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Item 16 – Population projections by age and sex and level of education

The Impact of Alternative Assumptions about Migration Differentials by Education on Projections of Human Capital

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Abstract

The global flow of people is a critical component of global human capital projections. Mostly due to the lack of adequate data, migration assumptions are commonly constrained to net-migration flows. Moreover, despite strong selection effects, migrants' education is typically assumed to be proportional to the population in the country of origin. This paper presents a new set of population projections carried out using directional migration probabilities in a multi-regional cohort-component framework. We draw on a new set of global bilateral migration flows for 2005-10 developed at the Wittgenstein Centre and the OECD DIOC-E dataset to estimate education differentials in country-specific immigration and emigration flows. We present three alternative assumptions about future trends in education-specific migration flows: the random-migrant assumption that has been used in earlier projections published by the Wittgenstein Centre, a continuation of current trends assumption that maintains education-specific base period intensities of immigration and emigration, and a continuation of current trends assumption that assumes a systematic change in education-specific migration rates as the populations in origin countries become more educated over the course of the projection period, 2010-60. We compare projection results across alternative assumptions about migration differentials by education, whilst constraining the other demographic components of population change to their mid-scenarios.

1 Introduction

International migration has become an integral part of demographic change and economic development. Besides the total number of people moving between countries, increasing attention is being paid to migrants' education level, the consequences of skilled migration for sending and receiving countries, and the degree of labour market integration in host societies. In the context of population ageing and the imminent decline of the labour force in many more developed countries, projecting the future trajectory of global migration and its impact on population size and structure is a timely and important task.

Surprisingly little attention has been given to projecting the future trajectory of the global flow of talent, with the only set of global human capital projections that take into account differentials in migration intensities by level of education being carried out by the Wittgenstein Centre. Global population projections by age and sex are prepared by several international agencies, but mostly due to the lack of adequate migration flow data, these agencies commonly use simplistic assumptions of net-migration measures derived as residuals from demographic accounting. Such simplistic models have a number of shortcomings, including unrealistic net migration age profiles, the danger of negative projected populations, and inconsistencies in the model resulting in net migration not summing to zero across all countries. In human capital projections, net-migration models are typically combined with a random-migrant assumption, disregarding strong selection effects by level of education.

In this paper, we focus on the way migration is handled in human capital projections and the effects of alternative specifications on projection results. A detailed discussion of the base period data for the global human capital projections, the assumptions on fertility, mortality and migration, and projection outcomes can be found in Lutz *et al.* (forthcoming). Rather than comparing the impact of alternative migration model specifications on the total number of migrants, this paper focuses on the addition of the education dimension into a multi-regional cohort component framework. In another paper that presents an comparative evaluation of migration model specifications in global population projections by age and sex, we show that net migration models and bi-regional flow models yield very different projected numbers of migrants and populations (Abel *et al.* (2013)). Here, we pay particular attention to the effects of migrant selectivity and the global educational expansion on projected numbers of (skilled) migrants.

Drawing on a new set of estimates of immigration and emigration flows by three levels of education for about 200 countries, we project the global flow of people by educational attainment in a multi-regional cohort-component framework. We compare our results to those of a traditional net-migration model to explore how the projected number of migrants populations by education differ depending on the way migration selectivity is incorporated in the global projection model. To allow a direct comparison, the other demographic components of population change and educational expansion are constrained to the Wittgenstein Centre medium assumptions.

The paper is structured as follows. The next section outlines the procedure for estimating

education-specific immigration and emigration flows for about 200 countries in the 5-year period 2005 to 2010. Section 3 gives a summary of the spatial patterns and intensities as observed in our flow estimates. The assumptions on future education-specific migration intensities are discussed in Section 4 and Section 5 presents some selected results of the population projections by educational attainment.

2 Estimating global migration flows by education

This section outlines our approach to the estimation of immigration and emigration flows by three levels of educational attainment for almost all countries in the world in the five year period 2005 to 2010. We begin with the total numbers of emigrants and immigrants by sex, which are taken from a new set of bilateral flow estimates developed by Abel (2013). These estimates capture the total number of people who changed their country of residence over the five year period 2005-10. They are harmonised across 200 countries and provide unique insights into the spatial patterns of contemporary migration flows. Given the lack of bilateral stock tables by age, we were unable to produce flow estimates disaggregated by age and thus had to rely on the seven parameter Rogers & Castro age schedule to derive age- and sex-specific flow tables.

The education composition of these flows is estimated from the DIOC-E dataset on education levels of bilateral migrant stock populations, see Widmaier & Dumont (2011) for details. Figure 1 and Figure 2 show the global coverage of the DIOC-E dataset. The bilateral stock table covers almost all countries of origin and most of the key destination countries in the world. Gaps in the data are most prominent for immigration to African and Asian countries. Nevertheless, the DIOC-E dataset, which collates data from censuses, population registers and surveys on the education level of migrant populations by country of birth, is the most comprehensive dataset on the topic that is currently available.

The major drawback of the DIOC-E dataset is that it is based on migrant stock data and thus provides very limited information on the timing of migratory movements. However, for the projections that are carried out in five year steps, we require data on migration flows in 2005-10. In the absence of such flow data by education that are harmonised at the global level, we have to assume that the educational composition of bilateral migrant stock populations closely resembles that of the contemporary bilateral migrant flow. This assumption has its limitations, particularly in countries where a large proportion of the immigrant population arrived a long time ago and with substantially different characteristics compared to contemporary migrants. To reduce this bias, we use data on the education composition of immigrant populations with a duration of stay of 5 years or less wherever such data are available in DIOC 2005/06. This approach of taking into account only more recent arrivals yields a somewhat better estimate of the contemporary education composition of migrants.

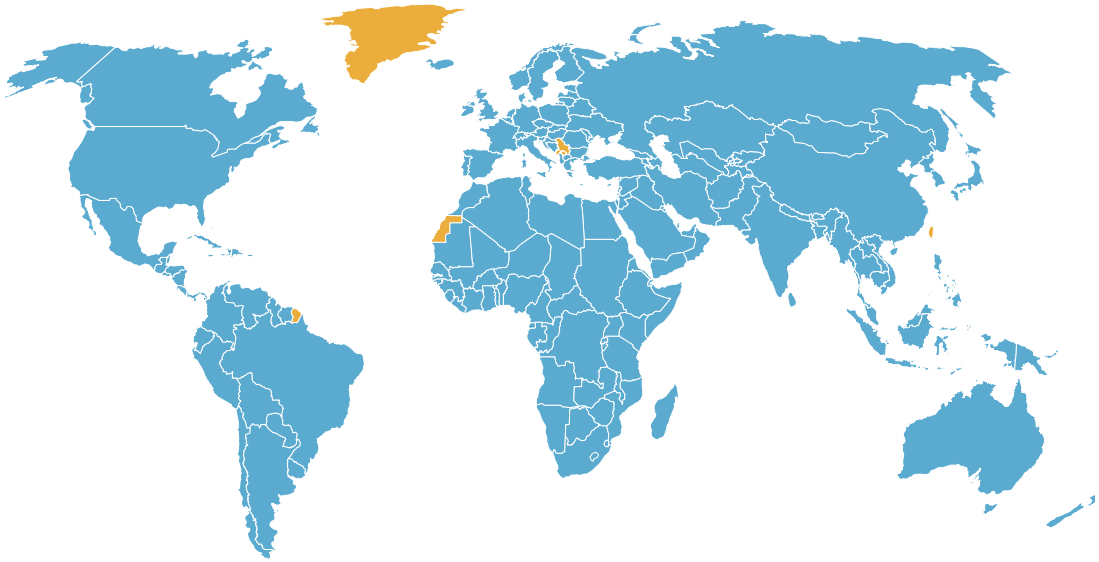

Figure 1: Coverage of DIOC-E data on emigration by education (orange = no data)

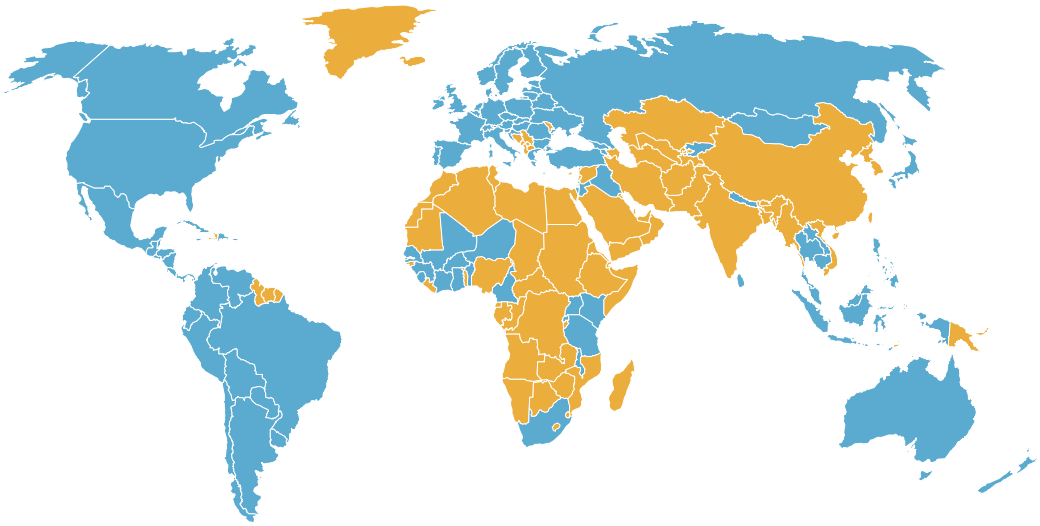

Figure 2: Coverage of DIOC-E data on immigration by education (orange = no data)

Figures 3 to 5 show the key origin and destination regions of the world's migrants by level of education. Immigrants with less than completed secondary education are more evenly distributed across destination regions than higher educated migrants, with North America, Africa, Europe and West Asia receiving similarly large shares of the total migrants. The origins are more limited, with most migrants coming from Latin America (including Mexico), Africa and South Asia. The better educated the migrants, the more spatially focussed the spatial patterns

are on destinations in Europe and North America. Remarkable is the even distribution of emigration flows among people with completed secondary education across regions (Figure 4), whereas emigration flows among the post-secondary educated are highly focussed on South Asia.

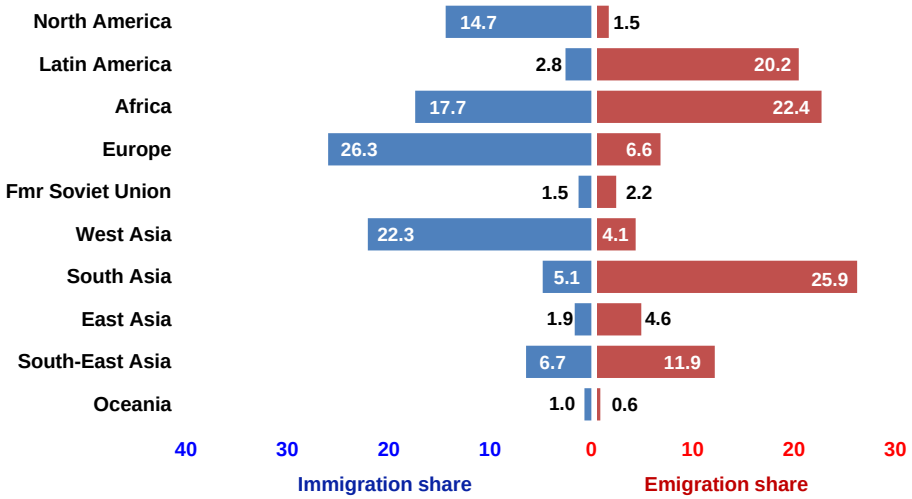

Figure 3: Distribution of immigrants (blue) and emigrants (red) with less than secondary education, by world region, 2005-10

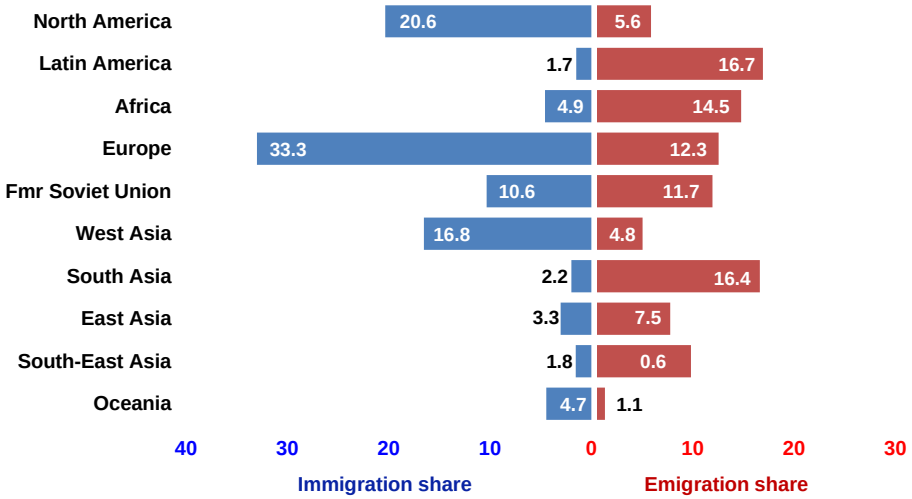

Figure 4: Distribution of immigrants (blue) and emigrants (red) with completed secondary education, by world region, 2005-10

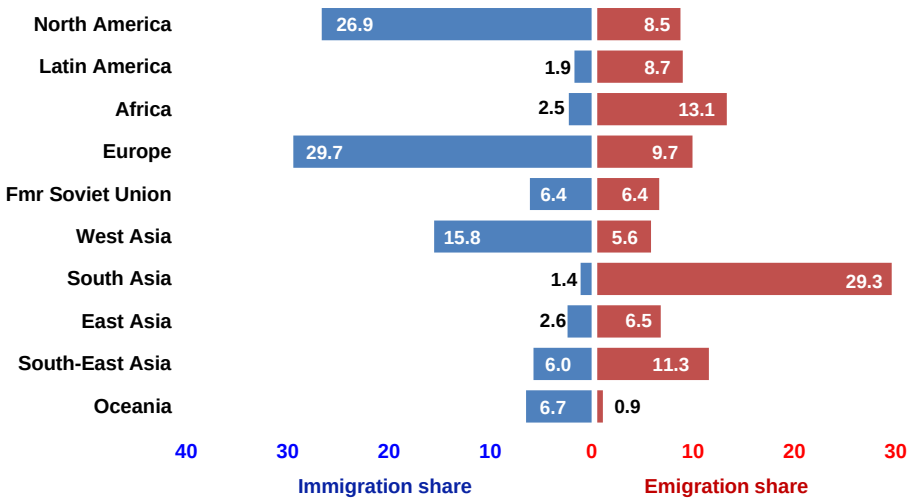

Figure 5: Distribution of immigrants (blue) and emigrants (red) with post-secondary education, by world region, 2005-10

Figures 6 and 7 give a summary of the spatial patterns of migration flows of people with less than secondary education (Figure 6) and of people with at least secondary education (Figure 7). Using an IPF routine, we estimated region-to-region flows based on the margins in the flow table that were derived using the procedure outline above. The plots are created using Circos Krzywinski *et al.* (2009) and arrange the origin and destination regions in a circular layout. Each region is assigned a unique color, which is used to indicate the directionality of flows: The flows have the same colour as their origin. The width of the flow indicates their size. The direction of the flow is also shown by the gap between flow and country: the smaller gap denotes the origin; the larger gap denotes the destination. Tick marks show each country's gross migration in 100,000s. The circular plots clearly show the high degree of migration selectivity, with emigration from Africa being mostly low-skilled and immigration to North America predominantly higher-skilled. The example of South Asia highlights the destination-dependence of educational selectivity, with flows to North America and Europe being more highly skilled, whereas flows to Western Asia are predominantly low-skilled. This pattern may well explain the high spatial focus of emigration flows on South Asia shown in Figure 5.

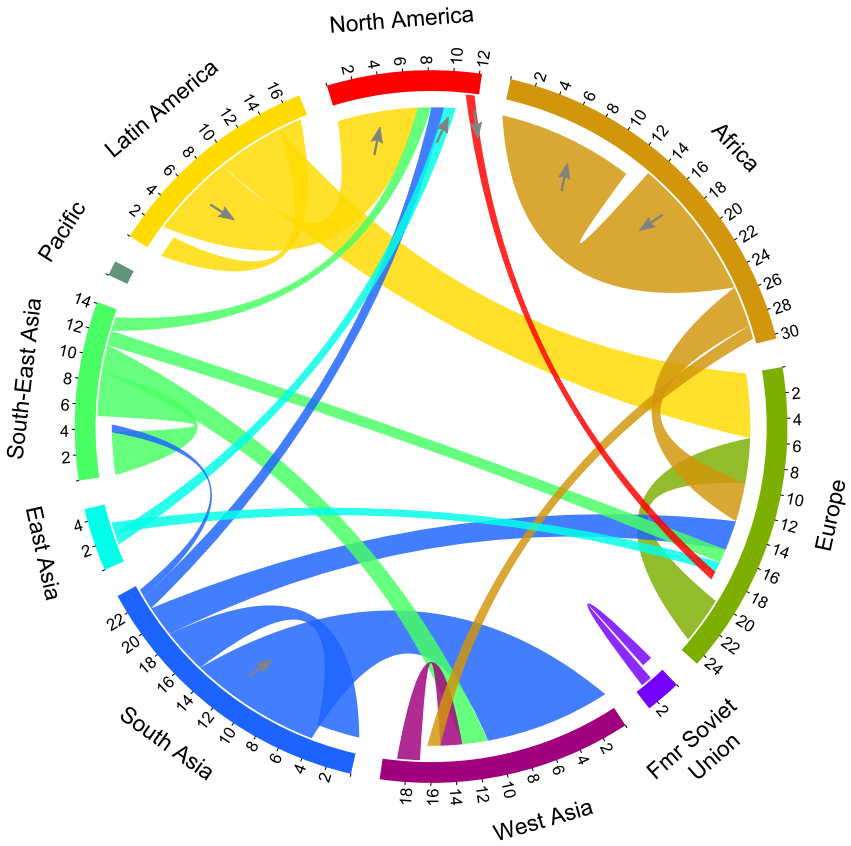

Figure 6: Circular plot showing estimated international migration flows for people with less than completed secondary education between world regions in 2005-10. Origin and destination regions are represented by the circle's segments. Each region is assigned a color and region-to-region flows have the same colour as their origin. The width of the flow indicates their size. The direction of the flow is also shown by the gap between flow and region segment: the smaller gap denotes the origin; the larger gap denotes the destination. Tick marks show each region's gross migration in 100,000s.

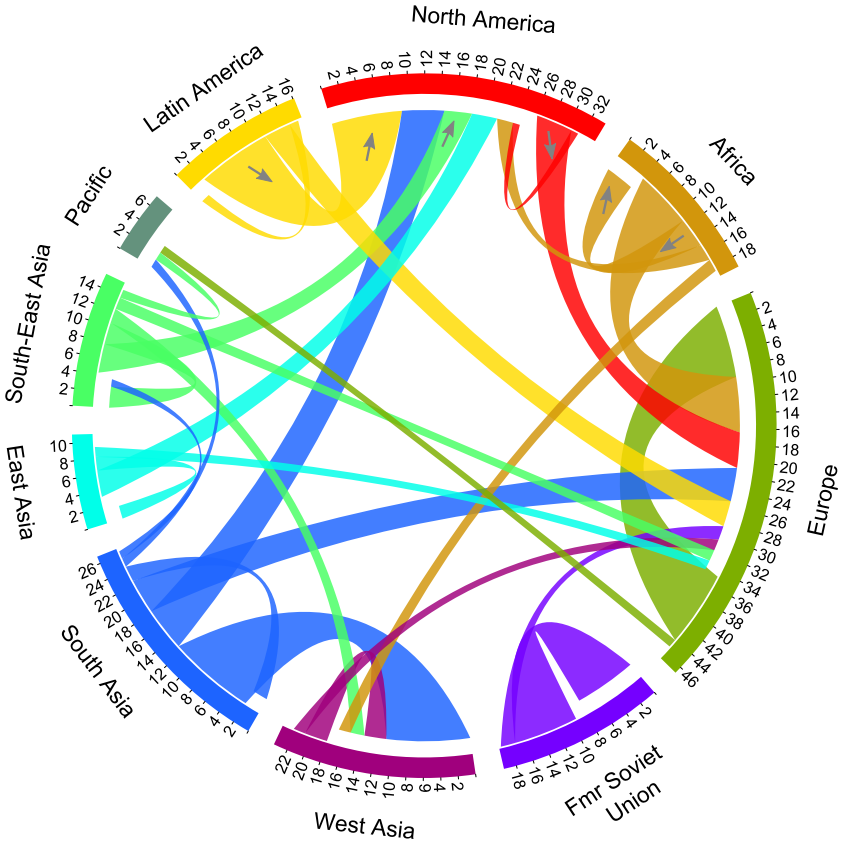

Figure 7: Circular plot showing estimated international migration flows for people with at least completed secondary education between world regions in 2005-10. Origin and destination regions are represented by the circle's segments. Each region is assigned a color and region-to-region flows have the same colour as their origin. The width of the flow indicates their size. The direction of the flow is also shown by the gap between flow and region segment: the smaller gap denotes the origin; the larger gap denotes the destination. Tick marks show each region's gross migration in 100,000s.

In the final step of the procedure for estimating base period migration intensities for use in human capita projections, we calculate rates of immigration and emigration in the base period 2005-10, using the Wittgenstein Centre dataset on educational attainment among populations in about 175 countries. Figure 8 gives a snapshot of this comprehensive dataset on educational attainment. Data are harmonised to the ISCED education classification. The patterns broadly follow conventional thinking on contemporary education differentials between the more educated societies in North America, Europe and Australasia, and the less educated countries in Africa and South/South-east Asia.

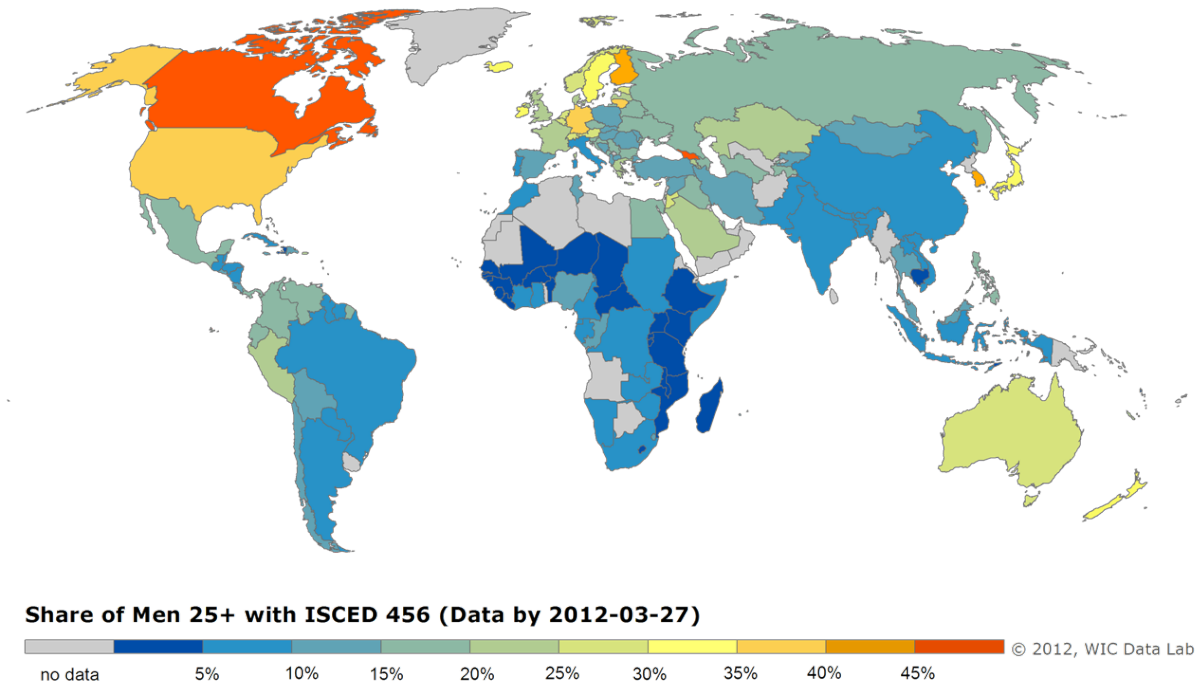

Figure 8: Wittgenstein Centre Dataset on global levels of educational attainment: Post-secondary education among men aged 25 and over in 2000-2010

3 Assumptions on future education-specific migration intensities

To reflect the difficulties in anticipating changes in the spatial patterns and intensities of international migration flows over the next 50 years, our medium migration scenario assumes base period migration intensities to remain constant over the projection horizon. To take into account changes in the size of origin populations over the projection period, we assume constant rates rather than numbers of migrants. The details of this assumption are discussed in Lutz *et al.* (forthcoming) and Abel (2013). Adding the education dimension to the constant rates assumption requires additional adjustments to take into account the likely global expansion of education over the coming 50 years. If base period emigration and immigration intensities by education were held constant over the 50-year projection period, improvements in the educational structure of origin populations would amplify the projected number of emigrants among the higher educated groups.

Figure 9 shows for each country the ratio of the emigration rate for post-secondary educated (ER tertiary) to the emigration rate for primary educated (ER primary) by the proportion of post-secondary educated in the origin population (x axis) in 2005-10. The ratio decreases strongly as the proportion of post-secondary educated in the population increases from zero to 20 per cent.

Any further improvement in the educational level of the origin population has a negligible impact on the intensity of highly-skilled emigration relative to low-skilled emigration. Emigration rates in countries with a low proportion of post-secondary educated tend to be highest for post-secondary and lowest for primary educated, reflecting the small size of the denominator (i.e. population with post-secondary education). For countries with a more educated population, the trend tends to be the opposite, with rates being highest among the primary educated. When projecting the future number of migrants by level of education using a constant-rates approach, we have to take into account systematic changes in the emigration rates as the education level of the countries improves. We thus assume in our projections that for countries with less than 20 per cent post-secondary educated in 2005-10, the ratio decreases as the education level in the country improves. The decrease is assumed to continue until the ratio ER tertiary to ER primary reaches a target value of 0.5 at the same time as 30 per cent of the origin country's population is tertiary educated. Figure 9 gives the example of Cameroon, which is assumed to experience in increase in the proportion of post-secondary educated (aged 25 plus) from 4 per cent in 2010 to 11 per cent in 2060.

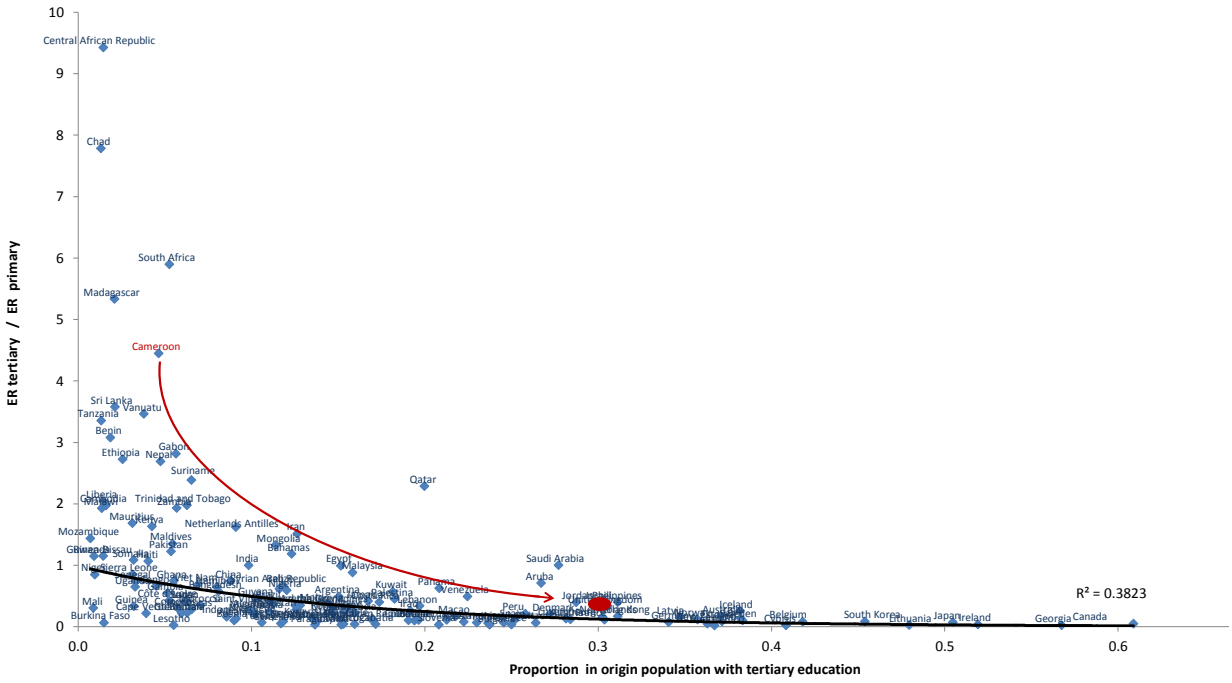

Figure 9: Rratio of emigration rate for post-secondary educated (ER tertiary) to emigration rate for primary educated (ER primary) by the proportion of post-secondary educated in the origin population in 2005-10. Red dot indicates target value assumed in projections, red arrow indicates the assumed pathway until target value is reached.

4 Results

Contrary to the common perception of a rapid increase in international migration, our projections suggest that the global number of people who change their country of residence over a five year period is projected to increase only slightly from about 40 million in 2005-10 to 47 million in 2040-45. Mainly due to population ageing and the assumed decrease in migration propensity with age, the global number of migrants is projected to decline from 47 million in 2040-45 to 46 million in 2055-60.

Our projections suggest a shift in the education composition of migrants towards higher levels of educational attainment. Using a flow model with immigration and emigration rates assumed to remain constant, rather than assuming net numbers of migrants yields a stronger effect of changes in population size, age structure and educational composition on emigration numbers. For example, Malaysia is predicted to grow steadily, experience a rapid educational advancement, and record only minor ageing of its population. Therefore, the predicted total numbers of emigrants are almost stable over the projection horizon, with the emigration flow becoming increasingly educated.

The world's population is in the midst of a fundamental transition from population growth to population ageing and educational expansion. Our projections show that international migration flows are likely to play a major role in the redistribution of human capital and, consequently, in determining the future trajectory of major emigration and immigration countries with regards to their education structure. While it seems unlikely that we will see the development of completely new migration patterns over coming decades, increasing education levels of populations are likely to affect the size and skill level of country-to-country migration flows and vice versa.

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