The impact of circular migration on source countries
A simulation exercise

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Abstract

Circular migration schemes are often thought of having the capacity to deliver the benefits of migration for source countries while accommodating the labour needs of receiving countries, without hurting the political sensitivities in those countries. Despite this, quantifications of the overall effects of such type of migration on home countries are scant. We use a global integrated assessment model in order to provide some quantification of the possible effects of different types of circular migration patterns and compare them with traditional permanent migration. We focus on the multiple channels through which migration may affect development outcomes in home countries and calibrate the model following recent empirical evidence on such effects in order to capture these effects. Our results suggest that migration (whether permanent or temporary) is generally beneficial for income per capita as well as poverty reduction in the home countries as it raises remittances, labour productivity, trade and foreign direct investment as well as provides incentives for human capital accumulation. These channels are likely to easily offset the negative impact on the skills' base ('brain drain'). In the simulations for four countries (Sierra Leone, Ghana, Vietnam and Moldova) circular migration programmes yield better outcomes than permanent migration due to the productivity gains induced in the home countries by returning migrants.

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1. Introduction

There is convincing evidence that migration can be a powerful pro-development tool mainly as it directly increases the incomes of the migrants (who remain citizens of the source country even after migrating). For example, Clemens et al. (2008) show that an individual who moves from Nigeria to the US increases her earnings seven- to fifteen-fold and similar effects can be found for the majority of developing countries. There are other more negative effects of migration for source countries such as the loss of skills, but on balance migration appears to raise welfare in sending countries (Calì, 2008).

However immigration policy in receiving countries is hardly concerned with the supposed impact of migration for source countries, and in fact raising restrictions to immigration has been a common policy response to the recent global financial crisis in Europe and elsewhere.[2] This comes at the end of a period of increasingly adverse attitude towards immigration especially in high income countries. Temporary migration schemes, including circular migration, have sometimes been advocated as a politically more palatable policy for receiving countries than permanent migration. These schemes, the argument goes, would deliver the benefits of migration for source countries while accommodating the labour needs of receiving countries, without hurting the political sensitivities in those countries.

Unfortunately quantifications of the overall effects of such type of migration on sending countries are scant to date, thus limiting the extent to which one is able to adequately evaluate this policy option. Winters (2002) provides an oft-quoted quantification of the potential benefits of temporary migration via a global computable general equilibrium (CGE) model. He estimates that an increase in developed countries' quotas of temporary migrants equivalent to 3% of their labour force would raise world's income by US$ 150 billion. The results are mainly driven by increase in income for the temporary migrants, who are employed more productively than in their home country. However the impact of temporary migration in source countries is not an issue tackled by the model. Moreover the simulation is performed only on the global economy and not on specific countries.

This study aims to provide a quantification of the possible benefits and costs of circular migration for different source (developing) countries and regions by developing simulations on the basis of an integrated assessment model connecting social, economic and environmental dimensions. In order to do so we first define and characterize circular migration in today's policy context (section 2); then we identify the various mechanisms through which circular migration could affect the development of source countries (section three). We base the exercise on the review performed by Calì and te Velde (2009), who identify a number of such channels, including the impact on domestic capacity, remittances, labour markets, incentives for human capital formation (brain gain), trade and foreign direct investments, return migration.

[2] Recent measures that have been approved or discussed include the introduction of economic needs tests for employing migrants and the limitation of the right to family reunion for migrants already working in the country (Calì, 2009).

We then aim to incorporate those channels into an integrated assessment model to simulate the effect of circular migration on development in source countries. The International Futures (IFs) developed by Pardee University is a particularly suitable tool for such an exercise. The model includes a detailed description of the economies of more than 100 countries over the world and allows modelling a number of different economic channels across countries (see section three).

We model two different types of scenarios. In the first set of scenarios we modify only the net emigration rate for all countries. Then for a selected sample of countries (Ghana, Sierra Leone, Moldova and Vietnam) we modify a larger number of parameters to simulate the richer set of temporary migration impacts. Table 1 below provides an illustration of the expected effects of circular migration (assuming a skilled migration relatively to the source country's population) and the corresponding parameters to modify to simulate such effects.

2. Circular migration: definition and policy context

2.1 Defining circular migration

Circular migration is a fluid concept which recently has often overlapped with temporary migration. The key characteristic that distinguished these types of migration from the traditional permanent migration is their temporary nature. In the case of circular migration, the temporariness feature is usually accompanied by the repetitiveness of migration over time. De facto circular migration is the most common migration typology among countries whose borders are open by agreement, such as the EU countries and Australia and New Zealand, or where national borders are not enforced, such as between Mexico and the US until the early 1990s (Newland et al., 2008).[3] However circular migration is perhaps most commonly understood when there are specific programmes in place that facilitate this type of migration pattern, such as seasonal programmes, non seasonal circular programmes for low- and semi-skilled, and circular programmes for professionals. We will describe some of these programmes below.

Following Agunias and Newland (2007), a useful way to characterise circular migration is to differentiate both departure and return as either permanent or temporary. The former term refers to those migrants who have permanent residency or citizenship in their adopted countries. Table 1 presents the various types of circular migration. The North-Western quadrant depicts those situations in which permanent migrants decide to return permanently to their home country, such those Indian IT specialists who started to return to India from the US in the early 1990s and helped spur the development of the Indian IT sector. This is different to the typology represented in the North-Eastern quadrant which characterises temporary migrants returning permanently to their home countries, such as Indian IT programmers who came to European countries on a temporary basis at the dawn of the past millennium to solve the IT Y2K bug (Calì and te Velde, 2009).

[3] These types of circular migration underscore the importance of the tightness of borders in constraining the development of circular migration patterns. Migrants are often inclined to stay voluntarily in the destination country for a limited duration of time, then return home or move elsewhere and then migrate back again. However, given the difficulty of (re-)entry, they usually end up being trapped in the destination countries waiting for an occasion to be legalized (e.g. through an amnesty).

On the other hand there are instances - south-west quadrant - where permanent migrants return regularly to their native countries, such as those migrants of Taiwanese, Indian, or Chinese descent settled in Silicon Valley, California that return for business purposes to their home countries (Saxenian, 2002). These so-called "astronauts" (among the local Chinese) are effectively transnational entrepreneurs who set up subsidiaries, joint ventures, subcontracting, or other business operations in their countries of origin. Finally temporary return can also occur in the case of temporary migrants, which is the case in circular migration programmes proper (south-east quadrant). An example of this type is the seasonal agricultural worker programme (SAWP) of Canada, which brings every year around 20,000 migrants to work in the Canadian agricultural sector for a period between 6 weeks and 8 months (Newland et al., 2008). The programme, which has 60% of the workers from Mexico, offers repeat employment if both the migrant and the employer comply with the programme's requirements.

Table 1: Typology of Circular Migration

	Permanent Migrants	**Temporary Migrants**
Permanent Return	Return of Indian migrants from the US (helping to spur the IT industry development).	Indian IT programmers moving temporarily to Europe to solve the IT Y2K bug.
Temporary Return	Taiwanese "astronauts" from Canada and Silicon Valley, California.	Seasonal agricultural workers to Canada from Mexico.

Source: Adapted from Agunias and Newland (2007)

Given the limitation of a modelling exercise in representing all these various types of migratory flows, for the purpose of this paper we focus on the temporariness of migration as the main distinctive feature of circular migration vis-à-vis permanent migration without return.

2.2 Current policy context

Circular migration programmes have been historically used by governments to fill domestic skills' gaps in their own countries. In the post-World War II period the sustained growth of Western economies generated skills' shortages at home, to which some countries responded by the creation of temporary migration schemes. The *Bracero programme* providing manual labour from Mexico to the US in the 1950s and 1960s, and West Germany's *Gastarbeiter system* (a series of bilateral agreements with European countries and other Mediterranean countries mainly in the 1960s and 1970s) probably represent the most popular types of such schemes. In particular the Bracero programme provided almost half a million workers from Mexico to the US to be employed essentially in agriculture. These early guest worker programmes sometimes turned into permanent migration programmes for those migrants (and their families) who managed to settle in the host country, as it happened e.g. for the *Gastarbeiter.*

Consistently with the current general anti-immigration sentiment in policy circles globally, governments in recent years have not made intense use of bilateral migration programmes in order to fill their own countries' labour market gaps. In a survey of 92 host countries run by the International Labour Organisation (ILO) in 2003, Abella (2006) reports that the majority of high income countries offered some forms of special admission schemes, which grant temporary migration permits to specific categories of workers.[4] On the other hand middle and low income countries had very few such schemes (Table 2).

Table 2: Number of countries admitting workers under special schemes, circa 2003

	High Income	Upper Middle Income	Lower Middle Income	Low Income
Surveyed countries	31	18	26	17
Professionals, scientists, managers, other highly skilled	11	1	2	0
Contract workers	6	2	0	0
Seasonal workers especially for agriculture	6	2	0	0
Trainees	16	0	0	0
Working holiday makers	7	0	0	0
For employment in priority sectors esp. exports and small industries	7	5	6	3
For employment in priority regions	1	1	2	0

Source: Abella (2006)

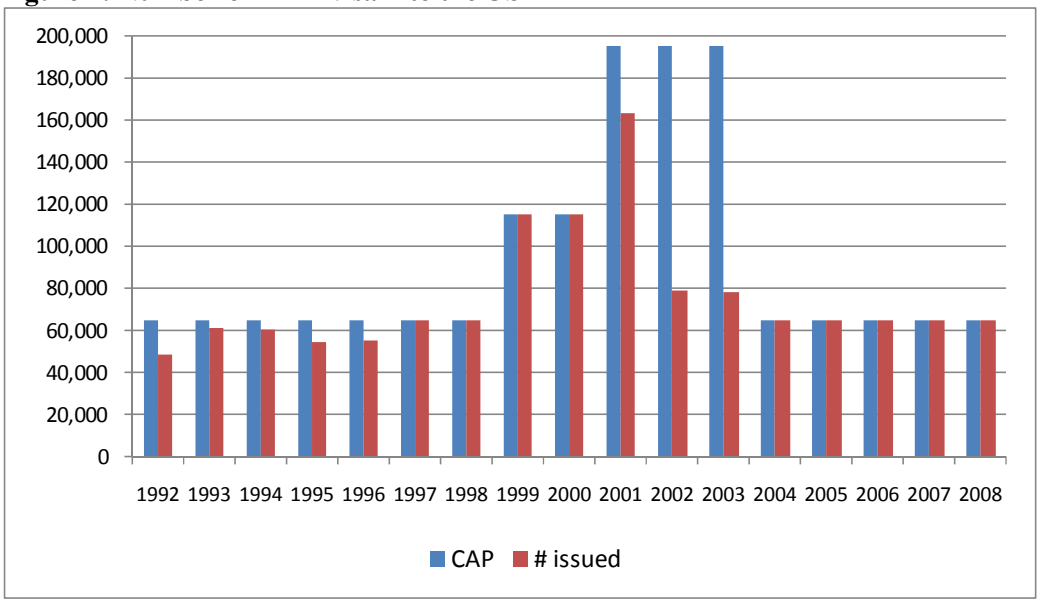
However even the programmes offered by high income countries involved only a relatively small fraction of the overall migrant workforce. For example one of the most popular of such temporary programmes, i.e. the H1B visa for foreign professionals to work in the US, offers only 65,000 places per year. This number is considerably smaller than what it used to be at the beginning of the decade (Figure 1) and the current H1B visa cap is exhausted well in advance of its deadline, confirming that the US economy needs more of this type of migrant workers that it currently allows.

According to the review of Newland et al. (2008), a lot of circular migration schemes offered by developed countries are essentially seasonal migration programmes (which represent only a fraction of the overall spectrum of temporary migration programmes as highlighted in Table 2). Most of these programmes involve some forms of cooperation between the sending and the receiving countries to ensure the temporariness of the migration pattern. In case of the Canadian

[4] Again, these schemes would turn into a means for permanent migration for some of the participants that settled in the host country.

SAWP sending countries are also responsible for recruiting the workers and monitor their living and working conditions. According to Verduzco (2007) these arrangements ensure a higher quality of life to the Mexican migrants relative to the large number of undocumented Mexican migrants who often depend on smugglers. Other seasonal programmes for unskilled and semi-skilled workers include Spain's *Contingente de Trabajadores Extranjeros*, which has a nine months cap as the maximum period to work in Spain in a year, New Zealand's programme for 5,000 seasonal agricultural workers from the Pacific Islands per year, Britain's Seasonal Agricultural Workers Scheme with a quota of 16,250 foreign agricultural workers per year, and the United States' H-2B visa programme for less skilled non-agricultural seasonal workers. Germany also has recently developed a seasonal migration programme with eight neighbouring new accession countries with an annual quota of 330,000 workers mostly employed in agriculture for up to ninety days per year.

Figure 1: Number of H-1B visa into the US



Source: Department of Homeland Security, National Foundation for American policy, American Council on International Personnel

There are also other non-seasonal circular programmes, often as the result of bilateral agreements between countries, such as those between Mauritius and Canada, Guatemala and Canada, and Ukraine and Moldova (Omelaniuk, 2010). Persian Gulf countries rely heavily on relatively unskilled foreign workers and thus have large circular migration programmes mostly with South Asian countries.

As evident in Table 2, many high income countries have set up circular migration programmes for high-skilled workers, such as professionals, scientists, managers, entrepreneurs and so on. Host countries are usually less strict in enforcing the temporariness of these types of programmes relative to those involving less skilled workers with the view of benefiting from the presence of high skilled individuals. In fact international organisations and home country governments have started to promote return migration (Newland et al., 2008). We will see in the next section why it

can be important for those skilled migrants to go back for the benefit of home countries, but also why the very emigration of these high skilled individuals needs not be detrimental for home countries.

3. Expected effects of circular migration on source countries

The main benefit from migration is the enhanced earning opportunities that this guarantees to the migrant's household of origin. Migration has historically been a livelihood strategy for large numbers of households in developing countries. These positive returns to migration can be fairly large and are typically appropriated by private individuals and their households of origin (through remittances and enhanced access to capital). For example Clemens et al. (2008) calculate that an individual that an individual that moves from Nigeria to the US increases her earnings by between seven and fifteen times.[5] Such increases explain a large part of recent poverty reduction achievements in many developing countries. Around seven out of ten Haitians who have been lifted out poverty in the last decade have done so by migrating.

Aside from these direct positive effects which are essentially appropriated privately, migration has a host of other more indirect effects on the welfare of home countries. The net impact of such effects depends crucially on various characteristics of migration, including the size of migration stream, the source country's characteristics and the type of migration (e.g. skilled vs. unskilled). It is very hard to generalise about the complex effects of migration on sending countries' welfare. Moreover, it is important to distinguish between static and dynamic effects of migration, which – as we will see below – can have different directions.[6] By and large most of these effects apply equally to both permanent and circular/temporary migration but there are certain distinctions, chiefly with respect to the difference in return migration rates.

'Brain drain'

The main static effect of migration on the home economy as a whole operates via a reduction in its available supply of labour. In developing countries where domestic skills are scarce the static effects of out-migration flows, which are usually skilled relatively to the home country population, may be detrimental. For example, 31.4% of African immigrants in the OECD were tertiary educated in 2000 (vis-à-vis 23 % in 1990), whilst the share of tertiary educated workers in Africa was 3.6% (2.2% in 1990). Small countries are most affected by high tertiary migration rates: two out of three tertiary educated Cape Verdeans were living out of their country in 2000 (based on Docquier and Marfouk, 2006). And some skilled groups, such as health professionals, are particularly affected by high migration rates: 28% of total physicians from SSA (and 75% from Mozambique) worked abroad in 2000 according to data collected by Clemens and Patterson (2006).

[5] This is computed as the pure effect of working in the US instead of in Nigeria for otherwise identical workers controlling for the self-selection of migrants as well.

[6] For example while the static effect of the out-migration of a skilled worker is a corresponding loss of skills in the home country, the dynamic effect may be positive through the incentives that this migration may create on the education investments of the residents of the home country.

The impact of circular migration programmes relative to traditional permanent migration on domestic capacity depends on the size of labour force migrating and the length of the period (Calì and te Velde, 2009). If circular migration schemes lead to a sudden increase in emigration of specific skilled workers scarcely available in the source country, then the brain drain effect may be more severe than with permanent migration. It is different if such schemes cover countries with an excess supply capacity in that skill. One example of this is the temporary immigration scheme for Indian information technology workers in the UK and in Germany. While there were schemes for temporary migration which increased the emigration rate of Indian IT personnel, India did not appear to have suffered serious skill shortages in the IT sector, which continued to grow fast. However, as circular migration schemes usually stipulate that migrants return to the home country, this should limit the eventual shortage of supply capacity in the home country in the long-run.

Return migration

The counterpart of the static effect on domestic capacity of out-migration is the static effect on domestic supply capacity if and when migrants return to their home country. This has obviously a direct impact on the average level of skills in the home country. In addition as migrants are often exposed to new technologies and acquire valuable skills while abroad, their return can offer benefits to the sending country (Domingues Dos Santos and Postel Vinay, 2003).[7] Calì and te Velde (2009) argue that the health sector is one where learning skills abroad may be particularly relevant, as migrants may have access to new technologies, career development schemes, and more advanced management systems. This experience may be an invaluable source of ideas and expertise in the upgrade of the sending country's health sector. A study of migration of health workers from the Pacific region indicated that there were some gains to migration in that many health workers returned from overseas with additional skills (and with capital that was invested in housing and businesses), thus providing both individual and national benefits (Connell, 2003).

Return migration has reached quite high rate for the Caribbean. Some estimate that 50% of immigrants into the UK have moved on within 5 years. However, return migration has been low and decreasing for areas such as SSA. The average number of African nurses going back every year has decreased from over 100 in the mid-1990s to around 40 in the period 2003-2005. The decline has happened in spite of the increasing number of African nurses employed in the UK (Calì and te Velde, 2009).

Return migration can also be important to increase access to capital for productive activities. Migrants typically save while working abroad and then possibly re-invest part of these savings if

[7] The realisation of the benefits from return migration through skill acquisition depends on a series of conditions. First, the extent to which the newly acquired skills are appropriate to the home environment. For example, Katseli et al (2006) note that Filipino nurses employed as nannies in rich countries may not significantly enhance their nursing skills to be eventually used upon return. Second, the impact of return migration would also depend on how productively the new skills are deployed upon return. In a survey conducted on Batswana nurses, Thupayagale (2006) found that returning nurses sometimes have to wait for over six months before they can be re-employed and the work experience abroad is not reflected in their new employment scale. These are part of the reasons that induce returning migrants to decide to emigrate again (Thupayagale, 2007).

and when they return home. Mesnard and Ravallion (2001) note that savings accumulated abroad are very important in explaining business start-ups by returning migrants in Tunisia. Dustmann and Kirchkamp (2002) report that half of returning Turkish migrants up to 1984 had started their own business.

In as much as return migration, especially of the highly skilled, is beneficial to the sending country, circular migration programmes may have a positive effect as it increases the return rate of migrants. Data on the return rate of migrants (both skilled and unskilled) are very scarce. The little evidence available reveals higher and earlier return migration among migrants from higher income countries (see Borjas and Bratsberg, 1996 on the US; and Edin et al., 2000 on Sweden).

'Brain gain'

While the static effect of out-migration – by reducing the available skills' supply in the source country – is usually negative ('brain drain'), its dynamic effect – by creating incentives to generate human capital – is likely to be positive ('brain gain'). As noted by Calì (2008) there are two arguments that may question the assumption that the net effects of migration on skills are negative for the sending country. First, there are doubts that these skilled migrants would have been able to use their skills productively in the source country. After all, the lack of adequate opportunities is often the key factor in a migrant's decision to leave.

Second, and more importantly, what really happens to the availability of skills in the source country in the absence of migration? Growing evidence suggests that migration can act as a stimulus to the skills base. By raising the expected returns on education, the opportunity to migrate can drive the acquisition of skills, particularly in certain professions. Evidence on skilled migration from Cape Verde suggests that migration has encouraged the accumulation of human capital. Almost 40% of Cape Verdean university graduates would not have enrolled in university had they not had the opportunity to migrate (Batista et al., 2010). Importantly the authors find that a shock decreasing migration by 9 per cent reduces the educational attainment of non-migrants by 7 per cent. This positive impact is also consistent with the findings of Chand and Clemens (2008) in the Fijian context.

What evidence is available on the net effect of migration on skills' availability in the home country? Macro evidence based on cross-country analysis suggests a net average positive effect of migration on human capital and thus on growth (Beine et al., 2008). However this effect is heterogeneous across countries and the gains are concentrated in a handful of countries in the sample, which include the largest countries (India, Brazil, Pakistan among others), representing 80% of the sample population. On the contrary the brain drain appears to have a negative impact on countries where the migration rate of the highly educated is higher than 20% and/or where the proportion of highly-educated in the total population is below 5%.[8]

[8] Despite the majority of the evidence points to an overall positive effect of migration on human capital formation, there seems to be no consensus on the issue yet. For example, based on static analysis, Schiff (2005) shows that the size of the brain gain and its impact on welfare and growth are likely to be significantly smaller than found in the literature and may even be negative.

Trade and FDI

Migration may have other more indirect positive effects on the source country via increasing its exports of goods and services. The Diaspora may help to create business and trade networks, which have been shown important to raise bilateral trade in goods (Gould, 1994; Rauch and Trindade, 2002), but they are just as valid for trade in services. For example, this is the case of the promotion by migrants of inbound tourism and of well known carnivals and other festivals in the Caribbean (see also Thomas-Hope, 2002). Jansen and Piermartini (2009) identify various channels through which permanent and temporary migration may raise merchandise trade flows:

- migrants prefer goods they were used to consuming at home, and may import from the country of origin
- migrants possess knowledge about their country of origin that makes matching/network search costs lower
- migrants facilitate a stronger enforcement of international contracts.

The authors provide evidence on the trade-inducing effect of migrants finding that temporary migrants tend to (positively) affect bilateral trade more than permanent migrants. A 10 per cent increase in the number of temporary migrants from a country raises US exports to that country by between 1 and 2.3 per cent (between 0.4 and 1.3 for permanent migration) and US imports from that country by 1 to 3.5 per cent (between 0 and 1.5 for permanent migration). One way to interpreting the differential impact between permanent and temporary migrants is that the latter may maintain more solid links with their country of origin given their intention (or obligation) to go back.

For similar reasons, migration may also spur investment flows to source countries, as migrants can serve as a conduit of information across national borders, reducing the costs of obtaining information and thus lowering the fixed cost of undertaking foreign investments. Javorcik et al (2010) estimate that a one percent increase in the migrant stock is associated with a 0.35 – 0.42 percent increase in the FDI stock. The effect appears to be stronger for skilled migrants, that is, those with at least a college education. A one percent increase in the number of migrants with tertiary education increases FDI by 0.41 – 0.52 percent.

Remittances

Along with the individual and household level effects described above, remittances sent home by migrants can also have a positive impact at the national level. Along with the individual and household level effects, remittances sent home by migrants can also have a positive impact at the national level. Official remittances to developing countries stood at more than US$316 billion in 2009, which despite their drop was a level much higher than that of international aid. Adding remittances through informal channels, which are estimated to be over 50% of the official estimates makes remittances the largest source of external capital in many developing countries. Moreover remittances are fairly resilient to external shocks, as the recent global crisis demonstrates. Remittance flows are estimated to have dropped by around 6% in 2009 (World Bank, 2010), showing more resilience than other external flows including capital flows and trade. This source has been on the increase across all developing regions.

Its impact on source countries goes beyond the receiving household and extends to the macro-economy. Straubhaar and Vadean (2005) argue that remittances may be more beneficial than official development assistance and foreign direct investment, as their use is not tied to specific investment projects with high implementation content, they do not entail interest payments and they are likely not to be repaid.

The extent to which remittances may have beneficial effects on the economy crucially depends on the way these funds are used. The most important distinction in this respect is that between productive (investment) and unproductive (consumption) use; the main argument being that productive investments increase productivity and thus economic activity. A case of concern is that remittances are sometimes used to stimulate consumption rather than investment. The debate on productive versus unproductive use is based on the assumption that the former benefits directly the host economy by increasing its productive capacity. However, to the extent that remittances can have indirect multiplier effects, even remittance-financed consumption may have growth-enhancing effects on the economy. These multiplier effects have a beneficial impact on the growth of the economy subject to the condition that the supply response is sufficiently elastic, or equivalently that there are no constraints to expansion of domestic production.

As with all sources of large inflows of foreign exchange, remittances may have negative macro-economic effects via the appreciation of the real exchange rate. This is the classic 'Dutch Disease' problem, which may undermine the competitiveness of the export sector.[9] However, there is no empirical evidence to date linking remittances to this problem and there are a few factors that may counter the risk of Dutch Disease from remittances. Their growth is fairly stable and their inflow seems to be sustainable, thus they are quite different from the sudden increased inflow of foreign exchange typical of commodity booms that generates Dutch Disease. Moreover, remittances have usually resulted in foreign exchange by providing an important source of employment, which should minimise the possible Dutch Disease effects.

Recent evidence based on German household data reveals that other things being equal remittances per capita from temporary migrants are higher than those from permanent migrants (Dustman and Mestres, 2010). In particular a 10 percentage points increase in permanent migration plans for a migrant is associated with a 15% drop in remittances sent back to the home country. A migrant's plans to return home increase her willingness to remit, consistently with the evidence mentioned above on trade networks.

Table 3 summarises the expected effects of migration on the home countries, distinguishing wherever possible between permanent and circular/temporary migration. These effects will be incorporated to the extent possible in the simulations performed in the next sections.

[9] "Dutch disease" refers to the consequence of a large inflow of foreign exchange into the country (due for instance to an export boom, or a sudden increase in aid flows or remittances), which generates the appreciation of the real exchange rate thus undermining the competitiveness of the tradable sector.

Table 3: Expected effects of an increase in circular migration

	Permanent migration	Circular migration
Static effects on domestic capacity ('Brain drain')	Usually negative effect on the home economy, especially the higher the level of skills of migrants relative to the home country's population. However, one should also consider how effectively skills could be employed at home.	Effect may depend on the size of labour force involved in the temporary schemes. In the long-run eventual shortages should be covered by increased return migration.
Return migration	Possible gains from return migration due to static effects (symmetrical to 'brain drain'), to skill acquisition (although this depends on how effectively they are deployed at home) and to access to capital for business development.	Positive to the extent that can increase the rate of returns, especially of the highly skilled workers, which would increase the number of contacts in the broader networks.
Dynamic effects on domestic capacity ('Brain Gain')	By raising the expected returns on education, migration seems to drive the acquisition of skills, particularly in certain professions.	Not clear whether there is any differential impact for temporary migration.
Trade	Bilateral trade enhancing effects (both for imports and exports) due to migrants' networks (commercial links and contract enforcement) and tastes on goods and services from source countries.	Stronger effects for temporary migrants as they may maintain more solid links with their country of origin.
FDI	Migrants' networks operate by favouring FDI in source country from host country.	No evidence of differential impact.
Remittances	Positive effects especially at micro level (poverty reduction, insurance). More beneficial effects in context where remittances support productive investment and where their multiplier effect is higher.	Evidence of higher remittance per capita for temporary migrants.

4. Modelling possible effects of circular migration on source country

4.1 **Description of the model**

The International Futures (IFs) developed by Pardee University (Hughes and Hillebrand 2006, Hughes 2007, Hughes et al. 2008) is a particularly suitable tool for such an exercise. It is a

sophisticated integrated assessment model connecting economy, environment and social variables in different countries.[10] The extensive database underlying IFs includes data for 183 countries over most years since 1960. In addition to providing a basis for developing formulations within the model, the database facilitates comparison of data with historic forecasts over the 1960-2005 period. The model is organized through systems of equations belonging to different modules (health, education etc.) showing strong interconnections and interdependency. Figure 2 briefly illustrates the organization of the modules and their relationships. Types of work carried out using the IFs include Project 2020 on the Global Trends 2025 for the Obama administration (http://www.ifs.du.edu/community/supporters.aspx) and driver forecasts for the fourth Global Environment Outlook (GEO4) of the United Nations Environment Program (http://www.unep.org/geo/geo4/media/GEO4%20SDM_launch.pdf).[11]

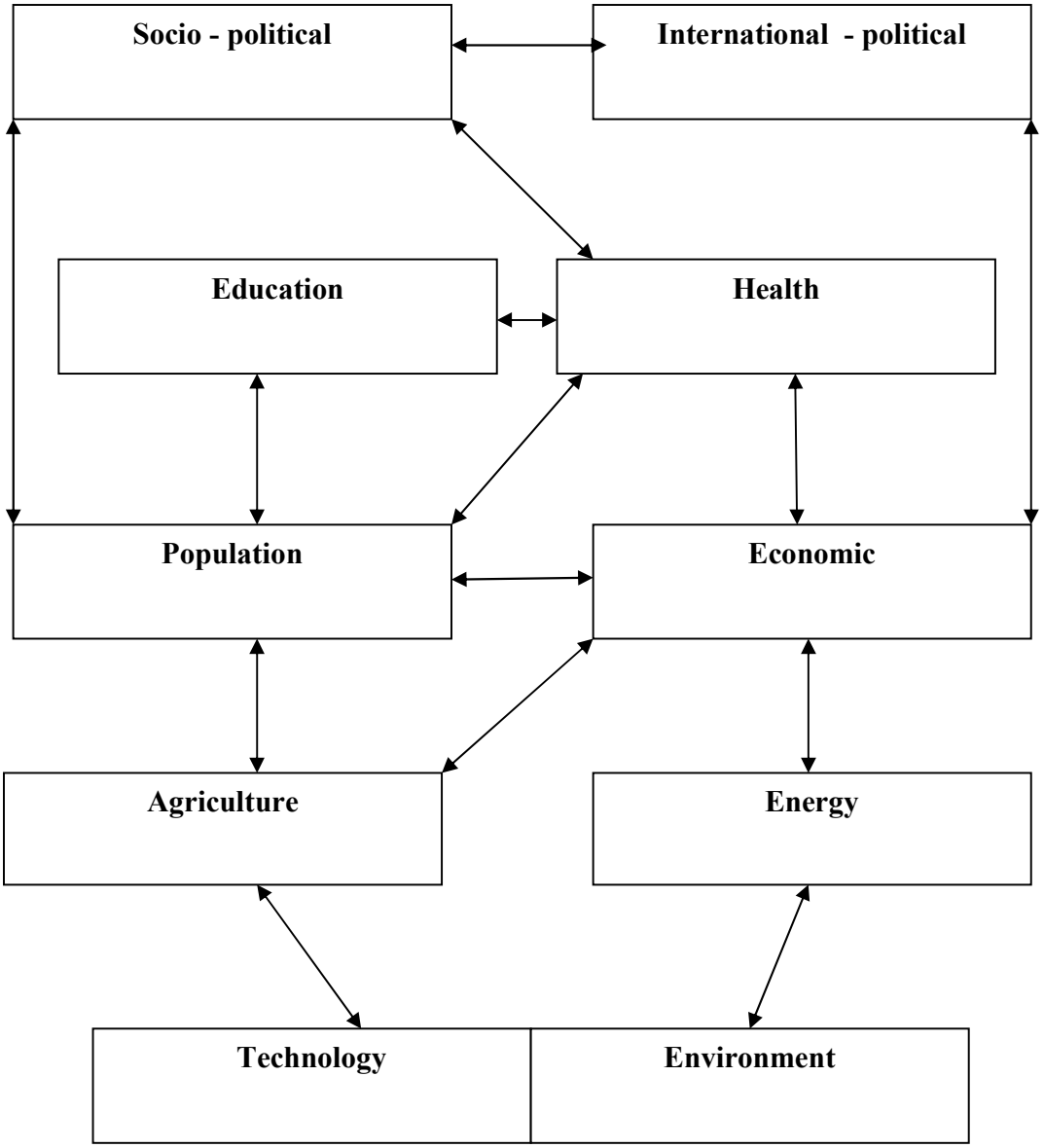
IFs does not specifically deal with migration issues. Migration is just one of the processes described in the model such as climate change, poverty, technological change. IFs cannot capture endogenously all the effects deriving from the changes in migration. Remittance is the only effect induced by migration explicitly modeled by the framework. Effects on trade, foreign direct investments, brain drain and brain gain must be appropriately calibrated through exogenous shifts of relevant parameters. IFs is a model interface facilitating analysts' interventions flexibly across time, issue, and geography. Modelers can easily change parameters belonging to blocks of equations corresponding to different policy drivers such as national spending on education, health, productivity levels, carbon tax levels and verify the impact on key output variables such as GDP, carbon emissions, poverty etc. As the only explicit channels through which migration affects welfare in source country in the IFs model is through remittances, we exogenously shift other parameters governing trade, FDI, brain drain and brain gain to reproduce the other channels through which migration affects development. The magnitude of the shifts imposed for each of these parameters is calibrated though the information derived from the relevant literature, as we will see below.

Hughes (2002) already uses the IFs model to analyze migration issues at the international level. He assumes flows of skilled emigration from rich regions to developing world regions and finds that countries with a very low schooling can enjoy human capital and productivity improvements due to migration. In contrast to Hughes in this paper we simulate migration programmes from poor to rich countries and analyze in depth the consequences of return migration policies. Specifically we will implement two different experiments. In the first experiment we will design global scenarios (GLOBAL) in which we assume a shift of the net emigration rate from developing regions. In our second experiment we implement local scenarios (LOCAL) by assuming the introduction of migration programmes in 4 developing countries: Sierra Leone, Ghana, Viet Nam and Moldova.

[10] Further information can be found in the model's website http://www.ifs.du.edu/

[11] As far as the Project 2020 is concerned the IFs model was used to forecast future trends of US national power and was influential at the international level. For the GEO-4, IFs provided population trends and the development in GDP and GDP per capita as well as additional information on value added, household consumption, health and education.

Figure 2. The IFs model main blocks



Source: Hughes et a. (2008)

It is worth noting that the IFs model does not allow to calculate bilateral migratory flows of migration, but instead it incorporates a pooled approach. It calculates a global level of migration rate and then endogenously distributes net emigration/immigration flows across countries. Migration is driven by an exogenous parameter (*migrate*) specifying the net percentage of the population migrating each year (negative values indicate immigration and positive values

indicate emigration). As a first step the model calculates a world's "immigration" (WIMD) and an emigration "demand" (WEMD) for each country as follows:

1) $WIMD = \sum_r migrate_r Pop_r$

2) $WEMD = \sum_r migrate_r Pop_r$

where *migrate* is the country specific rate of demand of net immigration (>0) and emigration (<0) of each country and *r* represents a specific region/country.

After calculating the world's sums of immigrants and emigrants, the IFs model computes the total world migration flow as the average of WIMD and WEMD:

3) $WORLDIMEM = \frac{WIMD + WEMD}{2}$

As final step the total region specific net immigration/emigration flow for each country is calculated through normalization.

4) $NIMMIGRANTS = \frac{migrate_r * Pop_r * WORLDIMEM}{WIMD}$

5) $NEMIGRANTS = \frac{migrate_r * Pop_r * WORLDIMEM}{WEMD}$

Workers' remittances are the only endogenous transmission channel computing direct effects of migration.

As showed in equation (6) below the specific formulation for the calculation of the outflow remittances (XWORKREMIT) computes a global average remittance rate per worker (WWorkRemitRate) and a host-country specific ratio of remittance rate to the global one (WorkRemitRate) in the first year. In subsequent years, those rates are applied to the total stock of foreign born people (POPFOREIGN), but adjusted by the ratio of current GDP per capita to initial GDP per capita in the host country to incorporate future variations of remittances on the basis of eventual improvement in the economic development in the host country.

6) $XWORKREMIT_{r,t} = POPFOREIGNr_{r,t} * WWorkremit_{r,t-1} * Workremitrate_{r,t-1} * \frac{GDPPC_{r,t}}{GDPPC_{r,t-1}}$

Remittances outflows then translate into inflows in the home countries according to countries' emigration levels. Initial data on worker remittances, added to the IFs database as a percentage of GDP, come from the World Bank's World Development Indicators, and so do data on foreign

population as a percentage of the total.[12] Moreover the model does not allow distinguishing migration by level of skills, thus we again simulate relatively skilled migration by imposing changes to the model's parameters as explained below. The next section describes more in detail our calibration strategy associated to each scenario.

4.2 **Calibration and description of the GLOBAL scenario and results**

As mentioned above we implement two types of exercises, GLOBAL and LOCAL. As a first step we will first consider the GLOBAL scenarios. The first exercise takes a global approach (GLOBAL). In particular we build a GLOBAL_PERMANENT and a GLOBAL_CIRCULAR scenario by assuming about 50% increase in the net emigration rate for all world countries over the period 2011 - 2030. The hypothesis underlying this scenario is that yearly emigration flows increase for the vast majority of developing countries. In building this scenario we are inspired by Hughes et al. (2008) that implement a similar experiment to analyse the importance of surges in remittances in reducing poverty. Differently to Hughes et al. (2008) we also assume a further GLOBAL_CIRCULAR50 scenario in which the net emigration rate parameter increase is just 25% rather than 50% over the period 2016 – 2030 as about half of the migrant population returns home through circular migration programmes. Finally in the GLOBAL_CIRCULAR90 scenario we assume a higher level of return migration (about 90%) to run an analysis of the sensitivity to the results to the percentage of return migration.

Table 4. Modelling the global scenarios

	Parameter in IFs	Timing
GLOBAL_PERMANENT	wmigrm	In the period 2005 – 2011 smooth path towards a 50% increase of the wmigrm representing global shifts of emigration. Since 2011 this parameter is kept constant at 2011 levels
GLOBAL_CIRCULAR50	wmigrm	In the period 2005 – 2011 smooth path towards a 50% increase of the wmigrm parameter (vs baseline) representing global shifts of net emigration rates. Since 2011 this parameter reduces with a smooth path towards a 25% increase (vs baseline).
GLOBAL_CIRCULAR90	wmigrm	In the period 2005 – 2011 smooth path towards a 50% increase of the wmigrm parameter (vs baseline) representing global shifts of net emigration rates. Since 2011 this parameter reduces with a smooth path towards a 5% increase (vs baseline).

In these global scenarios welfare in source countries is affected by migration through the changes induced in source countries' population as well as through variations in net remittances. We are not able to model the richer set of effects across all countries as this would require to change exogenously the parameters linked to the expected effects of migration for each and every country. In the GLOBAL scenarios emigration mainly operates through two transmission channels: on the one hand emigration other things being equal raises GDP per capita because the elasticity of labour to GDP is lower than 1 in the standard Cobb-Douglas production function. This means that a percentage decrease of population (for instance due to emigration) generates a

[12] Note that the original sources were Global Development Finance and the OECD, respectively.

less than proportionate decrease of GDP and this generates a higher GDP per capita. The opposite effect holds for immigration. On the other hand emigration policies increase remittances of foreign workers and stimulate internal consumption, growth rates and poverty reduction. It should be noted that that in spite of the above trivial transmission channels description it is not always easy to isolate and comment all the effects of specific policies within the model, especially at the country level. There are hundreds of equations characterizing the IFs and hundreds of endogenous relationships across different variables. For example if an emigration policy increases GDP per capita, remittances and reduces poverty, a developing country will enjoy an improvement in the health system and a reduction in the mortality rate over time. The reduction of the mortality rate may generate a positive impact on population levels and a reduction of the GDP per capita levels which may offset the positive effect on GDP per capita of remittances and the population reduction from migration. Therefore every "general" interpretation of the results from the model should be cautiously considered and used for policy implications.

Global scenarios are relatively less interesting from a policy point of view as they are built just by shifting one parameter in both the permanent and the circular migration scenarios. In this sense they are not able to reproduce the rich set of channels through which migration may affects development in the home country. However these scenarios are useful to introduce the mechanisms underlying the IFs model. In the global scenarios when we shift the migration parameters we expect a shift in the increase of net remittances from abroad in the sources countries boosting their growth and reducing their poverty. We also expect that countries enjoying the highest increases of remittances are those showing the highest gains in terms of GDP per capita. In figure 3 and in tables 5-6 we provide aggregate results for different levels of emigration rates[13], GDP per capita, remittances and poverty (number of people with income less than 1$ per day) for developing economies (as defined by the World Bank).[14] Figures are consistent with our simple intuition that an increase of emigration generates positive effects to the economy of developing countries. Of course in this very simplistic approach global circular programs are less palatable than permanent migration because with circular migration remittances are lower when migrants return to their home country. This simple analysis does not take into account brain gain, effects on FDI, trade and productivity which are fully incorporated in our local scenarios. From table 7 it is clear that the GLOBAL_PERMANENT scenario yields better outcomes for developing countries than the GLOBAL_CIRCULAR scenarios in terms of remittances, GDP per capita and poverty levels. The GLOBAL_CIRCULAR50 scenario yields better outcomes than the GLOBAL_CIRCULAR90 scenario in terms of poverty reduction and remittances because in the GLOBAL_CIRCULAR90 scenario the higher level of return migration reduces remittances of foreign workers and increases poverty. However the differences in terms of GDP per capita levels are negligible.

[13] The IFs model represents emigrants with a negative sign (-) and immigrants with a positive sign (+). In this paper we choose the keep the same representation for clarity reasons.

[14] WB uses Gross National Income to classify developing countries. GNI is treated by the World Bank with the Atlas Method to eliminate distortions from the exchange rate

Figure 3. Number of emigrants in the GLOBAL_PERMANENT and GLOBAL_CIRCULAR scenarios. Net emigration (millions) in developing economies (according to the World Bank definition) 2005 – 2030.

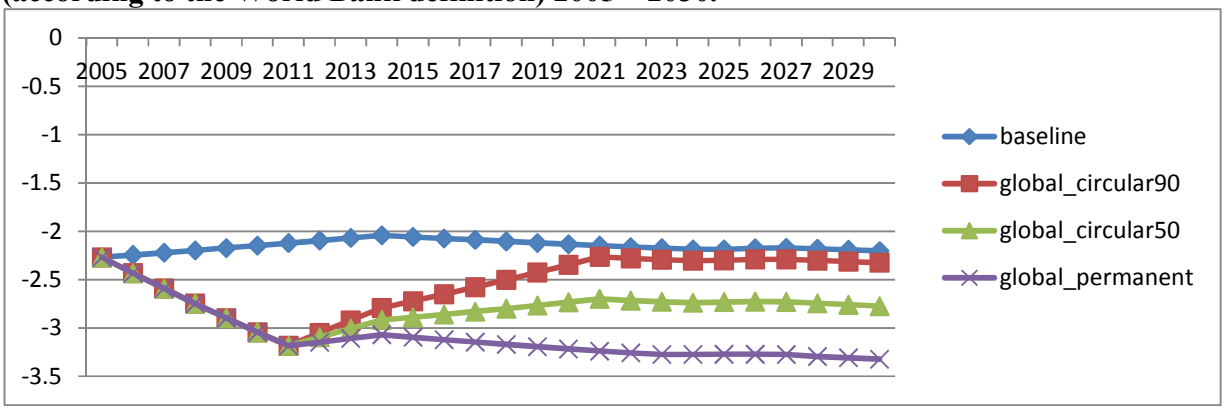


Table 5. Levels of GDP per capita (thousands of 1995 PPP $ per capita)*, remittances (billions $) and poverty levels (millions of people with an income less than 1$) in developing economies (WB definition) in 2030.

	Baseline	CIRCULAR90	CIRCULAR50	PERMANENT
GDP per capita	7.780	7.784	7.784	7.786
Net remittances[15]	166.5	181.4	191.4	203.8
Poverty levels	791.3	788.2	786.4	784.3

* Note that we choose to express GDP data in terms of constant prices and Purchase Parity Power (PPP) to facilitate comparison across countries. The choice of 1995 as reference year to express GDP levels in terms of constant prices is constrained by the default options for output variables provided by the IFs model.

Table 6. % Variations of GDP per capita (thousands of 1995 PPP $ per capita), remittances (billions $) and poverty levels (millions of people with income less than 1$) vs a baseline scenario in developing economies (WB definition) in 2030.

	CIRCULAR90	CIRCULAR50	PERMANENT
GDP per capita	0.05	0.05	0.08
Net remittances	8.95	14.95	22.40
Poverty levels	-0.39	-0.23	-0.49

We also provide a more detailed summary of individual developing countries showing the winners and losers in terms of GDP per capita for the GLOBAL scenarios. For comparison purposes we include data on net remittances (we define "inflow" the net remittances for receipt countries and "outflow" the remittances from source countries) and poverty (people with income less less than 1$ per day) in the GLOBAL_PERMANENT scenario and data about the

[15] The IFs model interprets positive net remittances in a receipts country perspective.

GLOBAL_CIRCULAR scenario for the same countries. We present results for both 2020 and 2030 to capture eventual differences across countries over time.[16]

From tables 5-6 countries with initial negative net immigration (i.e. with immigration higher than emigration) enjoy higher levels of GDP per capita, inflow net remittances and poverty reduction than countries showing a positive or null net emigration rate. For countries with a positive net immigration rate (e.g. Kuwait, Bahrain and Luxembourg showing immigrations flows which are higher than emigration flows) an increase in the net immigration rate further decreases emigration and increases net outflow of remittances to abroad. For countries where the net emigration rate is 0 (e.g. Turkmenistan), the bad performance is determined by the decrease of the emigrants stock as the flow of net emigration over time is 0 whatever the value of the country specific multiplicative net emigration rate parameter as it is evident from equations (1) – (5). For Turkmenistan, the stock of emigrants decreases over time as this is not fed by emigration and the level of inflow net remittances decreases over time.

Table 7. Ranking of the best and worst 5 developing countries in 2020 and 2030 on the basis of GDP per capita. (% vs baseline). GLOBAL_PERMANENT scenario.

	2030				2020		
	GDP per capita	**Remittances**	**Poverty**		**GDP per capita**	**Remittances**	**Poverty**
best	GLOBAL_PERMANENT			**best**	GLOBAL_PERMANENT		
Samoa	1.90	3.85 (inflow)	-14.29	**Samoa**	2.14	5.56 (inflow)	- 13.04
Suriname	1.81	20.00 (inflow)	na	**Guyana**	2.09	6.81 (inflow)	-9.09
Kazakhstan	1.75	18.72 (inflow)	na	**Suriname**	1.66	3.33 (inflow)	-16.67
Fiji	1.70	12.74 (inflow)	-12.93	**Kazakhstan**	1.59	12.96 (inflow)	na
Guyana	1.66	4.71 (inflow)	-20	**Fiji**	1.41	10.78 (inflow)	-7.97
worst	**GDP per capita**	**Remittances**	**Poverty**	**worst**	**GDP per capita**	**Remittances**	**Poverty**
Kuwait	-3.89	7.85 (outflow)	na	**Brunei**	-1.90	2.14 (outflows)	na
Afghanistan	-1.93	na	2.33	**Timor Leste**	-1.69	na	1.90
Timor - Leste	-1.81	na	4.63	**Afghanistan**	-1.29	na	4.48
Turkmenistan	-1.57	-1.65 (inflow)	na	**Luxembourg**	-1.09	13.97 (outflows)	na
Bahrain	-1.10	9.55 (outflow)	na	**Kuwait**	-1.07	5.29 (outflows)	na

*The symbol na means that we are not able to provide a number as the difference between poverty levels in 2030 in the alternative scenario and baseline scenarios is a ratio between 0 values (undefined case)

[16] Results for all countries are available upon request.

Finally even for countries with a negative net emigration rate in some cases we find the counter intuitive result that the level of remittances in both the GLOBAL_PERMANENT and GLOBAL_CIRCULAR cases is equivalent (e.g. Samoa and Guyana). This is determined by the pooled approach of the IFs model to calculate migration flows. The model calculates a world emigration and immigration total world flow. The flows of immigration and emigration match by definition. World immigration and world emigration are then respectively shared to countries with positive and negative net emigration rate on the basis of weights depending on country specific net emigration rates and population levels The equation 5 clearly shows that an increase of the parameter *migrate* in a specific country does not automatically generate an increase of the net emigration flows because final weights to assign to countries net emigration and immigration levels will also depend on the future path of population of each country over time.

Table 8. Ranking of the best and worst 5 developing countries in 2020 and 2030 on the basis of GDP per capita. (% vs baseline). GLOBAL_CIRCULAR50 scenario.

	2030				2020		
	GDP per capita	**Remittances**	**Poverty**		**GDP per capita**	**Remittances**	**Poverty**
best	GLOBAL_CIRCULAR50			**best**	GLOBAL_CIRCULAR50		
Samoa	1.76	3.85 (inflow)	-14.29	**Samoa**	1.96	4.44 (inflow)	-8.70
Guyana	1.54	4.71 (inflow)	-10.00	**Guyana**	1.82	5.96 (inflow)	-9.09
Tajikistan	1.43	10.45 (inflow)	-4.11	**Suriname**	1.45	3.33 (inflow)	-8.33
Suriname	1.40	16.67 (inflow)	na	**Kazakhstan**	1.30	11.11 (inflow)	na
Fiji	1.38	10.38 (inflow)	-10.34	**Fiji**	1.19	8.98 (inflow)	-6.52
worst	**GDP per capita**	**Remittances**	**Poverty**	**worst**	**GDP per capita**	**Remittances**	**Poverty**
Kuwait	-3.22	4.71 (outflow)	na	**Brunei**	-1.79	1.60 (outflow)	na
Afghanistan	-1.93	na	2.40	**Timor - Leste**	-1.69	na	1.90
Timor - Leste	-1.76	na	4.63	**Afghanistan**	-1.29	na	4.48
Turkmenistan	-1.63	-1.65 (inflow)	na	**Luxembourg**	-1.01	11.79 (outflow)	na
Qatar	-1.11	- 0.24 (inflow)	na	**Kuwait**	-0.88	4.48 (outflow)	na

Table 9. Ranking of the best and worst 5 developing countries in 2020 and 2030 on the basis of GDP per capita. (% vs baseline). GLOBAL_CIRCULAR90 scenario.

	2030				2020		
	GDP per capita	**Remittances**	**Poverty**		**GDP per capita**	**Remittances**	**Poverty**
best	GLOBAL_CIRCULAR90			**best**	GLOBAL_CIRCULAR90		
Samoa	1.56	2.88 (inflow)	-9.52	**Samoa**	1.77	4.44 (inflow)	-8.70
Guyana	1.31	3.99 (inflow)	-10.00	**Guyana**	1.56	4.68 (inflow)	0.00
Tajikistan	1.30	7.84 (inflow)	-3.29	**Suriname**	1.27	0.00	-8.33
Suriname	0.99	16.67 (inflow)	na	**Kazakhstan**	1.08	9.88 (inflow)	na
Fiji	0.88	6.13 (inflow)	-6.90	**Fiji**	1.03	7.19 (inflow)	-5.80
worst	**GDP per capita**	**Remittances**	**Poverty**	**worst**	**GDP per capita**	**Remittances**	**Poverty**
Kuwait	-2.06	2.77 (outflow)	na	**Brunei**	-1.71	3.83 (outflow)	na
Afghanistan	-1.93	na	2.40	**Timor-Leste**	-1.69	na	1.90
Timor Leste	-1.71	na	4.63	**Afghanistan**	-1.29	na	4.48
Qatar	-1.17	-0.64 (inflow)	na	**Luxembourg**	-0.97	9.61 (outflow)	na
Bahrain	-0.68	3.85 (outflow)	na	**Kuwait**	-0.73	3.83 (outflow)	na

4.3 Calibration and description of the LOCAL results and policy implications

The second exercise is a local approach (LOCAL) modelling five scenarios with a specific focus on four developing countries: Viet Nam, Ghana, Sierra Leone and Moldova. The scenarios differ according to the rates of return migration, with one scenario without return migration (LOCAL_PERMANENT), and four scenarios with different rates of return migration (LOCAL_CIRCULAR). Concentrating on a handful of countries allows us modelling the richer set of expected migration effects. In particular we assume the implementation in 2011 of a program increasing emigrants' flows from these countries (27,000 in Viet Nam, 15,000 in Ghana, 10,000 in Moldova and 10,000 in Sierra Leone). For both LOCAL_PERMANENT and LOCAL_CIRCULAR scenarios this shock increases the level of remittances as the stock of migrants increases over time. Following the estimations of the literature we also assume that the increase in emigrants' stock also generates other benefits in those sources countries in terms of trade (increase of exports and imports), FDI and brain gain. These benefits are introduced in the model by manipulating relevant parameters governing the path of these variables. The magnitude of these shifts is taken from the literature. The aim of the calibration process is to estimate the order of magnitude of the impacts of migration. We are not implementing a forecast exercise and for this reason we acknowledge a measurement error that the reader should take into account in the presentation of the results. As a first step we calculate the percentage stock variation on the basis of the assumed migrants' flows and by considering the stock of emigrants in those countries on the basis of the data derived from the World Bank. Having calculated the percentage

variations of emigrants' stock we can then calculate the impact on FDI, trade and brain gain on the basis of the literature reviewed in section three and summarised here for convenience.

Brain gain: A shock decreasing migration by 9pp, reduces the educational attainment of non-migrants by 7pp (Batista et al., 2010). This effect has been found through an econometric analysis for Cape Verde.

Trade: A 10 per cent increase in the number of temporary migrants from country j raises US imports to that country by 1 to 2.3 per cent (between 0.4 and 1.3 for permanent migration) and US exports from that country by 1 to 3.5 per cent (between 0 and 1.5 for permanent migration). (Jansen and Piermartini, 2009). These numbers come from an econometric analysis applied to migrants to the US. To simplify the calibration process we just assume a 1.7% variation for exports and a 1.4% variation for imports.

FDI: A one percent increase in the migrant stock is associated with a 0.35 – 0.42 percent increase in the FDI stock (Javorcick et al., 2010). These numbers derive from empirical evidence investigating the effect of the presence of immigrants in United States. The effect appears to be stronger for skilled migrants, that is, a one percent increase in the number of migrants with tertiary education increases FDI by 0.41 – 0.52 percent. To simplify the calibration process we just assume a 0.38% value.

We acknowledge that we are extracting figures from case studies (Cape Verde, USA) which are not perfectly consistent with the countries we are considering for our study (Sierra Leone, Ghana, Viet Nam, Moldova). However these studies are among the most rigorous and allow us to use figures which are key to gauge the order of magnitude of the various effects of migration on the source countries.

An important issue to consider is the timing of the effects. In other words it is reasonable to assume that once migration takes place, positive effects occur with a time lag. For this reason we assume that impacts on brain gain, trade and FDI fully reach the percentage variation indicated by the literature only in 2016 by following a smooth path over the period 2011 - 2016. After 2016 those values remain constant as we assume that networks once built are solid over time as they represent permanent social capital.

For the brain gain effects, we even implement a more prudent assumption by assuming that a smooth path until the attainment target calculated through our calibration is reached for all countries in the 2020 – 2030 decade. This is because we acknowledge that especially in poor countries the education supply is quite rigid and can respond very slowly to exogenous shocks. This is also consistent to the modelling framework context where variations of the parameter we manipulate regulating the average schooling (the success rate of students in tertiary education, upper secondary and lower secondary education) generates significant effects only in the medium term. Moreover the delay of brain gain effects is also justified by the fact that in the initial years of the migration program there is a relevant brain drain effect. Our calibration shows that the brain drain is lower than the brain gain for all four countries and for this reason the brain drain effect is implicitly incorporated in the model by assuming that between 2011 and 2016 the increase in the success rate parameter in secondary and tertiary education is much more limited.

Brain drain: On the basis of the model information on average schooling years and about population in Sierra Leone, Viet Nam, Moldova and Ghana in 2010 we can calculate the total average of schooling in those countries. To calculate the average schooling loss we simply assume a reduction of the population corresponding to the migration flow and that migration flows involve only skilled people with 16 years of schooling. Even if we assume that for every country emigration flows concern only skilled people, the brain drain effect would turn out to be much lower than the brain gain effect in terms of % average schooling variation (Table 13 below).

2016 is the year in which LOCAL_PERMANENT and LOCAL_CIRCULAR scenarios begin to differ. We assume that over the period 2016 – 2020 in the LOCAL_CIRCULAR scenario about 50% of emigrants come back. This percentage is inspired by the work of Dustmann and Weiss (2007) showing that return migration from rich to rich regions in the first ten years is generally 50%, whereas return migration from rich to poor countries is only 10%. In our LOCAL_CIRCULAR50 scenario we assume that policy makers stipulating circular migration programmes aim to achieve return migration rates at the about 50% level typical of high income countries within five years (within 2020). In a LOCAL_CIRCULAR90 scenario we tighten this hypothesis and we assume that return migration reaches 80/90% levels with a 3 years increase of the migration program duration (within 2023).

Productiviy: Finally we also distinguish between two LOCAL_CIRCULAR scenarios following recent evidence for less developed countries (Batista et al. 2007) and for middle income or fast growing countries (Luo and Wang 2002, Commander et al. 2004, Gundel and Peters 2008) which emphasizes how the returnees may be particularly concentrated among the highly educated, and are often among the most successful of them (Zucker and Darby, 2007). There is also evidence that very successful skilled workers are likely to return to their home countries as entrepreneurs (Dustmann and Kirchkamp, 2002), earning high returns to their human and entrepreneurial capital. On the basis of this evidence we assume that return migration increases productivity.

In order to calibrate the model to account for the increase in productivity induced by return migration, we rely on recent work by Boubtane and Dumont (2010) who investigate the impact on GDP of foreign–born migration vis-à-vis native-born. Dolado et al. (1994) find that immigration in OECD countries reduces GDP per capita as the level of population increases, but when the immigration is skilled this reduction is much lower. The recent work from Boubtane and Dumont (2010) acknowledges the strength of the pioneering work from Dolado et al., but also emphasizes that the empirical evidence investigated by that work (1960 – 1985) was mainly characterized by low skilled emigration flows. With an updated econometric analysis on OECD countries they find that: “An increase of 50% in net migration of the foreign-born generates less than one tenth of percentage point variation on productivity growth in all the countries but one. Increasing selectivity of migration logically yields to more positive effects on productivity growth”. Moreover they find by econometric tests that the impact of foreign born net emigration does not show a significant difference in terms if compared to native born migration. We use

these results on the impact of foreign born emigration policies on productivity to investigate the impact of native born emigration policies on growth.

We simulate two LOCAL_CIRCULAR scenarios. In the LOCAL_CIRCULAR50 scenario we assume a 50% of return migration within 2020 and in the LOCAL_CIRCULAR90 scenario we assume a 90% of return migration within 2023. In those scenarios the impact of return migration on productivity is calibrated according to Boubtane and Dumont (2010). We assume that in each year that return immigration policy is implemented (2016 – 2020 for the LOCAL_CIRCULAR50 scenario and 2016 – 2023 for the LOCAL_CIRCULAR90 scenario) the impact of reductions of 50% in the net emigration rate (compared to the baseline) generate a 0.1% increase of productivity. We choose to use the upper bound of the Boubtane and Dumont estimation because Boubtane and Dumont explicitly mention that "increasing selectivity of migration logically yields to more positive effects on productivity growth". This case fits well the case study of our LOCAL scenarios assuming the implementation of specific and selected migration programs.

We label those scenarios incorporating the 0.1% increase of productivity from a 50% increase of net immigration as LOCAL_CIRCULAR50_low and LOCAL_CIRCULAR90_low. As a benchmark we also run two LOCAL_CIRCULAR50 and LOCAL_CIRCULAR90 scenarios in which we assume that return migration does not generate any productivity increases because we acknowledge the high uncertainty of the calibration of productivity parameters from migration programmes.

A fundamental difference between Boubtane and Dumont (2010) and our case is that they study the effect of skilled migration to OECD countries while we are looking at the impact of return migration in developing countries. Although the types of effects on the economy may be similar in principle, our estimates of productivity increases deriving from return migration of skilled workers could be underestimated vis-à-vis theirs. This is because the impact in terms of human capital is likely to be much higher in poor countries than in OECD countries, where the availability of skilled workers is much larger than in developing countries (thus the effect on the average level of schooling would be lower). To incorporate this bias we also investigate two further scenarios (LOCAL_CIRCULAR50_high and LOCAL_CIRCULAR90_high) where we assume that the impact of return migration on productivity is double than the one calculated by Boubtane and Dumont for OECD countries. For those scenarios we assume a 0.2% increase of productivity from a 50% increase of net emigration in the years when return migration policies are implemented. As it turns out the increase in productivity from return migration is one of the key parameters to drive the gains from migration in our model. Because of the importance of such parameter, we run various simulations using a number of different values of the productivity parameter. In particular we also assume a productivity increase of 0.05%, 0.025% and 0.15%. In this way we are able to test more precisely the sensitivity of the results to the productivity parameter.

Another challenge of this scenarios analysis is the incorporation of a dynamic effect of productivity growth induced by migration. To capture the dynamic impact of migration we assume that productivity gains from return migration are accumulated over time by each poor

country and that the stock of knowledge fed by return migration does not depreciate over time. For simplicity we also assume that when return migration programs are completed the productivity gains (compared to a baseline) remain constant until 2030.

We acknowledge that our calibration strategy is speculative and the academic literature has still much to say about the impact of migration policies. However to the best of our knowledge the numbers we introduce in the model are the most plausible for the exercise we are implementing.. The IFs starting year is 2005 and we assume for the simulations the time horizon 2005 – 2030. Tables 10-16 provide details of the calibration exercise for each of the countries considered.

Table 10. Calibration strategy. Local scenarios. Foreign Direct investments

	Emigrants increase in 2011*	Migration stock increase (%) in 2011	Javorcik et al. (2010) elasticity of FDI to migration (%)	% change of FDI to migration programs
Viet Nam	27000	1.2	0.38	0.46
Ghana	15000	1.6	0.38	0.62
Sierra Leone	10000	11.3	0.38	4.29
Moldova	10000	1.4	0.38	0.53

Table 11. Calibration strategy. Local scenarios. Exports

	Emigrants increase in 2011*	Migration stock increase (%) in 2011	Jansen and Piermartini elasticity of exports to migration (%)	% change of exports to migration programs
Viet Nam	27000	1.2	0.17	0.20
Ghana	15000	1.6	0.17	0.28
Sierra Leone	10000	11.3	0.17	1.92
Moldova	10000	1.4	0.17	0.24

Table 12. Calibration strategy. Local scenarios. Imports

	Emigrants increase in 2011*	Migration stock increase (%) in 2011	Jansen and Piermartini elasticity of imports to migration (%)	% change of exports to migration programs
Viet Nam	27000	1.2	0.14	0.19
Ghana	15000	1.6	0.14	0.23
Sierra Leone	10000	11.3	0.14	1.58
Moldova	10000	1.4	0.14	0.20

Table 13. Calibration strategy. Local scenarios. Brain gain and brain drain

	Emigrants increase in 2011*	Migration stock increase (%) in 2011	Batista et al. (2010) elasticity of imports to migration (%)	% change of attainment to migration programs (brain gain)	Brain drain in 2011 (assuming 100% skilled emigration)
Viet Nam	27000	1.2	0.077	1.02	0.16
Ghana	15000	1.6	0.077	1.25	0.36
Sierra L.	10000	11.3	0.077	8.70	1.77
Moldova	10000	1.4	0.077	1.08	0.43

Table 14. Calibration strategy. Local scenarios. Productivity of return migration*

	Variation of net return immigration vs baseline in 2016	Boubtane and Dumont (2010) elasticity of productivity to net migration variation	Variation of productivity	Cumulative productivity (0.1%)	Cumulative productivity (0.2%)
Viet Nam		50% of net migration increase generates 0.1% increase of productivity			
2016	14%		0.029%	0.03%	0.06%
2017	14%		0.029%	0.06%	0.12%
2018	14%		0.029%	0.09%	0.18%
2019	14%		0.029%	0.11%	0.22%
2020	18%		0.036%	0.15%	0.30%
2021	9%		0.018%	0.17%	0.34%
2022	9%		0.018%	0.19%	0.38%
2023	9%		0.018%	0.21%	0.42%
Ghana					
2016	25%		0.05%	0.05%	0.10%
2017	40%		0.08%	0.13%	0.26%
2018	40%		0.08%	0.21%	0.42%
2019	20%		0.04%	0.25%	0.50%
2020	20%		0.04%	0.29%	0.58%
2021	40%		0.08%	0.37%	0.74%
2022	40%		0.08%	0.45%	0.90%
2023	40%		0.08%	0.53%	1.06%
Sierra L.[17]					
2016	100%		0.2%	0.2%	0.4%
2017	100%		0.2%	0.4%	0.8%
2018	100%		0.2%	0.6%	1.2%
2019	100%		0.2%	0.8%	1.6%
2020	100%		0.2%	1.0%	2.0%
2021	100%		0.2%	1.2%	2.4%
2022	100%		0.2%	1.4%	2.8%
2023	100%		0.2%	1.6%	3.2%
Moldova					
2016	12.5%		0.025%	0.025%	0.050%
2017	12.5%		0.025%	0.050%	0.100%
2018	12.5%		0.025%	0.075%	0.150%
2019	12.5%		0.025%	0.100%	0.200%
2020	12.5%		0.025%	0.125%	0.250%
2021	12.5%		0.025%	0.150%	0.300%
2022	12.5%		0.025%	0.175%	0.350%
2023	25%		0.500%	0.225%	0.400%

* Return migration programs over the period 2016 – 2020 belong to the category LOCAL_CIRCULAR50, in the 2016 – 2023 period to the LOCAL_CIRCULAR90 scenario

[17] Net migration of Sierra Leone is set in the model 0 in the baseline. For this reason the variation of productivity would be ∞. For sake of simplicity we set a very high level of net emigration variation (100%).

Table 15. Return migration programs

	Number of return migrants by year
Viet Nam	
2016	3000
2017	3000
2018	3000
2019	3000
2020	4000
Total return migration LOCAL50 scenario	**16000**
2021	2000
2022	2000
2023	2000
Total return migration LOCAL90 scenario	**22000**
Ghana	
2016	1000
2017	2000
2018	2000
2019	1000
2020	1000
Total return migration LOCAL50 scenario	**7000**
2021	2000
2022	2000
2023	2000
Total return migration LOCAL90 scenario	**13000**
Sierra L.	
2016	1000
2017	1000
2018	1000
2019	1000
2020	1000
Total return migration LOCAL50 scenario	**5000**
2021	1000
2022	1000
2023	1000
Total return migration LOCAL90 scenario	**8000**
Moldova	
2016	1000
2017	1000
2018	1000
2019	1000
2020	1000
Total return migration LOCAL50 scenario	**5000**
2021	1000
2022	1000
2023	2000
Total return migration LOCAL90 scenario	**9000**

Table 16. Modelling the calibration strategy in local scenarios in the LOCAL_PERMANENT, LOCAL_CIRCULAR50 and LOCAL_CIRCULAR90 scenarios.

	Parameter in IFs	Timing
Emigration flows	migrater	In LOCAL_PERMANENT and LOCAL_CIRCULAR scenarios we increase the parameter *migrater* representing country specific net emigration rates to match emigration flows described in the table 10 in 2011. In LOCAL_CIRCULAR scenarios since 2016 to 2020 we decrease *migrater* to assume a 50% return migration in LOCAL_CIRCULAR50 and 90% return migration in LOCAL_CIRCULAR90 scenarios.
FDI	xdfistockm	Increase of the parameter *xdfistockm* representing a multiplier of investments from abroad since 2011 to 2016 to match the target indicated in the table 10. After 2016 this coefficient is kept constant at the target level
Exports	xshift	Increase of the parameter *xshift* representing additive % increases or decreases of exports since 2011 to 2016 to match the target indicated in the table 11. After 2016 this coefficient is kept constant at the target level.
Imports	protecm	Decrease of the parameter *protecm* representing price of imported goods. We decrease the price of imported goods to match in 2016 the increase of imports in each country as indicated in the table 12 if compared to a baseline scenario. After 2016 this coefficient is kept constant at the target level.
Brain drain	edtergradr, edsecupprsuvgr, edseclowrsurvgr	In the period 2011 – 2016 the increase of the parameters *edtergradr, edsecupprsuvgr, edseclowrsurvgr* representing success rate in lower secondary, upper secondary, tertiary school is kept below the post 2016 levels to incorporate brain drain effects
Brain gain	edtergradr, edsecupprsuvgr, edseclowrsurvgr	We increase the paramaters *edtergradr, edsecupprsuvgr, edseclowrsurvgr* (representing success rate in lower secondary, upper secondary, tertiary school) to match in the decade 2020 – 2030 the average schooling of + 15 population increase indicated in the table 13. When the target is reached the coefficients are kept constant
Productivity	Mfpadd	In the LOCAL_CIRCULAR50_low, LOCAL_CIRCULAR50_high, LOCAL_CIRCULAR90_low, LOCAL_CIRCULAR90_high scenarios we increase the *mfpadd* parameter representing output productivity to match the target level indicated in the table 14. After the end of the return migration program this coefficient is kept constant.
Net remittances	Endogenous	Endogenous

4.4 Local scenarios

We now turn our attention to the consequences for Viet Nam, Ghana, Sierra Leone, Moldova of migration programs increasing emigration in 2011. We then investigate the effects of return migration policies in the period 2016 – 2020 in LOCAL_CIRCULAR50 scenarios or 2016 – 2023 in LOCAL_CIRCULAR90 scenarios. We present results again for GDP per capita, net remittances and poverty reduction in table 17. The evolution of poverty levels – defined in terms of share of people below the US$ 1 dollar per day poverty line – is derived from GDP per capita data and the national level of income inequality through a cross country econometric estimation of the relationship between poverty levels, income per capita and the country specific Gini index.

This allows the model to compute the elasticity of poverty with respect to GDP per capita and the national Gini index. Remittances are calculated by the model according to equation (6).

Table 17: % Variations of GDP per capita (thousands of 1995 PPP $ per capita), net remittances (billions $) and poverty levels (millions of people with income less than 1$ per day) vs a baseline scenario in 2030.[18]

	GDP per capita	Net remittances	Poverty reduction
LOCAL_PERMANENT			
Viet Nam	0.37	1.89	-2.56
Ghana	0.47	1.66	-0.53
Sierra Leone	0.78	0.00	-0.67
Moldova	0.19	Na	13.33
LOCAL_CIRCULAR50			
Viet Nam	0.39	1.01	-2.56
Ghana	0.52	0.00	-0.54
Sierra Leone	0.83	0.00	-0.75
Moldova	0.24	na	13.33
LOCAL_CIRCULAR50_0.025%			
Viet Nam	0.67	1.01	-2.56
Ghana	1.36	0.00	-0.80
Sierra Leone	2.82	0.00	-1.65
Moldova	0.49	na	13.33
LOCAL_CIRCULAR50_0.05%			
Viet Nam	0.96	1.01	-2.56
Ghana	2.25	0.00	-1.07
Sierra Leone	4.99	0.00	-2.63
Moldova	0.72	na	13.33
LOCAL_CIRCULAR50_0.10%			
Viet Nam	1.55	1.01	-2.56
Ghana	3.97	0.00	-1.51
Sierra Leone	9.40	0.00	-4.68
Moldova	1.26	na	13.33
LOCAL_CIRCULAR50_0.15%			
Viet Nam	2.12	1.01	-2.56
Ghana	5.75	0.00	-2.05
Sierra Leone	14.22	0.00	-6.90
Moldova	1.79	na	13.33
LOCAL_CIRCULAR50_0.20%			
Viet Nam	2.73	1.01	-2.56
Ghana	7.58	0.00	-2.58
Sierra Leone	19.30	0.00	-9.16
Moldova	2.33	na	13.33
LOCAL_CIRCULAR90			
Viet Nam	0.37	0.67	-2.56

[18] Poverty levels are calculated by a cross sectional definition. IFs modellers implement a cross country econometric estimation relating poverty levels and income per capita. On the basis of these estimates the model calculates poverty levels on the basis of GDP per capita path in each scenario.

Ghana	0.52	0.00	-0.45
Sierra Leone	0.83	0.00	-0.70
Moldova	0.19	na	13.33
LOCAL_CIRCULAR90_0.025%			
Viet Nam	0.74	0.67	-2.56
Ghana	1.78	0.00	-0.89
Sierra Leone	3.66	0.00	-1.98
Moldova	0.58	na	13.33
LOCAL_CIRCULAR90_0.05%			
Viet Nam	1.11	0.67	-2.56
Ghana	3.04	0.00	-1.25
Sierra Leone	6.74	0.00	-3.38
Moldova	0.97	na	13.33
LOCAL_CIRCULAR90_0.1%			
Viet Nam	1.83	0.67	-2.56
Ghana	5.55	0.00	-1.96
Sierra Leone	13.14	0.00	-6.32
Moldova	1.80	na	13.33
LOCAL_CIRCULAR90_0.15%			
Viet Nam	2.57	0.67	-2.56
Ghana	8.16	0.00	-2.68
Sierra Leone	20.38	0.00	-9.49
Moldova	2.58	na	13.33
LOCAL_CIRCULAR90_0.2%			
Viet Nam	3.38	0.67	-5.13
Ghana	10.52	0.00	-3.30
Sierra Leone	29.87	0.00	-12.76
Moldova	3.35	na	10.00
GLOBAL_PERMANENT			
Viet Nam	0.00	6.44	-2.56
Ghana	1.10	0.00	-0.71
Sierra Leone	-0.08	-4.35	-0.16
Moldova	0.63	na	10.00
GLOBAL_CIRCULAR50			
Viet Nam	0.00	4.22	0.00
Ghana	0.94	0.00	-0.62
Sierra Leone	-0.08	-4.35	-0.09
Moldova	0.49	na	13.33
GLOBAL_CIRCULAR90			
Viet Nam	0.00	2.47	0.00
Ghana	0.84	0.00	-0.45
Sierra Leone	-0.08	-4.35	-0.02
Moldova	0.34	na	13.33

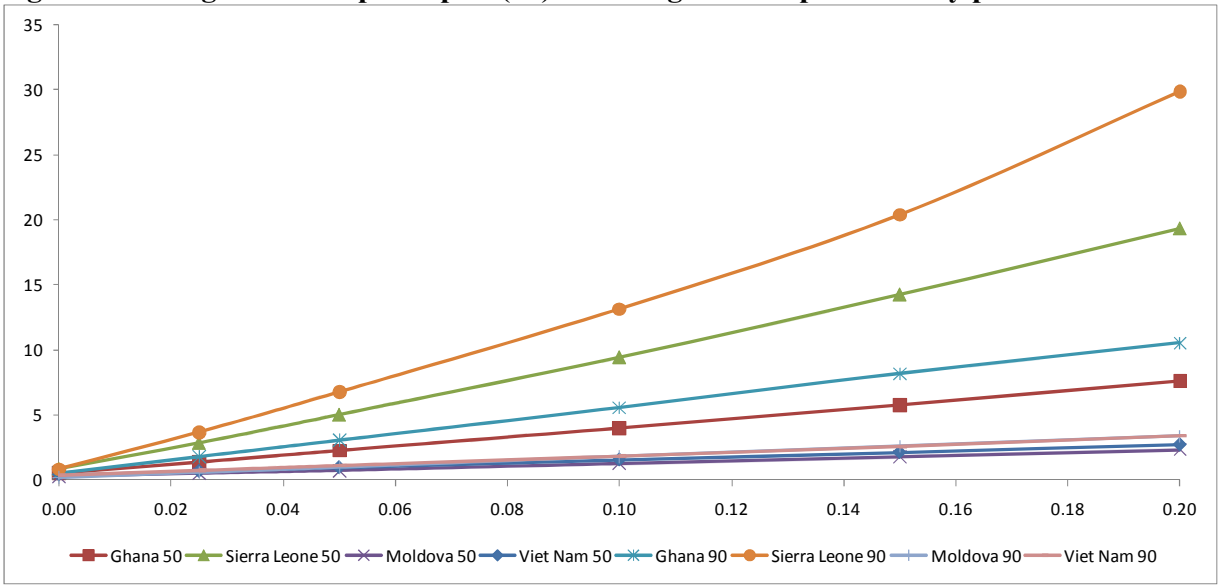
The table clearly shows that the best scenario is the LOCAL_CIRCULAR90_0.2 as it shows the highest levels of GDP per capita for all 4 countries. This finding can be clearly explained by our

scenario analysis design incorporating in LOCAL_CIRCULAR90_0.2 the most optimistic assumption about productivity increases from return migration. This applies to GLOBAL_CIRCULAR scenarios as well. The effect of decreasing the productivity enhancing parameter on GDP is quasi-linear for all of the four countries, i.e. changes in the parameter have similar effect on GDP for different levels of parameters. For example moving from the 0.1% to the 0.05% parameter has a similar effect as moving from 0.15% to 0.1%.

Figure 4 illustrates the GDP per capita-productivity parameter relation in some more detail plotting the variation in GDP per capita associated to the variations in the productivity for the four countries in each of the two scenarios (GLOBAL and CIRCULAR). Sierra Leone appears to be the country where GDP per capita is most responsive to changes in productivity, followed by Ghana while Vietnam and Moldova have lower elasticity of GDP per capita to productivity. Sierra Leone is also the only country for which the relation is slightly non linear. It has a convex shape which suggests that increases in productivity have more effect on GDP per capita for higher than for lower levels of productivity.

On the other hand variations in poverty are much less elastic to the productivity parameter than the GDP, suggesting that productivity increases do not benefit everyone in the same way. In particular those below the poverty line enjoy less benefits from productivity and GDP increases than the rest of the population. Not surprisingly remittances do not vary with changes in the productivity parameter.

Figure 4: Changes in GDP per capita (%) vs. changes in the productivity parameters



If we just analyse scenarios which do not include assumptions about productivity increases from return migration (LOCAL_PERMANENT, LOCAL_CIRCULAR50, LOCAL_CIRCULAR90 and GLOBAL scenarios) Sierra Leone is the country performing better in LOCAL scenarios and worse in GLOBAL scenarios. In LOCAL scenarios our calibrated values of FDI, trade and brain

gains variations are bigger in Sierra Leone than in other countries as showed in Tables 10 - 15. In spite of our assumption of equal elasticity of FDI, trade and brain gain to migration variation across countries, for Sierra Leone we register the highest levels of migration stock variation in 2011 as a consequence of emigration programs implementation. Higher levels of FDI, trade and brain gain are reflected in higher levels of GDP per capita. In GLOBAL scenarios the negative values for GDP per capita and net remittances variations (compared to the baseline) of Sierra Leone is explained by the 0 net emigration rate of this country. A zero net emigration implies that whatever the value of the parameter *migrate* that we shift in the GLOBAL scenario net emigration will not change and the stock of emigrants together with the level of net remittances will reduce over time. After Sierra Leone, Ghana is the country showing the highest levels of benefits from migration and GDP per capita in all scenarios assuming migration policies.

Again excluding those scenarios incorporating optimistic assumptions about productivity, the LOCAL_CIRCULAR and the GLOBAL_CIRCULAR scenarios do not show significant variations in terms of GDP per capita, remittances and poverty levels if compared to LOCAL_PERMANENT and GLOBAL_PERMANENT scenarios for all countries. This is hardly surprising if we consider that both typologies of scenarios include similar assumptions about FDI, trade and brain gain and can differ just because in the LOCAL_CIRCULAR scenarios net remittances reduce as a consequence of return migration programs and because the increase of immigration leads to a decrease of GDP per capita with a Cobb Douglas production incorporating constant returns to scale. In spite of this theoretical underpinning surprisingly we find that the LOCAL_CIRCULAR scenarios perform slightly better than LOCAL_PERMANENT scenarios in terms of GDP per capita. This result can be explained by the complexity and calculation approximations of the IFs model. On one hand different forces affect the dynamics of population such as fertility and mortality which are endogenous and can affect the final GDP per capita levels. Second, if we consider the case of Ghana showing the widest discrepancy between GDP per capita in the LOCAL_CIRCULAR50 and the LOCAL_PERMANENT scenario the difference is just 1$ per capita. The reader should consider that this is a model dealing with numbers concerning billions of world poor people and 183 countries and is built to capture with more effectiveness big processes rather than exact estimates for every country in every period.

From Table 17 and Figure 4 we can draw some interesting policy conclusions and remarks:

1) Migration programs generate GDP benefits vis-à-vis those scenarios in which there is no migration (baseline). In many cases migration significantly increases the level of remittances of foreign workers and boost GDP per capita through a reduction of population.

2) Gains for poor countries are relevant in those scenarios incorporating a productivity increase from return migration. The higher is the productivity increase assumed the higher the gain of poor countries in terms of GDP and poverty reduction.

3) LOCAL_CIRCULAR scenarios which do not incorporate the assumption of productivity increases deriving from return migration show numbers similar to those in the LOCAL_PERMANENT scenarios. In other words the impact of productivity growth induced by

return migration makes the real difference between permanent and circular migration programs. This result is partly justified by the background literature we used to shape our scenarios for which LOCAL_CIRCULAR and LOCAL_PERMANENT show the same impacts in terms of FDI, brain gain and trade. The core of our exercise is the analysis of the trade off from return migration programs in terms of net remittances reduction vs. increase of productivity in LOCAL_CIRCULAR scenarios with different productivity enhancing parameters. The model clearly indicates that the benefits from productivity overwhelm net remittances losses if appropriate migration selection programs will be put in place.

4) In the case of Moldova we obtain some counter-intuitive results because of the model framework. Moldova displays an increase of poverty in every scenario incorporating migration policies if compared to a baseline. In this case the IFs model calculates that Moldova will have just 3300 people in 2030 that live with less than 1$ per day in all scenarios including migration compared to 3000 poor people in the baseline in 2030. This is because the IFs model calculations of poverty incorporate the notion of inclusive growth. In spite of a GDP per capita increase, poverty levels can increase if the computed level of the country-specific Gini index increases.

The examples above show that the model's results should be cautiously considered when dealing with country specific mechanisms and when small variations are involved. Models are powerful tools to stimulate the thinking rather than tools for forecast and this should always be considered when interpreting results. Having said that, the main contribution that a model like this can provide is the provision of information which are useful to elaborate insights and policy implications arising from the analysis of the transmission channels incorporated in the model.

In our exercise the most interesting policy implication is that the main difference between the home countries' welfare effects of permanent vs. circular migration programmes lies in the effects of increase of productivity induced by the return of skilled migrants. In other words a robust virtuous process boosting growth and innovation will be implemented in developing countries only if circulation programmes will be able to promote in the source countries opportunities and the right environment enabling skilled migrants to exploit their know-how and technological skills. Effects of migration programs on FDI, trade and brain gain are relevant but mild in our simulations.

The policy debate that our work stimulates concerns the following crucial questions:

1) What can be done to maximize the process of skills acquisition of migrants during their stay in host countries?

2) How can an appropriate environment be created in home countries to maximize the positive impact of return migrants and to fully exploit their potential?

Modelling exercises inform policy decisions by posing the most important questions that decision makers should consider in elaborating their policy exercises.

5 **Conclusions**

In this paper we have analysed the impact of migration programs on growth, development and poverty of developing countries. In a first set of scenarios we assume an homogenous and widespread increase of the net emigration rate boosting emigration flows especially in developing countries (global scenarios). In the second part of our simulation exercise we assume the implementation of specific migration programs in 4 countries: Viet Nam, Ghana, Sierra Leone and Moldova (local scenarios). We assume a scenario in which since 2011 the emigration is permanent and other six scenarios in which we assume a return migration policy over the period 2016 – 2020.

From our analysis we find robust evidence that migration is good to enhance development, GDP and to reduce poverty. The comparison between permanent and circular migration is more complex to examine. If we just consider the pure effect of migration on remittances, our global scenarios show that permanent migration is preferable to circular migration as return migration policies generate a reduction of remittances when migrants come back in their home countries. This simplistic finding is challenged by results coming from our further set of results. In both permanent and circulation scenarios migration generates a positive impact on FDI, trading and education. However, whereas in the LOCAL_CIRCULATION scenarios return migration to their home country reduces remittances from abroad, this negative effect is overwhelmed by positive effects deriving from gains in terms of productivity deriving from the increased knowledge and know-how of workers (especially skilled workers). The most important theme to which policy makers should focus their attention to shape circular migration programmes at macro-economic is the construction of a solid business environment allowing return workers to express their enhanced capability.

The limit of our analysis is that we work with a model in which complicated processes are simplified by stylized equations and that we work with a calibration process that we acknowledge as imperfect. In particular the productivity parameter which we introduced to describe the impact of return migration on productivity is highly speculative and unfortunately we cannot explicitly model migration processes by explicitly distinguishing skilled and unskilled workers. In spite of these limits we emphasize some interesting policy conclusions that can be very useful for policy makers in designing their migration policies and to feed the current debate on development.

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