-educated and less educated individuals.[7] We observe a positive selection in migration aspirations, but this selection is much weaker when compared to actual migration. At low levels of development, the average willingness to migrate among the highly-educated is greater by a factor of four (when compared to the lower-skilled) $\left(\overline{p}^h \simeq 4\overline{p}^l\right)$. In the richest countries, the ratio falls to one and a half $\left(\overline{p}^h \simeq 1.5\overline{p}^l\right)$.

Figure 2.d. describes the relationship between income per capita and the realization rates of college graduates $\left(\overline{r}_i^h\right)$ and the less-educated $\left(\overline{r}_i^l\right)$. Overall, the realization rate of the high-skilled slightly decreases with development. Its slope is not as sharp as that of the $\overline{p}^h$ curve. The realization rate of the less educated however, is the only inverted-U shaped component of the decomposition equation (1). At low levels of income per capita, the high-skilled are eight times more likely to realize their migration aspirations compared to the low-skilled $\left(\overline{r}^h \simeq 8\overline{r}^l\right)$. This ratio falls to 2 at intermediate income levels (around US $5,000) and reaches 3 in the richest countries.

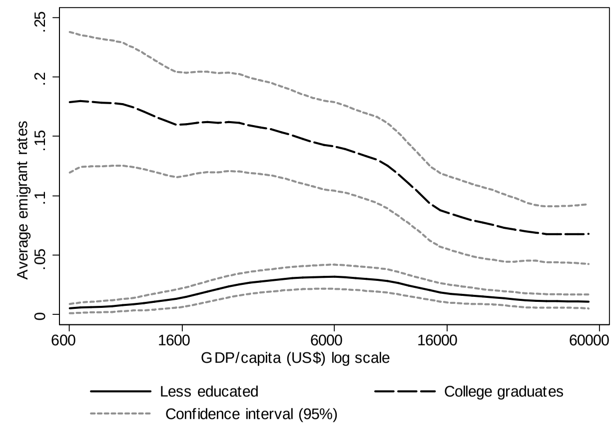
[7] Total potential migration, is equal to the sum of those potential migrants expressing a willingness to migrate (from the Gallup data) and the actual migrants who effectively migrated between 2000 and 2010.

Fig 2. Nonparametric regressions of the aggregate components of emigration on income per capita

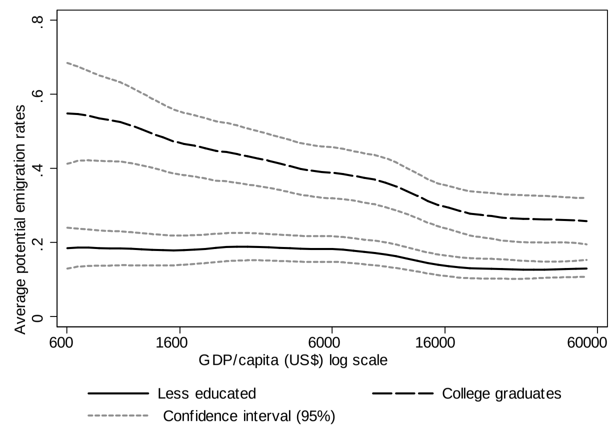
2.a. Shares of college graduates and less educated natives



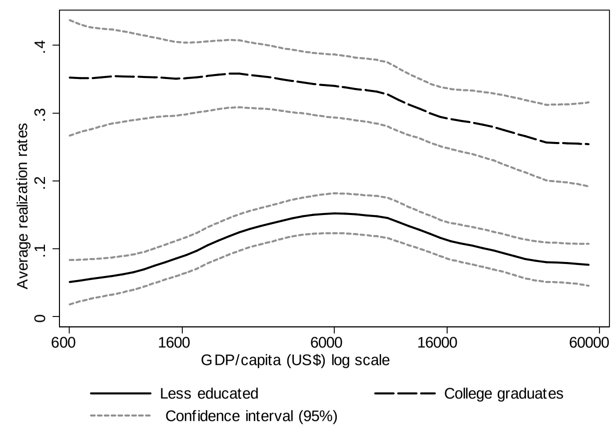
2.b. Emigration rates by education level



2.c. Migration aspirations by education level



2.d. Realization rates by education level



Notes: Non-parametric regression using Epanechnikov kernel, local-mean smoothing, bandwidth 0.5. The skill migration rates are the differences between migrant stocks in 2000 and 2010, normalized by the skill population of the origin countries. The migration aspirations rates are calculated as the sum of the number non migrants expressing a willingness to emigrate and actual migration flows between 2000-2010, normalized by the origin country populations. Realization rates are obtained by dividing the 2000-2010 migration flows by the total number of potential migrants. The sample consists of 123 countries. Data on GDP per capita at PPP in 2000 are taken from the *Penn World Tables 7.0*.

3 Empirical Analysis

The stylized facts described in the previous section reveal that average aspiration and realization rates of both high and low-skilled individuals are strongly correlated with the level of economic development of origin countries. Importantly, the only inverted-U shaped component is the realization rate of the low-skilled. In this section, we implement regressions to explore the relationship between emigration intensity and development. Given our foregoing discussions, our aim is to estimate (and subsequently quantify) the relative contributions of all the factors that the literature has highlighted as being potential explanations of the mobility transition including: *microeconomic drivers*, socio-demographic variables, and the influence of gravity and networks. Importantly, we evaluate the impact of all these variables on both high-skilled and low-skilled emigration rates. Identifying the influence of gravity drivers requires our analysis to be conducted at the bilateral level, as well as controlling for absolute geography, culture and other exogenous determinants of migration flows. Hence, building upon (2), the average emigration rate of country i ($i = 1, ..., I$) can be decomposed as following:

$$\overline{m}_i = \sigma_i^h \sum_{j \neq i} p_{ij}^h r_{ij}^h + \sigma_i^l \sum_{j \neq i} p_{ij}^l r_{ij}^l \tag{3}$$

Our empirical analysis distinguishes between four dependent variables, namely the bilateral migration aspirations and realization rates of both college-educated and less educated adults, p_{ij}^s and r_{ij}^s ($s = h, l$). The set of explanatory variables includes the following variables:

- Gravity drivers (denoted by G_{ij}) includes the log of geographic distance between sending and receiving countries and a set of dummy variables that equal one should the sending and receiving countries by contiguous, speak a common language or share a colonial heritage after 1945. These variables are obtained from the *CEPII Dyadic Distance Database* described in Mayer and Zignago (2011). We also include a measure of genetic diversity as a proxy for cultural distance; we use the probability that two alleles (a particular form taken by a gene) at a given locus selected at random from two populations are different (proxy for time since isolation) from Spolaore and Wacziarg (2009). Genetic distance is based on blood sample and proxies the time since two populations had common ancestors. Spolaore and Wacziarg (2015) find a pattern of positive and significant relationships between genetic distance and various measures of cultural distance, including language, religion, values, and norms. Finally, we control for population size.

- To account for pre-existing migrant networks (denoted by S_{ij}), we use the total stock of bilateral migrants from i to j in the year 2000, divided by the native population of country i in the same year. This variable captures the probability that a native from country i has a friend or relative in country j at the beginning of the period.

- Socio-demographic drivers (denoted by A_i) include: the share of the population in country i aged between 15 and 24 in 2000 as a proxy for the adult population in the age of migration between 2000 and 2010, average weighted import tariffs, as proxies for the degree of openness of country i and an index of education quality. The shares of the population aged 15-24 are obtained from the *UN-DESA World Population Prospects 2012*. Information on weighted import tariffs comes from the *World Integrated Trade Solution (WITS)* as of the year 2000. This variable is constructed using the average of all effectively applied import tariffs weighted by their corresponding trade value.[8] The lower the import tariffs, the more open a country. Data on education quality are proxied by the test score results of high school students in maths, science and reading skills, which are taken from Angrist et al. (2013).

- Having controlled for gravity, network and socio-demographic channels (i.e. all the relevant, origin-specific mechanisms identified in the existing literature), we further consider the residual effects of income and inequality (denoted by y_i and ω_i). This residual effect reasonably gives an upper-bound for the effect of *microeconomic drivers*. We construct proxies for skill-specific levels of income, y_i^h and y_i^l and include their logged levels and their squares. Our measures of income proxy for income inequality. We use GDP per capita data at destination (PPP in 2005) international USD (Chain series) in 2000 (y_i) from the *Penn World Tables 7.0* and data on the wage ratio between college educated and less educated workers (ω_i) from Hendricks (2004). We combine these values with the proportions of high-skilled and low-skilled workers from Artuç et al. (2015). Skill-specific income levels are computed as $y_i^l = y_i / \left(\sigma_i^h \omega_i + \sigma_i^l\right)$ and $y_i^h = \omega_i y_i / \left(\sigma_i^h \omega_i + \sigma_i^l\right)$.

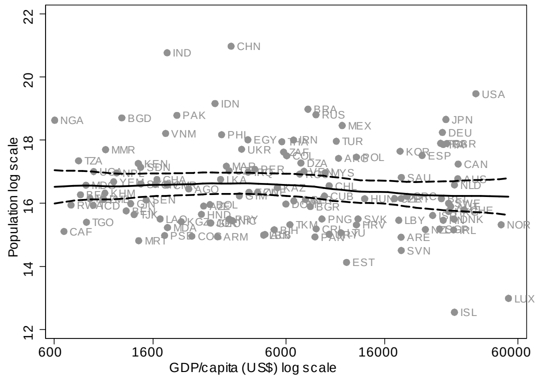
- Finally, each regression includes a full set of destination fixed effects. These capture the relative attractiveness of all destinations as well as accounting for immigration policies that do not discriminate between origins.

Figure 3 depicts the cross-sectional relationships between the main potential drivers of emigration rates and the level of income per capita in the origin country. These relationships are estimated using the non-parametric Epanechnikov kernel density estimation (see Epanechnikov, 1969). On average, population size is poorly correlated with development (fig. 3.a). On the contrary, the share of the population aged 15 to 24 (fig. 3.b), the average geographic distance from the nearest OECD country (fig. 3.c), and the level of income inequality in the origin country (fig. 3.f) are negatively correlated with income per capita. As far as the network size (fig. 3.d) is concerned, it first increases with development before decreasing when income per capita exceeds $7,000. Finally, education quality (fig. 3.e) is positively correlated with development.

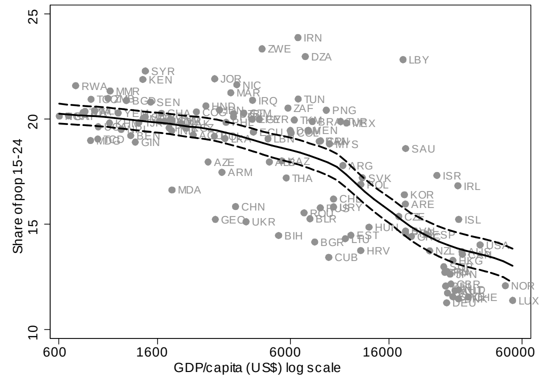
[8] Data for 12 European countries (Belgium, Denmark, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, United Kingdom) are not available. While under the common trade policy, the EU15 (plus Austria, Finland, Sweden) apply the same tariff rates to all their imports. The weighted tariffs are not equivalent due to the differences in import volumes. For the sake of simplicity given the difficulty of working with 6-digit commodity lines in order to calculate the exact weighted tariffs for each country however, we decided to use the average value of the European Union, which is available, for those 12 countries.

Fig 3. Nonparametric regressions of main drivers on income per capita

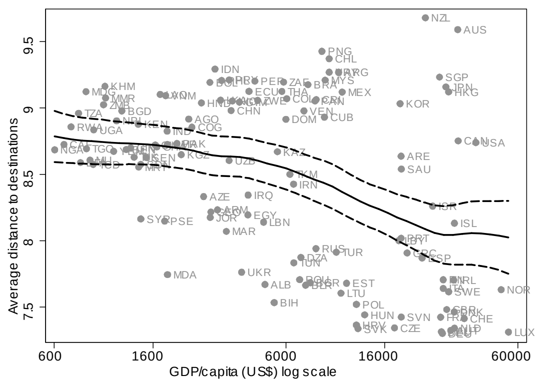
3.a. Population (in logs)



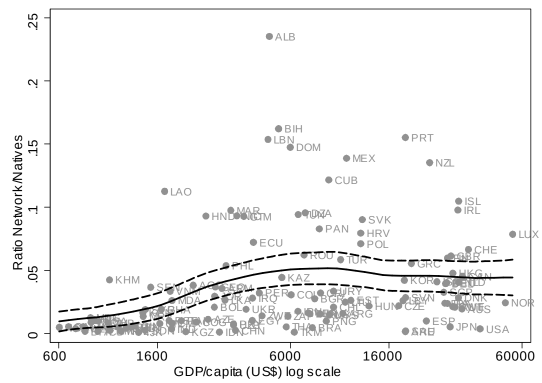
3.b. Pop aged 15-24 (as percent of pop.)



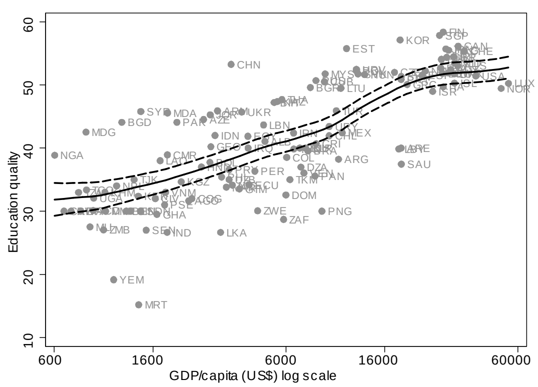
3.c. Distance from OECD (in logs)



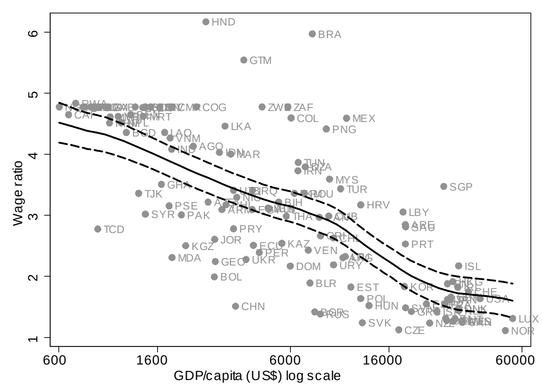
3.d. Network size (as percent of pop.)



3.e. Education quality



3.f. Income inequality



Notes: Non-parametric regression using Epanechnikov kernel, local-mean smoothing, bandwidth 0.5. The sample consists of 123 countries.

To estimate potential bilateral emigration rates p_{ij}^s we use the Poisson pseudo-maximum likelihood estimator (PPML) described in Santos Silva and Tenreyro (2006 and 2011), for three reasons. First, the variance of the error in gravity equations, which is non-linear, varies across country-pairs such that the OLS estimator may be biased due to heteroskedasticity. Second, the PPML estimator is consistent in the presence of fixed effects. Third, the potential bilateral rate variables p_{ij}^s contain a large proportion of zero values (7.25% for college graduates and 8.8% for the less educated) due to the absence of migrants between many country-pairs. The PPML estimator does not exclude these zeroes and thus eliminates sample selection bias.

Our measures of realization rates r_{ij}^s, contain high proportions of both zeroes and ones. The cause of zero realization rates is the same as for actual migration rates. Values of one, which are equivalent to a one hundred percent probability of realizing migration, are due to the total absence of individuals expressing a desire to emigrate in the Gallup World Poll and having not yet emigrated between 2000-2010. Realization rates of 0 and 1 among the less- and college-educated account for 3.85 and 9.52% of the total migration of their skill groups respectively and 2.3 and 3.9% of the total migration stock. The presence of these zeroes and ones may lead to our results being inconsistent since our estimations may be biased towards smaller and less important corridors that account for a large number of observations in our sample. We decide to drop these observations and rely upon OLS.

The specifications of our potential and realization equations are:

$$p_{ij}^s = \exp\left[\alpha_0^s + \alpha_j^s + \alpha_G^s G_{ij} + \alpha_S^s S_{ij} + \alpha_A^s A_i + \alpha_{y1}^s \log y_i^s + \alpha_{y2}^s \left[\log y_i^s\right]^2 + \varepsilon_{ij}^s\right] \quad (4)$$

$$r_{ij}^s = \gamma_0^s + \gamma_j^s + \gamma_G^s G_{ij} + \gamma_S^s S_{ij} + \gamma_A^s A_i + \gamma_{y1}^s \log y_i^s + \gamma_{y2}^s \left[\log y_i^s\right]^2 + \epsilon_{ij}^s \quad (5)$$

where p_{ij}^s in equation (3) is the potential bilateral migration rate and r_{ij}^s the realization rate. Both are regressed on the same set of explanatory variables: gravity drivers G_{ij}, migrant networks S_{ij}, socio-demographic determinants A_i, skill-specific logarithmic wages y_i^s, destination country fixed effects α_j^s and γ_j^s. The exp(.) specification in (4) is due to the use of the PPML estimator.

The (gravity) regressions that we estimate below, although not formally derived from an underlying random utility model, nevertheless manifest similarly. One particular concern in this regard is the potential role of multilateral resistance to migration (MRM) - see Bertoli and Fernandez-Huertas Moraga (2013), which is the observation that the attractiveness of a particular destination country for potential migrants at origin will likely depend upon the relative attractiveness of alternative destinations. To account for any potential bias that might arise from the existence of MRM, we follow the approach of Baier and Bergstrand (2009), one adapted to the case of migration as in Gröschl (2012) and control for MRM with the inclusion of two additional terms in Eqs. (4) and (5). These terms capture the average distance and contiguity of country i and j with respect to all other migration partners.

Regression results for migration aspiration and realization rates are presented in Tables 1 and 2. All estimations include both destination fixed effects and variables controlling for multilateral resistance to migration. The standard errors are clustered by country of origin. Columns (L1) and (H1) include the full set of controls and the log of the skill-specific level of income (linear specification). Columns (L2) and (H2) add the squared level of income (quadratic specification). Finally, columns (L3) and (H3) represent our parsimonious specifications comprising significant controls only, in addition to the log level of income. The parsimonious specifications are obtained after running backward stepwise regressions starting from the most complete model. Decision to include a variable is based on its p-value, i.e. the variable should be significantly different from zero at 5% threshold, and on the global fit of the model before and after eliminating that variable. The correlations between income, income squared, gravity and socio-demographic determinants prove important and in our subsequent counterfactual simulations, we use the estimates of the parsimonious regressions to minimize collinearity problems.

Focusing first upon migration aspirations, Table 1 reveals that the effect of skill-specific income level is only significant for the less-educated; it is insignificant for college graduates. When both the linear and squared income terms are included, in model (L2), the low-skill wage loses its significance. This suggests that migration aspirations of the less educated are linearly decreasing with income. In accordance with figure 2.c, we find no evidence that migration aspirations increase with income in early stages of development. The presence of a network abroad as a huge effect on migration aspirations, especially for the less educated. Among the socio-demographic drivers, the share of population aged between 15 and 24 has a significant effect, but only for the highly skilled. Education quality has no significant impact. This variable only reflects the cognitive abilities of high-school students and so it plausibly has little influence on global attitudes towards migration. Higher average import tariffs, which correspond to lower degrees of openness, do not affect migration aspirations. The coefficients on the gravity variables exhibit the expected signs. Geographic distance reduces migration aspirations while common language and colonial links increase them. The effect of contiguity is negative in both skill groups; this counter-intuitive result could be interpreted as a border effect when geographic distance is small. Genetic distance has no significant effect on the desire to emigrate. The results on population size are negative for the low-skilled, which might be indicative of the fact that larger countries usually exhibit lower (international) migration rates since their citizens have access to wider ranges of job opportunities at home. Our results do show that countries populated by relatively young and educated citizens experience higher average willingness to emigrate however.

The determinants of realization rates are presented in Table 2. Interestingly, both the linear and squared terms of the low-skill wage variable are now highly significant, suggesting that the relationship between realizing migration and financial capacity is non-linear. In line with Clemens (2014), realization rates tend to increase at low income levels and reach a maximum when wages are around $5,027, decreasing thereafter. This suggests that economic progress increases the capacity of the less educated to financially meet the cost of international movement during early stages of development. For the college-educated, we do not identify a similar non-linear pattern; the effect of income is monotonic and significantly negative. This suggests that instead of being financially constrained, the college-graduates face higher opportunity cost with migration when income rises at home. Financial hurdles are partially captured by geographic distance however, which has negative effect on realization rates. The closer an origin to a major OECD destination, the more potential migrants realize their aspirations. Geographic distance represents both financial and psychic costs of being far from family and friends however. Sharing colonial ties or a common language increases realization rates, but these variables only remain statistically significant for the college-educated. Overall, the gravity channels however play an important role in determining both the willingness and realization of migration. Migrant networks mitigate these costs related to long-distance movement and have sizable effects on the success of migration; contrary to aspirations, the magnitude of network effects is globally similar across skill groups. Socio-demographic factors do not have any impact upon realization rates, except for the positive effect of education quality on the realization rates of the low-skilled.

4 Dissecting the Anatomy of the Mobility Transition

In this section, we quantify the relative contributions of those factors that have been documented in the literature as providing potential foundations for the mobility transition curve. In line with the development accounting literature (Jones, 2015), we use counterfactual simulations to assess the capacity of each set of drivers to account for cross-country variations in emigration rates. More precisely, we compute counterfactual emigration rates and compare their trend with that observed. Our counterfactuals are emigration rates that would be obtained should one set of explanatory variables at the time be equal to the average level observed in the richest countries of the world (all countries in our sample with income per capita above \$25,000).[9]

Given the bilateral decomposition of observed emigration rates used in our empirics, we can generalize (3) and write:

$$\overline{m}(\sigma_i, G_{ij}, S_{ij}, A_i, \omega_i, y_i) \equiv \sigma_i^h \sum_{j \neq i} p_{ij}^h(.) r_{ij}^h(.) + \sigma_i^l \sum_{j \neq i} p_{ij}^l(.) r_{ij}^l(.). \quad (6)$$

If a set $X = \{\sigma, G, S, A, \omega, y\}$ of determinants is set to the average level observed in the richest countries $(\widehat{X})$, the variations in potential emigration rates, $\Delta \ln p_{ij}^s = \alpha_X^s(\widehat{X} - X_i)$, and in realization rates, $\Delta r_{ij}^s = \gamma_X^s(\widehat{X} - X_i)$, can be computed for each pair of countries using the estimated coefficients (α_X^s, γ_X^s) from (4) and (5). In these simulations, we only consider those coefficients that are significantly different from zero at the 95% confidence level in our parsimonious specifications (i.e. columns L3 and H3 in Tables 1 and 2). We then use (6) to aggregate the new aspirations and realization rates to compute counterfactual emigration rates, migration aspirations and realization rates for the whole population and particular skill groups.

[9]The richest countries is restricted to 25 countries: Australia, Austria, Belgium, Canada, China. Hong Kong, Denmark, Finland, France, Germany, Iceland, Ireland, Israel, Italy, Japan, Luxembourg, Netherlands, New Zealand, Norway, Singapore, Spain, Sweden, Switzerland, United Kingdom, and the United States.

Tab 1. Determinants of migration aspirations (PPML regressions)

	Less educated			College Graduates		
	(L1)	(L2)	(L3)	(H4)	(H5)	(H6)
Geo. Dist. (log)	-0.531***	-0.538***	-0.517***	-0.468***	-0.460***	-0.443***
	(0.075)	(0.074)	(0.069)	(0.067)	(0.066)	(0.065)
Contiguity	-0.512**	-0.429*	-0.542**	-0.686**	-0.583**	-0.693**
	(0.231)	(0.222)	(0.214)	(0.287)	(0.285)	(0.280)
Com. Lang.	1.156***	1.190***	1.183***	0.772***	0.803***	0.832***
	(0.128)	(0.132)	(0.125)	(0.146)	(0.148)	(0.149)
Colonial Link	0.288**	0.294**	0.286**	0.928***	0.943***	0.930***
	(0.134)	(0.131)	(0.138)	(0.217)	(0.221)	(0.223)
Genetic Dist.	0.024	0.048		0.140	0.160	
	(0.082)	(0.080)		(0.087)	(0.082)	
Population (log)	-0.081	-0.087*	-0.109***	-0.048	-0.063	
	(0.052)	(0.052)	(0.039)	(0.054)	(0.054)	
Network (% pop.)	18.443***	17.876***	18.939***	9.258***	8.972***	8.227***
	(1.857)	(1.806)	(1.491)	(1.796)	(1.783)	(2.033)
Pop 15-24 (% pop.)	-0.020	-0.035		0.034	0.027	0.085***
	(0.027)	(0.030)		(0.034)	(0.034)	(0.019)
Import Tariff	0.011	0.011		0.015	0.017	
	(0.010)	(0.010)		(0.012)	(0.012)	
Educ. Quality	-0.007	-0.007		-0.008	-0.007	
	(0.009)	(0.009)		(0.009)	(0.009)	
Low-Skill Wage	-0.243***	1.026	-0.292***			
	(0.076)	(0.887)	(0.052)			
Low-Skill Wage Sq.		-0.072				
		(0.049)				
High-Skill Wage				-0.034	2.726	
				(0.076)	(1.854)	
High-Skill Wage Sq.					-0.139	
					(0.092)	
Constant	0.699	-4.391	5.257***	-2.321	-15.232	-6.949**
	(4.346)	(5.618)	(1.134)	(4.200)	(9.964)	(3.106)
Dest. FE	Yes	Yes	Yes	Yes	Yes	Yes
MRM	Yes	Yes	No	Yes	Yes	Yes
R-squared	0.606	0.609	0.611	0.469	0.472	0.442
N. of obs	3359	3359	3359	3523	3523	3523

Notes: Standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Regressions use the Poisson pseudo-maximum likelihood (PPML) estimator. All regressions include Destination Fixed Effects and variables to control for Multilateral Resistance to Migration. The full sample consists of 4,026 observations corresponding to bilateral migration between 123 origins and 33 destinations. The less- and high-educated migration aspirations variables contain, respectively, 667 and 503 missing values, thus 3,359 and 3,523 observations remain. Standard errors are clustered by country of origin.

Tab 2. Determinants of realization rates (OLS regressions)

	Less educated			College Graduates		
	(1)	(2)	(3)	(4)	(5)	(6)
Geo. Dist. (log)	-0.014**	-0.015**	-0.020***	-0.030***	-0.029***	-0.033***
	(0.007)	(0.007)	(0.007)	(0.008)	(0.008)	(0.008)
Contiguity	-0.012	0.006		0.012	0.017	
	(0.029)	(0.026)		(0.029)	(0.029)	
Com. Lang.	0.006	0.016		0.077***	0.082***	0.076***
	(0.013)	(0.013)		(0.022)	(0.022)	(0.023)
Colonial Link	0.002	0.016		0.142***	0.148***	0.137***
	(0.024)	(0.022)		(0.042)	(0.041)	(0.041)
Genetic Dist.	-0.026**	-0.018*		0.002	0.004	
	(0.011)	(0.010)		(0.017)	(0.016)	
Population (log)	-0.015***	-0.016***	-0.017***	-0.031***	-0.033***	-0.024***
	(0.005)	(0.005)	(0.005)	(0.009)	(0.008)	(0.006)
Network (% pop.)	2.874***	2.673***	2.738***	3.125***	3.056***	3.207***
	(0.494)	(0.489)	(0.467)	(0.571)	(0.551)	(0.564)
Pop 15-24 (% pop.)	0.002	-0.003		-0.002	-0.003	
	(0.003)	(0.004)		(0.006)	(0.006)	
Import Tariff	-0.001	-0.001		0.004	0.003	
	(0.001)	(0.001)		(0.002)	(0.002)	
Educ. Quality	0.002	0.002	0.002**	0.002	0.002	
	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	
Low-Skill Wage	-0.026**	0.397***	0.375***			
	(0.011)	(0.108)	(0.094)			
Low-Skill Wage Sq.		-0.024***	-0.022***			
		(0.006)	(0.005)			
High-Skill Wage				-0.032*	0.543	-0.029**
				(0.018)	(0.431)	(0.012)
High-Skill Wage Sq.					-0.029	
					(0.021)	
Constant	1.178***	-0.587	-0.553	1.138***	-1.531	0.935***
	(0.313)	(0.488)	(0.442)	(0.405)	(2.079)	(0.173)
Dest. FE	Yes	Yes	Yes	Yes	Yes	Yes
MRM	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.221	0.247	0.238	0.363	0.368	0.356
N. of obs	1409	1409	1409	1067	1067	1067

Notes: Standard errors in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Regressions use Ordinary Least Squares (OLS). All regressions include Destination Fixed Effects and variables to control for Multilateral Resistance to Migration. The full sample consists of 4125 observations that correspond to bilateral migration between 123 origins and 33 destinations. The less- and high-educated migration realization variables contain, respectively, 951 and 883 missing values, 106 and 73 values of zero, 1,560 and 2,041 values of one, thus 1,409 and 1,067 observations remain. Standard errors are clustered by country of origin.

4.1 Drivers of the Mobility Transition Curve

Our main variable of interest is the average emigration rate. As seven drivers prove significant in our regressions, we conduct eight counterfactual experiments. The first consists of weighting skill-specific average emigration rates by the average proportions of college graduates and less educated workers in the labor force of the richest countries ($\widehat{\sigma}^s$ instead of σ_i^s). Our second replaces the distance matrices (G_{ij}) by the average distance between the richest countries and each destination ($\widehat{G}_j$).[10] Similarly, our third counterfactual replaces the bilateral network sizes (S_{ij}) by the average stock of emigrants from the richest countries to each destination j ($\widehat{S}_j$). The fourth and fifth counterfactuals replace the share of population aged 15-24 ($\widehat{A}_{1j}$) and the education quality ($\widehat{A}_{2j}$) by the average levels observed in the richest countries, respectively. In the sixth counterfactual, we assess the impact of inequality, by replacing the skill-specific income levels by those obtained if the wage ratio was equivalent to the average ratio in the richest countries (keeping income per capita at its observed level, y_i), i.e. $\widehat{y}_i^l = y_i / \left(\sigma_i^h \widehat{\omega} + \sigma_i^l\right)$ and $\widehat{y}_i^h = \widehat{\omega} y_i / \left(\sigma_i^h \widehat{\omega} + \sigma_i^l\right)$. For the seventh counterfactual, we implement the average level of income per capita observed in the richest countries (keeping the wage ratio at its observed level, ω_i), i.e. $\widehat{y}_i^l = \widehat{y} / \left(\sigma_i^h \omega_i + \sigma_i^l\right)$ and $y_i^h = \omega_i \widehat{y} / \left(\sigma_i^h \omega_i + \sigma_i^l\right)$. The final experiment consists on replacing all significant drivers jointly. In the latter case, the counterfactual emigration rate $\widehat{m}_{all,i}$ is not exactly equal to the average rate observed in the richest countries. The reason is that our parsimonious regressions explains around 50% of the variability in aspirations, and around 30% of the variability in realization rates. However the difference between $\widehat{m}_{all,i}$ and the emigration rate of the richest countries is small. We obtain eight counterfactual vectors of emigration rates labeled as $\widehat{m}_{X,i}$ henceforth and defined as:

$$\widehat{m}_{X,i} = \begin{cases} \widehat{m}_{\sigma,i} \equiv m(\widehat{\sigma}, G_{ij}, S_{ij}, A_{1i}, A_{2i}, \omega_i, y_i) \\ \widehat{m}_{G,i} \equiv m(\sigma_i, \widehat{G}_j, S_{ij}, A_{1i}, A_{2i}, \omega_i, y_i) \\ \widehat{m}_{S,i} \equiv m(\sigma_i, G_i, \widehat{S}_j, A_{1i}, A_{2i}, \omega_i, y_i) \\ \widehat{m}_{A,i} \equiv m(\sigma_i, G_i, S_{ij}, \widehat{A}_1, A_{2i}, \omega_i, y_i) \\ \widehat{m}_{A,i} \equiv m(\sigma_i, G_i, S_{ij}, A_{1i}, \widehat{A}_2, \omega_i, y_i) \\ \widehat{m}_{\omega,i} \equiv m(\sigma_i, G_i, S_{ij}, A_{1i}, A_{2i}, \widehat{\omega}, y_i) \\ \widehat{m}_{y,i} \equiv m(\sigma_i, G_i, S_{ij}, A_{1i}, A_{2i}, \omega_i, \widehat{y}) \\ \widehat{m}_{all,i} \equiv m(\widehat{\sigma}, \widehat{G}_j, \widehat{S}_j, \widehat{A}_1, \widehat{A}_2, \widehat{\omega}, \widehat{y}) \end{cases}$$

For each counterfactual vector of emigration rates, we estimate the nonparametric trend $\widehat{m}_X(y)$ using the Epanechnikov kernel method with a bandwidth of 0.5 and compare it with the inverted-U shaped curve computed for the observed emigration rates, $\widehat{m}(y)$. Deviations in levels and variations can be expressed as:

$$\begin{aligned} \Delta_X(y) &\equiv \widehat{m}(y) - \widehat{m}_X(y) \\ \delta_X(y) &\equiv \frac{d\Delta_X}{dy} = \frac{d\widehat{m}}{dy} - \frac{d\widehat{m}_X}{dy} \end{aligned}$$

[10] The vector $\widehat{G}_j$ basically captures the average distance between the 25 richest countries and each OECD destination country j in our bilateral sample.

The results of the decompositions of average emigration rates are depicted in Figure 4. Figure 4.a illustrates the relationship between the counterfactual emigration rates and the level of income per capita, i.e. $\widehat{m}_X(y)$. In Figure 4.b, the level of $\Delta_X(y)$ shows how each driver X affects the emigration rates for any level of economic development. The magnitude of $\Delta_X(y)$ is determined by the effect of X on aspirations and realization rates, as well as by the correlation between economic development and the determinants depicted on Figure 3, i.e. $X(y)$. If $\Delta_X(y) > 0$, it means that, compared to the average level of the richest countries ($\widehat{X}$), the level of $X(y)$ tends to increase the emigration rates at the level of development y; equivalently, transposing the characteristics of the richest countries would decrease the emigration rate. If $\Delta_X(y) < 0$, the level of $X(y)$ tends to decrease emigration rates; equivalently, transposing the characteristics of the richest countries would increase emigration. In Figure 4.c, the sign and level of $\delta_X(y)$, the slope of $\Delta_X(y)$, tells us whether a marginal increase in economic development stimulates or reduces emigration rates through $X(y)$. We are particularly interested in identifying the drivers that explain the positive slope of the *mobility transition curve* at low level of development.

In Table 3, we report the values of $\Delta_X(y)$ and $\delta_X(y)$ (multiplied by 100) for five benchmark levels of income, \$1,000 (which approximately corresponds to the income threshold defining low-income countries), \$1,600 (which corresponds to the peak of the $\delta_X(y)$ curve), \$4,000 (which approximately corresponds to the income threshold defining lower–middle-income countries), \$6,000 (which corresponds to the peak of the mobility transition curve), and \$12,000 (which approximately corresponds to the income threshold defining high-income countries). As our model is highly nonlinear, summing the effects of each drivers taken in isolation does not match the effect of the joint counterfactual $\Delta_{all}(y)$. The residual row informs us about the magnitude of the interactions (complementarity or substitution) between drivers.

In Figure 4.a, it appears that relatively small (albeit intuitive and non negligible) changes in emigration rates are obtained when transposing the wage inequality, the education quality, and the share of 15-24 observed in the richest countries. In the same vein, gravity drivers have a limited impact on emigration. On the contrary, counterfactual emigration rates are much greater when transposing the skill structure of industrialized countries, and much smaller when transposing their average income level. The effect of the migrant network varies with development. At low level of development, transposing the average network size of industrialized countries has virtually no effect en emigration; at intermediate levels of development, the same counterfactual reduces the emigration rate. Hence, quantitatively, the most important drivers of the mobility transition curve are the skill composition of the population, the size of the migrant network, and the *microeconomic drivers*.

Figure 4.b confirms these results by depicting the differences between the observed emigration rates and the counterfactual ones. One the one hand, the drivers $X(y)$ that tend to decrease emigration (i.e. those for which $\Delta_X(y) < 0$) are the skill composition of the working-age population and, to a much lesser extent, education quality and gravity variables. On the other hand, the drivers $X(y)$ that tend to increase emigration (i.e. those for which $\Delta_X(y) > 0$) are the average level of income, the network effects (mainly for intermediate income levels) and, to a much lesser extent, the age structure of the population. The effect of income inequality is negligible. In Table 3, it clearly appears that the contribution

of the education channel exceeds that of the income and network channels in low-income countries. For example, when income per capita is equal to \$1,600, the smallness of the share of college graduates decreases the emigration rate by 2.69% compared to the richest countries, while the smallness of the income level increases emigration by 1.60%. At \$4,000, the income effect (+2.26%) dominates the skill composition effect (-1.88%).

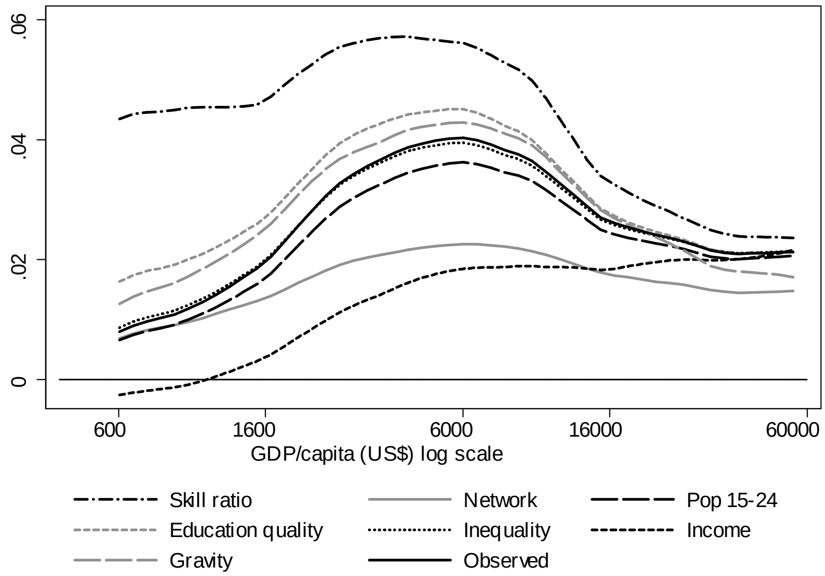
Clearly, the contribution of each driver varies with development and needs not operating monotonically. For example, income per capita ambiguously affects the realization rates of the less educated (see Table 2), and the network size or the share of 15-24 vary non linearly with income (see Figure 3). Focusing on the slope of the mobility transition curve, $\delta_X(y)$, Figure 4.c disentangles the marginal impact of development on emigration by driver. It shows that all derivatives are positive (or are very small below \$4,000). This is confirmed by Table 3: in the first three columns related to $\delta_X(y)$, all contributions are positive or negligible, except for the residual channel (which attenuates the sum of all effects). This implies that each channel taken in isolation contributes to increasing emigration in low-income and lower-middle-income countries. However the relative importance of the key drivers varies with economic development:

- At low levels of development (income per capita around \$1,000), most of the effect is driven by the skill composition (32.2% of the sum, excluding the residual interaction term), followed by the network (29.3%) and the income channels (25.2%).
- If income per capita is around \$1,600, the slope of the migration curve peaks and the contribution of the skill composition is still dominant (31.0% of the sum, excluding the residual interaction term), followed by the network channel (30.4%) and by the income channel (21.5% of the total).
- If income per capita is around \$4,000, the income channel becomes small and negative (-7.6%). On the contrary, the skill composition channel is overwhelmingly dominant (54.4%), followed by the network effect (30.4%).
- As income per capita get closer to \$6,000, the total slope becomes negative and some drivers operate with opposite signs.

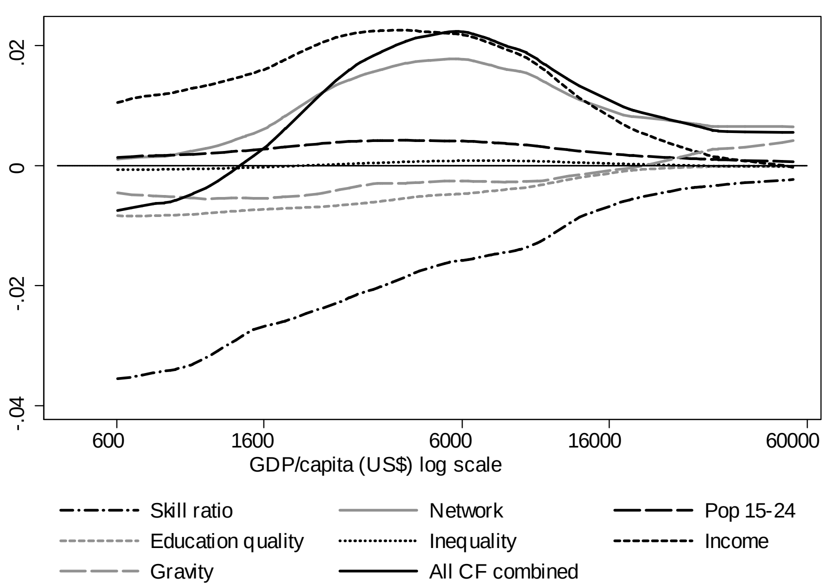
Overall, the role of *microeconomic drivers* in shaping the mobility transition curve is non negligible but should not be overestimated. Given the high levels of selectivity observed in poor countries, about one third of the rise in emigration is due to the changing skill composition of the working-age population in low-income countries, and this contribution exceeds 50% in lower-middle-income countries. In other words, emigration increases with development, mainly because the proportion of college graduates in the native population increases and this group has the greatest propensity to emigrate by far. At low level of development, the contribution of *microeconomic drivers* (i.e. income and inequality effects) is limited. They only explain 25% of the increasing segment in the poorest countries, and less than 20% in lower-middle-income countries. The remainder is explained by a changing combination of network, socio-demographic and gravity effects.

Fig 4. Drivers of the mobility transition curve

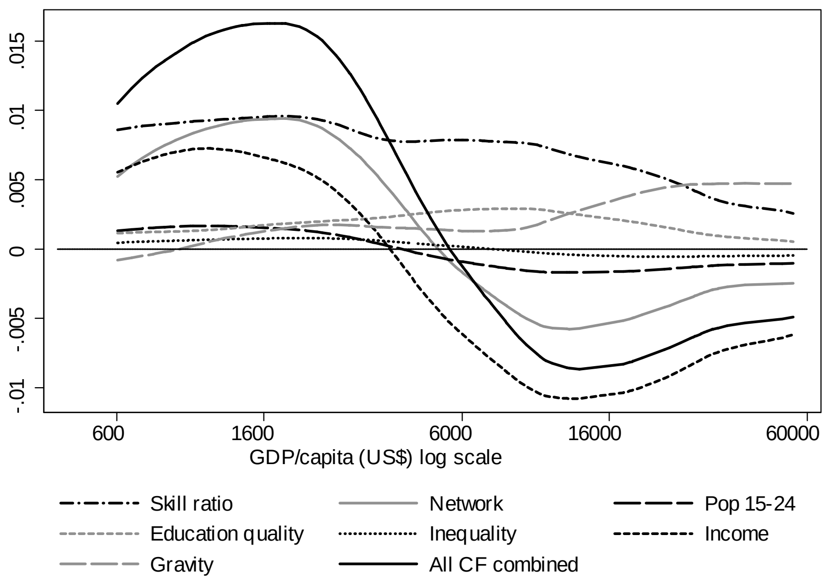
4.a. Counterfactual emigration rates, $\widehat{m}_X(y)$



4.b. Effect of driver X on the level (Δ_X)



4.c. Effect of driver X on the slope (δ_X)



Notes: The curves in figure 4.a. show the counterfactual migration rates. The curves in figure 4.b show the difference between the observed migration rates and the counter-factual ones. The curves in figure 4.b. show the variation of the difference curves with respect to income per capita. The curves are smoothed using Epanechnikov kernel estimations at local mean and bandwidth 0.5. The sample consists of 123 countries.

Table 3. Decomposition of the mobility transition curve for various levels of y

	Effect on Δ_X ×100					Effect on δ_X ×100				
Driver / y	\$1K	\$1,6K	\$4K	\$6K	\$12K	\$1K	\$1,6K	\$4K	\$6K	\$12K
Education	-3.31	-2.69	-1.88	-1.58	-1.00	0.92	0.95	0.78	0.79	0.69
Network	0.25	0.61	1.69	1.77	1.20	0.84	0.94	0.32	-0.17	-0.58
Share 15-24	0.19	0.27	0.42	0.41	0.27	0.17	0.15	0.00	-0.09	-0.17
Educ quality	-0.81	-0.73	-0.56	-0.48	-0.24	0.13	0.17	0.24	0.28	0.26
Inequality	-0.06	-0.03	0.06	0.08	0.06	0.06	0.08	0.05	0.02	-0.04
Income p.c.	1.29	1.60	2.26	2.18	1.29	0.72	0.66	-0.11	-0.61	-1.08
Gravity	-0.54	-0.55	-0.30	-0.26	-0.18	0.02	0.13	0.15	0.13	0.25
Residual	2.53	1.80	0.35	0.10	0.06	-1.37	-1.45	-0.82	-0.46	-0.19
All	-0.47	0.29	2.04	2.23	1.45	1.49	1.63	0.61	-0.12	-0.86

Notes: The number reported in this table are the predictions of the Epanechnikov kernel trends depicted on figures 4.b and 4.c, evaluated at income levels of \$1,000, \$1,600, \$4,000, \$6,000 and \$12,000.

4.2 Analysis by Education Level

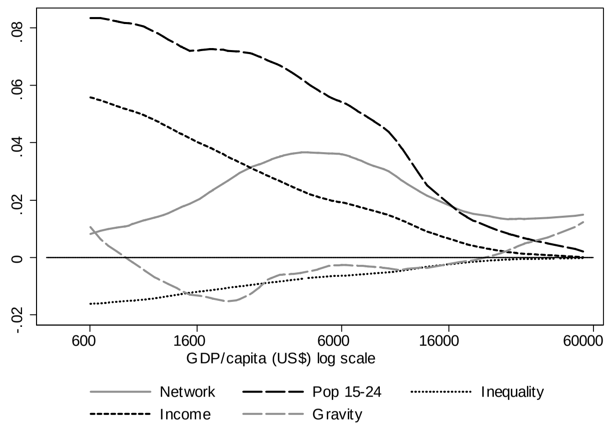
Counterfactual emigration rates can be calculated for college graduates and the less educated separately. In this section, we simulate counterfactual emigration rates $\overline{m}^s_{X,i}$ for each group of workers ($s = h, l$) and for each country i, we estimate the nonparametric trends $\overline{m}^s_X(y)$ using the Epanechnikov kernel method. We compare these with the trends computed using observed values, $\overline{m}^s(y)$. In the simulations, we only consider the coefficients that are significantly different from zero at the 95% confidence level in our parsimonious specifications (column H3 in Tables 1 and 2). Obviously, the skill composition effect is meaningless here as we focus on skill-specific responses. Figure 4 depicts the deviations in level, $\Delta^s_X(y)$ and their slopes, $\delta^s_X(y)$.

Figure 5.a shows that the age structure of the population, the network size and the income level observed in developing countries tend to increase emigration of college-educated workers (these are the drivers $X(y)$ such that $\Delta^h_X(y) > 0$). On the contrary, gravity drivers and the high level of within-country inequality tends to decrease high-skilled emigration rates (these are the drivers $X(y)$ such that $\Delta^h_X(y) < 0$). In terms of magnitude, the age structure and the income channels are the most important. As far as income is concerned, the (microeconomic) effects that prove central to neoclassical models of migration result from the comparison of the private costs and benefits from emigration. Overall, low levels of income in the poorest countries stimulate the emigration rate of college graduates. We find no evidence of binding migration constraints for the highly skilled. Indeed, although smaller in magnitude, the inequality effect also leads to smaller high-skilled emigration rates in poor countries meaning that greater returns to schooling in poor countries (which slightly increase income of the highly skilled) reduce high-skilled emigration. At low levels of development (income per capita of $1,000), the observed emigration rate of the highly skilled is 15 percentage points greater than would otherwise prevail if individual income was equivalent to that observed in the richest countries. In Figure 5.b, we observe that economic progress through the demographic and income channels. These are the most important channels. Their effects are however attenuated by the network channel (below $5,000), by the gravity channel (above $2,000), and by the (smaller) inequality channel.

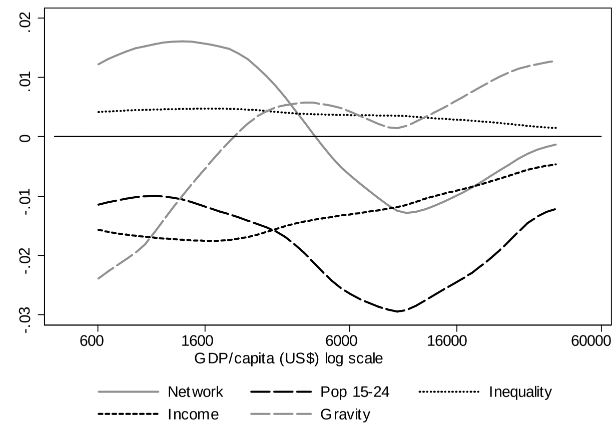
As for the less educated, most deviations in levels have the same sign as for the highly skilled. Figure 5.c reveals that most channels result in higher emigration rates in developing countries ($\Delta^l_X(y)$ are positive), except for the gravity drivers and for education quality. The major difference in comparison with college graduates is that these effects are no longer monotonic, as shown in Figure 5.d. At income levels below $4,000, a marginal increase in economic development stimulates the emigration of the less educated through all channels, especially through the network and income channels, which all turn negative above $4,000 to $5,000. This suggests that *microeconomic drivers* (including financial constraints) matter for the low-skilled. Migration constraints likely dominate the greater benefits from emigration at low levels of development. Notably distance decreases with development and restrains emigration from poor countries. As for the effects of inequality, these are smaller than any effect of income but play a similar role. At low levels of development, reducing inequality (i.e. increasing the wage rate of the poorest) would increase the emigration rate of the low-skilled.

Fig 5. Decomposition by education level

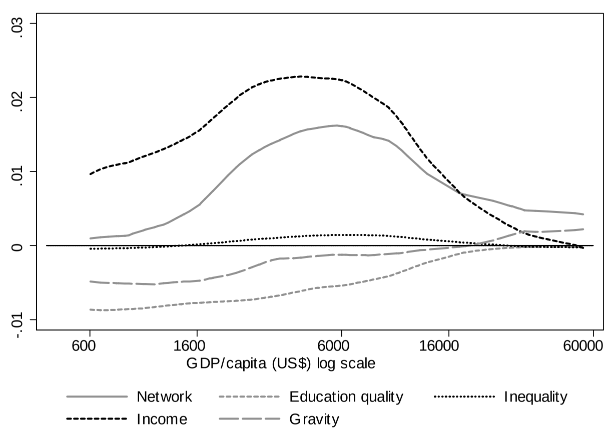
5.a. Effect in level (Δ_X^h) - College graduates



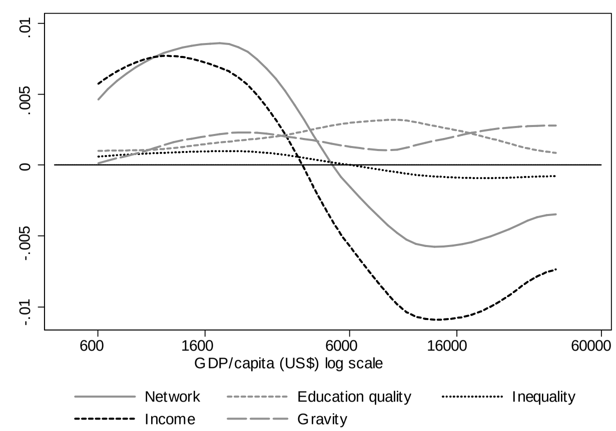
5.b. Effect in variations (δ_X^h) - College graduates



5.c. Effect in level (Δ_X^l) - Less educated



5.d. Effect in variations (δ_X^l) - Less educated



Notes: The curves in figures 5.a. and 5.c. show the difference between the observed average migration rates and the relevant counterfactuals. The curves in figures 5.b. and 5.d. show the variation of the difference curves with respect to income per capita. The curves are smoothed using Epanechnikov kernel estimations at the local mean and bandwidth 0.5. The sample consists of 123 countries.

Our analysis by education level reveals that during early stages of development, migration constraints matter for the low-skilled but these can be attenuated by economic progress. These constraints may include credit constraints (the impossibility of financing emigration costs in poor countries) or institutional constraints (higher emigration costs in poor countries). These findings suggest that a micro-founded models of migration decisions need account for the existence of such constraints, but as demonstrated in Figure 4, the effect of *microeconomic drivers* are limited on the aggregate. This is because their effect on the amplitude of variations in low-skilled emigration rates is rather small (+1.0 percentage point when income increases from $1,000 to $4,000), while their influence is also dominated by the changing skill composition of the population, as discussed in the previous section.

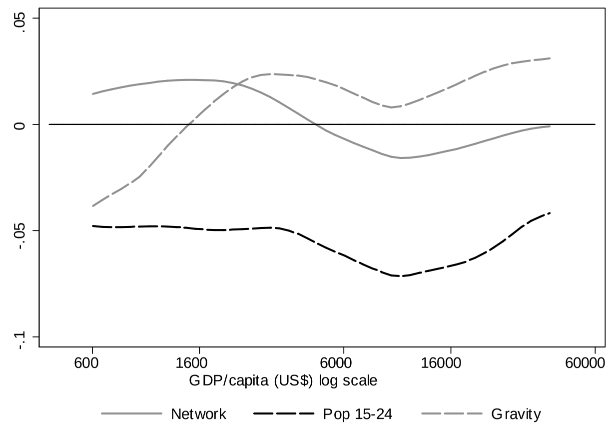
4.3 Modeling implications

Finally, in order to shed light on the microfoundations of migration decisions, we take our *migration accounting* methodology one step further and investigate the skill-specific effect of development on migration aspirations and realization rates. We simulate counterfactual levels of potential migration and realization rates, $\overline{p}^s_{X,i}$ and $\overline{r}^s_{X,i}$, for each group of workers ($s = h, l$) for each country i. As before, we use the significant estimates of the parsimonious regressions. We then estimate the nonparametric trends, $\overline{p}^s_X(y)$ and $\overline{r}^s_X(y)$, using the Epanechnikov kernel method with a bandwidth of 0.5 before finally comparing them with the trends computed using observed values, $\overline{p}^s(y)$ and $\overline{r}^s(y)$. Figure 6 depicts the marginal effect of economic development on aspirations and realization rates, $\delta^s_{\overline{p},X}(y)$ and $\delta^s_{\overline{r},X}(y)$.

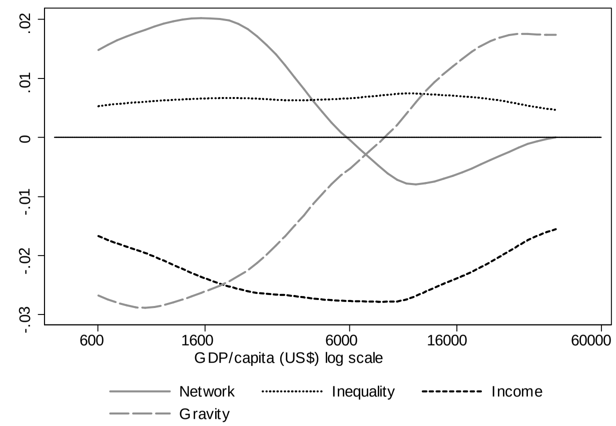
Turning first to the highly skilled - and bearing in mind Figures 2.c and 2.d that reveal that both migration aspirations and realization rates of college-educated individuals decrease with development - Figure 6.a shows that changes in average aspirations are mostly due to the influence of the share of the population aged 15 to 24 (in line with Table 1). Networks have a limited impact at the margin, while gravity drivers tend to increase aspirations for countries above $1,500 per capita. Decreases in distance stimulate aspirations, as shown by the gravity curve. Importantly, *microeconomic drivers* have no significant impact on the aspirations of college graduates. This result is compatible with a micro-founded model of relative deprivation, according to which aspirations are based on the relative position of an individual in a particular social hierarchy, as opposed to the absolute level of an individual's income (as in Stark, 1989 and 1991). Conversely, Figure 5.b shows that the negative effect of development on realization rates is mainly due to *microeconomic drivers* (the income channel). When income increases, the realization rate of the highly skilled decreases, an effect which is partially compensated by the inequality channel. Realization rates are clearly endogenous and decrease with the level of development at origin. This might be due to the fact that the opportunity costs of preparing a migration spell increase with development. For countries with incomes per capita below $10,000, this effect is reinforced by both the gravity channel.

Fig 6. Marginal effect of development on aspirations and realization rates

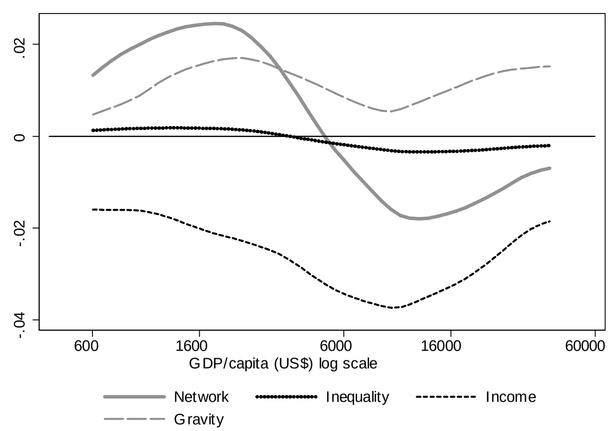
6.a. Effect on aspirations - College graduates



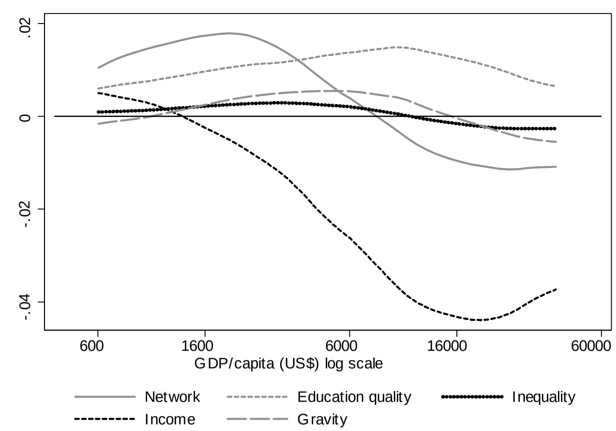
6.b. Effect on realization rates - College graduates



6.c. Effect on aspirations - Less educated



6.d. Effect on realization rates - Less educated



Notes: The curves in figure 6.a. to 6.d. show the variation of the difference curves with respect to income per capita. The curves are smoothed using Epanechnikov kernel estimations at local mean and bandwidth 0.5. The sample consists of 123 countries.

As far as the less educated are concerned, Figure 2.c and 2.d reveal that migration aspirations slightly decrease with development, while realization rates exhibit an inverted-U shaped relationship with a peak at \$6,000 of income per capita. Figure 6.c shows that the effect of development on aspirations is driven by the income channel. Contrary to the case of college graduates, the willingness of the less educated to migrate decreases with income. Gravity and network drivers attenuate these effects, especially in countries where income per capital is lower than \$5,000. With regards realization rates, an increase in development stimulates emigration through the gravity, network and socio-demographic channels at low levels of development. The income channel has an ambiguous effect on realization rates. Increasing income stimulates realization rates below \$1,600 (reflecting lower migration constraints). Above \$1,600 however, realization rates decrease with income as for the college educated. The negative effect of income becomes dominant when income per capita exceeds \$6,000.

These findings have implications for the modeling of migration decisions. They suggest that both aspiration and realization rates result from cost-benefit analyses. At the margin, an increase in development reduces the willingness to emigrate through the income channel (at least for the less educated). In particular, the Gallup data on aspirations (or willingness to emigrate) show that while income disparities and migration costs matter for the low skilled, they exert no significant influence on high skilled individuals. A model of relative deprivation is compatible with these patterns. Realization rates decrease with income at intermediate and high levels of development, especially for the highly skilled. For the less educated an increase in income stimulates realization rates during early stages of development. This finding is compatible with the existence of endogenous migration constraints. Realization rates are clearly not exogenously determined by the legal restrictions imposed by the destination countries. These results are compatible with a two-step model of migration decisions. Aspiration data capture the perceived psychic costs and benefits of emigration of crossing borders. Realization data are suggestive of a decision model wherein the probability of success decreases with the development level of the origin country. This may reflect the fact that the time (or opportunity) cost of preparing for migration (and obtaining a visa) is valued at the market wage of the origin country.

5 Conclusion

Zelinsky (1971) in his seminal paper, was the first to hypothesize an inverted-U shape between migration and development, a relationship that he termed the *mobility transition*, which has subsequently been observed in a variety of settings. Neo-classical explanations have been unable to explain the upward segment of the curve whereby migration increases with development at origin for countries with low or middling incomes per capita. The existence of this section of the curve has therefore constituted a decades-old puzzle for which several potential explanations have been proffered in numerous geographical and historical contexts.

In this paper we analyze rich aggregated micro-data on individual's aspirations and realization rates in a unified multi-country, *migration accounting* setting to address this apparent enigma. Having confirmed the existence of the *mobility transition* non-parametrically, we subsequently use regression analysis to run a horse race between all competing theories underpinning the observed relationship for the first time. Having identified statistically significant variables from this analysis, we simulate counterfactual emigration rates to quantify the relative contributions of each potential driver of the *mobility transition*. Our counterfactual emigration rates are those obtained when one of our explanatory variables is set to the average level prevailing across rich countries, from which we estimate non-parametric trends, which in turn are compared to actual emigration rates.

Our key result is that whereas the contributions of what we term *microeconomic drivers* (i.e. income and inequality effects) are limited, accounting for only 25% of slope of the increasing segment of the *mobility transition curve* in the poorest countries and less than 20% in lower-middle income countries; our analysis clearly demonstrates that a fraction ranging between one-third and one-half of rises in emigration from developing countries are rather driven by the changing skill composition of the working-age population. While our conclusion is somewhat at odds with many pre-existing explanations, it is rather intuitive. Emigration increases with development, because the proportion of college graduates in the native population increases and it is precisely this group that has highest propensity to emigrate abroad.

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