International Migration, Transfer of Norms and Home Country Fertility

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26 February 2012

Abstract This paper examines the relationship between international migration and source country fertility. The impact of international migration on source country fertility may have a number of causes, including a transfer of destination countries' fertility norms. We provide a rigorous test of the diffusion of fertility norms using highly detailed original data on migration. Our results provide evidence of a significant transfer of destination countries' fertility norms from migrants to their country of origin: a one percent decrease in the fertility norm to which migrants are exposed reduces home country fertility by about 0.3 percent.

JEL classification: *J13, J61, O11*

Keywords: *International migration, endogenous fertility, human capital, social norms*

Acknowledgement. This paper was written while Michel Beine was visiting the World Bank, DECRG Trade Unit. We thank the editor David Green and one anonymous referee for very useful comments and suggestions. Thanks are also due to Chris Parsons for providing us with the data, to Assaf Razin, Hillel Rapoport, Caglar Ozden, Ramón Lopez, Paola Conconi, and participants at the July 2008 OECD-CEPII Brain Drain Conference in Paris and of the TOM Conference in Louvain for their useful comments, and to Cristina Neagu for assistance with various aspects of the paper. The views presented in this paper are those of the authors and do not necessarily reflect those by their respective institutions, including the World Bank, its Executive Directors or the governments they represent. The second author acknowledges financial support from the ARC convention on "Geographical Mobility of Workers and Firms" (convention 09/14-019).

1 Introduction

With population forecasts indicating rapid population growth in developing countries and slow or negative growth in developed ones, international migration is likely to play an increasingly important role in the global economy. A world of rapid population growth and increasing pressure on natural resources would greatly benefit from South-North migration if the latter resulted in a reduction in source countries' fertility rates.

Migration may affect the fertility of migrants living in the host country, of migrants' households back home, and of the home country population as a whole. This paper focuses on the latter, that is, on the impact of migration on the fertility of the population in migrants' country of origin. No rigorous analysis of the impact of migration on home countries' fertility has been conducted to date. This paper presents a theoretical model and empirically tests the model's predictions. In particular, we test whether international migration leads to a transfer of fertility norms from host to migrants' home countries. The empirical framework developed for this purpose uses a concept of behavioral norms that is similar to Spilimbergo (2009) and could be used to examine the existence of transfers of other behavioral norms. Communications with migrants abroad, growing interest by source country residents in the culture and habits of migrants' host countries, and increased media coverage of these countries are some channels through which the diaspora might induce behavioral changes in the home countries.

Our main finding is that international migration results in a transfer of fertility norms from host to migrants' home countries, resulting in a decrease (increase) in home country fertility rates if they are higher (lower) than host country rates. This result is robust to the instrumentation of important control variables such as the migration rates and of the fertility norm itself. The findings are also robust to the sample of included countries. In our best specification, a one percent decrease in the fertility norm to which migrants are exposed reduces home country fertility by 0.3 to 0.4 percent.

Although the literature on migration and diaspora externalities is growing rapidly, it has so far not provided robust evidence of migration externalities of this sort. An exception is Spilimbergo (2008) who shows that foreign-trained individuals promote democracy in their home countries, but only if foreign education is acquired in democratic countries. Demonstrating the existence of such a transfer of fertility norms should open the door to analyses of the transfer of other behavioral norms between migrants' receiving and sending countries, including education choices, consumption habits, and social, economic and political participation and institutions. The approach provides an additional way of thinking about diaspora externalities. Indeed, contrary to the traditional literature whose effects are conveyed through decreases in communication, transaction and information costs, behavioral transfers involve changes in the very preferences of those left behind.

The paper is organized as follows. Section 1 presents a selected review of the literature on the impact of migration on fertility rates in the three groups mentioned above. Section 2 provides a description of the hypotheses about the main channels through which international migration may affect home country fertility. The model itself is provided in the Appendix. Section 3 presents the econometric specification, Section 4 describes data sources and Section 5 reports the empirical results. Section 6 concludes.

2 Selected Literature Review

A necessary condition for migration to result in source countries' adoption of host countries' behavioral norms is that they should be adopted by the migrants themselves. Similarly, one would expect these norms to be adopted by migrant households since they would most likely obtain the relevant information on host countries' norms before the rest of the home country population, and in a more direct and detailed manner.[1] Thus, examining what the literature says about migration's impact on the fertility of both migrants and home country migrant households is important for understanding whether and through what channels migration affects source country fertility. Studies on the impact of migration on migrants' and migrant households' fertility are reviewed in Section 1.1, and on the source country population in Section 1.2.

2.1 Fertility Impact on Migrants and Migrant Households

The bulk of the research on the relationship between migration and fertility has dealt with migration's impact on migrants' fertility. Several hypotheses have been examined, including socialization, adaptation, and selection. According to the socialization hypothesis, migrants are socialized by early childhood experiences and post-migration fertility levels remain similar to those in source areas or countries. Early studies on US internal migration find support for this hypothesis, with Goldberg (1959, 1960) and Freedman and Slesinger (1961) showing that rural-urban migrants exhibit higher fertility rates than urban natives. However, they do not examine changes in migrants' fertility over time. Furthermore, findings of later studies are generally consistent with the adaptation rather than the socialization hypothesis.

According to the adaptation hypothesis, the impact of host (home) country values and norms on migrants' behavior increases (decreases) with the length of time spent abroad, with migrants' fertility rates converging to those of natives over time. This hypothesis has received wide support in the literature, both for internal (rural-urban) and international migration.

The studies on internal migration in developing countries that find that rural-urban migration leads to convergence of fertility rates between migrants and urban natives: Those studies include Myers and Morris (1966) on Puerto Rico, Goldstein (1973) on Thailand, Martine (1975) on Colombia, Park and Park (1976) on Costa Rica, Hiday (1978) on the Philippines, Faber and Lee (1984) on Korea, Hervitz (1985) on Brazil, Lee and Pol (1993) on Mexico, Brockeroff (1995) on thirteen African countries, Umezaki and Ohtsuka (1998) on Papua New Guinea and Kulu (2003) on Estonia. Convergence results are also obtained

[1]Migration may of course affect the preferences of destination countries' natives, including their preferences for immigration. This issue is examined, for instance, in de Melo and Ettinger (1998) who show that migration's impact on these preferences is determined by individuals' factor endowments.

in studies of international migration, including Stephen and Bean (1992) and Lindstrom and Giorguli Saucedo (2002) for women of Mexican origin living in the US.

The third hypothesis is that convergence of fertility rates is due to selection rather than adaptation. Migrants do not constitute a random sample of the home population and might exhibit lower fertility rates than the overall population. White et al. (1995) found some support for the selection hypothesis in a study on internal migrants in Peru.[2] However, this result is not found in most of the studies. For instance, Goldstein (1973), Herwitz (1985) and Kulu (2003) examined the adaptation and selection hypotheses and found strong support for the former.

The impact of migration on the fertility of migrants' households back home has also been examined, though by a much smaller number of studies. One hypothesis examined is that the influence of host countries' fertility norms persists after migrants return home and thus results in a decrease in fertility. For instance, Lindstrom and Giorguli Saucedo (2002) find that Mexico-US temporary migration of women reduces long-term household fertility. Another hypothesis is that migration reduces fertility while the migrant is away and raises it when the migrant returns, a hypothesis confirmed in the case of male migration (e.g., Hervitz 1985). The results have been interpreted as being due to interruption and catching up of fertility, with no clear long-term fertility impact.

Lindstrom and Muñoz-Franco (2005) examine the impact of migration on women's modern contraceptive knowledge and use — and thus on their fertility — in rural Guatemala. They find that contraceptive use increases and fertility falls with variables such as having family members in urban or international destinations, living in a community where urban migration is common, especially in smaller ones, having social ties to urban or international migrants, and having an urban migration experience.

Thus, most studies on migration's fertility impact have confirmed that migration to low-fertility countries (regions) reduces migrants' fertility in the home country (region), and that the reduction in fertility is due to adaptation of migrants' fertility behavior to the norms of the host countries (regions). The studies obtain similar results with respect to home countries' migrant household fertility behavior. The latter is associated with a transfer of norms from the host country or region to the migrant household or community (mainly of small rural ones).

2.2 Fertility Impact on Home Country Population

Another question is whether migration results in a change in fertility rates of the population in migrants' countries of origin. Since migrants' behavioral norms with respect to fertility tend to converge to those of their host countries, it is not unreasonable to assume that migrants might serve as channels for the transmission of such norms and might affect the behavior of natives in their countries of origin. If this were the case, the positive spillover effect of migration in terms of reduced population pressure would be vastly greater than if

[2] They find that education and having fewer children are positively related to the degree of rural-urban mobility.

the decline in fertility rates only affected the migrants and their households.

It is important to note that the impact of international migration on fertility in migrants' home country may operate through several channels. The first channel consists of migrants' direct communication with their family, friends and community. Second, migration typically triggers an increase in interest by source countries' population about the general situation in host countries and that of their country's migrants living there including their economic performance, the way they are treated, and their adjustment to their new cultural and social environment. This tends to be reflected, inter alia, in an increase in media coverage of both the host countries and of the migrants living there.

Third, media attention is also likely to focus on the situation of return migrants, including their economic performance, views and behavioral modes, and how these might differ from those of natives back home. There is significant evidence that transmission of norms through media and in particular through television tends to affect people's behaviour in terms of fertility and marital choices. La Ferrara et al. (2008) and Chong and La Ferrara (2008) show that diffusion of telenovelas in some parts of Brazil had an impact of divorce rates and fertility choices of women. Fourth, a number of studies have found that migration and migrant networks result in increased trade between host and source countries (Gould 1994, Rauch 2001, Rauch and Trindade 2002) and in increased investment from the former to the latter (Kugler and Rapoport 2006, Javorcik et al., 2006). Thus, increased business-related contacts with migrants' host countries is likely to constitute another channel through which the latter's norms are diffused to source countries' natives. Finally, fertility and other behavioral norms that are diffused through these various channels are likely to be further diffused to those who do not have direct access to them through word-of-mouth.

The issue of international migration as a channel for the diffusion of fertility norms has not been systematically studied, at least at a macroeconomic level.[3] The only study we are aware of that examines the link between international migration and source country fertility is Fargues (2007). His analysis is based on fertility behavior in three source countries, namely Morocco, Turkey and Egypt. Migration from Morocco and Turkey over the period 1960-2000 was essentially to the low-fertility countries of Western Europe while that of Egypt was essentially to the high-fertility countries of the Persian Gulf. Fargues shows that fertility rates in these countries are correlated with the rates prevailing in their migrants' host countries, with rates declining in Morocco and Turkey and increasing in Egypt. He also finds that the degree to which the demographic transition has been attained increases with migration rates across regions of Morocco and Turkey and decreases with migration rates across regions of Egypt.

Fargues posits that the impact of host countries' fertility rates on those in migrants' home countries is due to the transfer of behavioral norms from host to source country. However,

[3]Quite recently, Bertoli and Marchetta proposed a microeconometric analysis using data of Egyptian households in order to test the influence of migration on their fertility behaviour. The implicit mechanism of transmission of norms at stake in their study is return migration. Their results support the transmission of fertility of norms through migration. In particular, everything equal elsewhere, households coming back from high fertility rates countries such as the Gulf countries display higher fertility rates than households with no migration experience.

he does not subject his hypothesis to rigorous testing or consider alternative ones.[4] Moreover, remittances are used as the channel for the transfer of fertility norms, with remittance levels reflecting the intensity by which they are transferred. However, remittances are flows rather than stocks and this implies two types of problems, which are related to short-term shocks and long-term forces. Remittances constitute a flow and are therefore likely to vary substantially with economic and other shocks (in both home and host countries) which are unrelated to the transfer of fertility norms. Consequently, we decided to use migration stocks instead. Migration stocks do not exhibit the degree of volatility exhibited by remittance flows and thus better capture the impact of current as well as past migration behavior. Second, remittance flows may be subject to long-term forces that differ according to host and home countries. Consequently, current flows may not capture the current influence of past flows. This is a second reason for which we decided to use migration stocks.

This paper provides a rigorous econometric analysis of the relationship between international migration and source country fertility at the macroeconomic level. The impact of the former on the latter may have a number of causes, one of which is the transfer of host country fertility norms. These causes are examined theoretically (see Appendix) and the hypotheses derived from the model are tested empirically. The econometric analysis is based on a new database of international bilateral migration for the year 2000 (Parsons et al. 2007) that covers all countries and territories. We find a significant and robust transfer of fertility norms from host to home countries, with fertility in migrants' home countries increasing with fertility rates in the countries where they live. In other words, source countries fertility decreases (increases) if it is higher (lower) than that of migrants' host countries.

3 The econometric specification

The econometric model we use in this paper relates the fertility rate in source countries with variables related to migration and additional control variables thought to influence the fertility behaviour of agents. The choice of the econometric specification requires first the theoretical identification of the channels through which migration may affect fertility decisions in migrants' countries of origin as well as the likely direction of their impact. To that aim, we develop an overlapping-generations model describing four main mechanisms. The model, which is provided in the Appendix, also enables us to generate a number of testable hypotheses. These are discussed in the remainder of this section. Four mechanisms through which migration may affect home country fertility are considered. The model solves for the impact of each one in turn. To account for the theoretical channels identified in the models, we use a set of observable variables realated to migration : the fertility

[4] Ebanks et al. (1975) for Barbados and Lee and Farber (1985) for Korea compute the impact of migration on fertility in the home country. However, their calculations are unrelated to the impact of migration on fertility behavior back home. Rather, they calculate what the fertility in the home country would have been had migrants stayed home by assuming that migrants' fertility rates are equal to those of observably similar non-migrants.

norm $\overline{n}^d$ (defined leter), the overall migration rate p_0, the selection ratio in terms of skills of migration flows denoted by S, the total amount of remittances received by the origin country R and the level of human capital denoted by H. The set of potential determinants unrelated to migration are denoted by X_k. The dependent variable is log of the fertility rate in source countries, $\log(n)$. The benchmark empirical model is written as:

$$\begin{aligned} \log(n) &= a_0 + a_1.\log(\overline{n}^d) + a_2.p_0.\log(\overline{n}^d) + a_3.\log(p_0) \\ &\quad + a_4.\log(S) + a_5.\log(R) + a_6.H + \sum_k b_k.X_k + \varepsilon \end{aligned} \qquad (1)$$

where a_0 is a constant , a_i $(i = 1, ..., 6)$ are parameters to be estimated and ε_t is a iid error term.

What are the theoretical channels underlying this empirical specification? First, migration may affect home country fertility through its impact on parents' incentive to invest in education. By raising the expected return to education, migration affects parents' incentive to invest in it. This reduces the amount of time available for other activities. The higher opportunity cost of time raises the relative cost of time-intensive activities, including raising children. Accordingly, the fertility rate should be decreasing with a country's average emigration rate and with quality-selective skill-biased immigration policies at destination.. Second, with children's income as an argument in parents' utility function, migration also raises parents' incentive to invest in their children's education. This also results in a negative impact on fertility. These two effects suggest the use of three relevant explanatory variables. The first one is the source country's overall emigration rate (p_0). The second one aims at measuring selection in migration flows and is proxied by the ratio of migrants to residents of skilled relative to unskilled labor (S). These variables are taken in logs and we expect a negative sign for the estimates of a_3 and a_4 in the empirical equation (1) below. Furthermore, theory predicts that migration prospects can stimulate the education of adults. Since educated parents have a higher opportunity cost of time, one expects the fertility rate to decrease in adults' human capital. In our regression, we will therefore use a third observable variable capturing the proportion of adults aged 25+ with secondary and/or post-secondary education (denoted by H) and expect a negative sign for the estimate of a_6 in 1 below.

Third, migration affects household income through migrant transfers. With children being a normal "good", remittances should have a positive impact on the fertility rate. On the other hand, part of the remittances parents expect to obtain should reduce parents' need for having a large number of children to provide for them when they are older. Thus, the impact of remittances is ambiguous. The impact of remittances is captured in the empirical analysis by the level of remittances R. The expected sign for a_5 is therefore ambiguous.

The fourth channel is related to the impact of migrants on the transfer of fertility norms from host countries to their country of origin.[5] The technology for the diffusion of fertility norms is likely to be a function of the geographic distribution of the migrant population and of fertility rates in the various countries. Denoting θ_d the proportion of the emigrant

[5] As mentioned above, each of these effects are solved for in the model provided in the Appendix.

population living in country d, we define the fertility norm $\overline{n}^d$ as $\overline{n}^d = \sum_d \theta_d n_d$, the average fertility rate at destination ($d = 1, ..., D$ are foreign destinations). A plausible diffusion technology is:

$$\log(\widetilde{n}) = N(p_0, \overline{n}^d) = \phi(p_0) . \log\left(\overline{n}^d\right) \tag{2}$$

with $\phi^{'} \geq 0$.

It is a priori unclear whether $\phi^{'}$ is high or low. On the one hand, it could be argued that a transfer of norms will only have an impact if the size of the diaspora is large enough. On the other hand, as the size of the diaspora becomes larger, the marginal impact of p_0 might decrease. A small or not significant $\phi^{'}$ would suggest the diffusion of norms is relatively independent of the intensity of migration, and possesses substantial public good characteristics. A large $\phi^{'}$ means that the diffusion of norms depends more strongly on the intensity of migration.[6]

The model (see Appendix) predicts that the fertility rate should be *increasing* with the fertility norm at destination. We assume a linear form for $\phi(p_0)$, i.e. $\phi(p_0) = a_1 + a_2.p_0$. From (2), the log of $\tilde{n}$ can be written as $\log(\widetilde{n}) = a_1 \log(\overline{n}^d) + a_2 p_0 \log(\overline{n}^d)$. We expect a non-negative sign for the estimates of a_1 and a_2 in the estimation equation (1) below. A similar technology is used by Spilimbergo (2009) who shows that foreign-educated promote democracy at home, but only if the foreign education is acquired in democratic countries.

Finally, we control for a set of K explanatory variables X_k ($k = 1, ..., K$) which are not necessarily linked to international migration but may have an impact on the fertility decision. We include the log of GDP per capita, the urbanization rate, regional dummies as well variables capturing the type and intensity of religious practice in source countries.

Our main coefficient of interest is a_1, the impact of the diffusion of the fertility norm. Given the double log specification, this coefficient captures the elasticity of the fertility rate in the home country with respect to the norm transmitted by its diaspora abraod. As derived from the model, the expected sign of a_1 is positive. In line with the diffusion technology, we also interact the log of the fertility norm with the migration rate to assess its impact on the diffusion of the norm (coefficient a_2). The emigration rate is also associated with parents' opportunity cost of time and the incentive to have children (coefficient a_3). We assume that this incentive effect follows a concave pattern and is captured by $\log(p_0)$. The expected signs of a_4, a_5, and a_6 are negative, ambiguous, and negative, as discussed above.

4 Data

Countries' emigration rates (p_0) and geographic shares of the emigrant population by destination (θ_d) are obtained from the database developed by Parsons, Skeldon, Walmsley and Winters (2007), which provides bilateral migration stocks for 208 countries and territories for the year 2000. The regression analysis is based on data for 175 source countries because of missing values for some of the control variables and on 145 countries when remittance

[6] For instance, if the norms coming from migrants are transmitted through media coverage, this effect is likely to be quite small.

data are included.

A striking feature arising from the data is the importance of South-South migration, with 47 percent of developing countries' migrants having their main destination in a non-OECD country, 81 percent of which being in a neighboring country. This is likely to be due to the fact that international migration is subject to liquidity constraints, particularly in developing countries (Lopez and Schiff, 1998; Mayda, 2007).

The intensity of South-South migration is important for our analysis. It suggests that migrants are by no means concentrated in OECD countries. Therefore, the fertility norms that they transfer are much more heterogeneous than one would expect if most migrants were located in OECD countries. In fact, 83 countries out of 208 (40%) have a higher fertility norm than the fertility rate prevailing at home.

Combining the fertility data with the bilateral migration matrix allows us to compute a weighted average of fertility rates in destination countries or fertility norm $\overline{n}^d$. As expected from the importance of South-South migration and the range of fertility rates, $\overline{n}^d$ exhibits a high degree of variability, ranging from 1.40 to 5.58.

Data on fertility rates (n), defined as the number of children women have between the ages of fifteen and fifty, are from the World Bank's World Development Indicators (WDI). Table 1 provides descriptive statistics of both fertility rates and fertility norms by country groups for the year 2000. Average fertility rates vary substantially across regions, from 4.8 in Sub-Saharan Africa to 1.4 in Europe (not shown). At the world level, the fertility rate is equal to 3.2 (ranging from 0.9 in Macau to 7.95 in Niger). It is equal to 1.87 for high income countries and about twice that for developing countries (3.64). The fertility norms are substantially greater in Sub-Saharan Africa than in other regions, probably because a large share of migration flows is towards neighboring countries that also display high fertility rates. The fertility norms in Muslim countries are also high, probably because most workers from countries such as Pakistan, Egypt, and other Middle Eastern countries migrate to the high-fertility Gulf countries.

Data on human capital (H) and on positive selection in emigration (S), proxied by the skilled-to-unskilled ratio of emigration rates to rich countries, are obtained from Docquier et al. (2007). Data on remittances are taken from the IMF database. In our set of controls, we include the urbanization rate (from WDI)[7], the share of Catholics and Muslims in each source country population and religious dummies, with regions consistent with the World Bank definition.

[7]Our results are consistent with those of Sato (2007) and Sato and Yamamoto (2005) who examine the impact of agglomeration and urbanization on fertility rates.

Table 1. Descriptive statistics on fertility rates and norms

	Nb. of	Emig.	Home-country Fertility				Fertility at destination			
	obs.	rate (%)	Mean	St. dev	Min	Max	Mean	St. dev	Min	Max
All countries	208	11.2	3.19	1.72	0.90	7.96	2.58	1.01	1.40	5.58
High-income countries	53	14.8	1.87	0.55	0.90	3.10	2.14	0.61	1.40	4.10
Developing countries	155	10.0	3.64	1.76	1.15	7.95	2.73	1.08	1.44	5.58
Remit. data countries	155	10.3	3.10	1.66	0.98	7.96	2.55	1.04	1.44	5.58
of which developing:	126	10.5	3.43	1.66	1.15	7.96	2.68	1.09	1.44	5.58
No remit. data countries	53	14.0	3.42	1.90	0.90	7.77	2.68	0.91	1.40	5.33
Developing:[i)]										
MENA	13	6.95	3.61	1.33	2.09	6.08	2.84	0.73	2.01	4.12
LAC	34	19.6	2.76	1.07	1.23	7.77	2.22	0.47	1.66	4.00
SSA	48	12.1	4.58	1.77	1.23	7.96	3.41	1.16	1.47	5.58
EAP	28	15.1	2.87	1.40	0.90	7.77	2.27	0.54	1.40	4.00
ECA and SAR	32	18.1	3.20	1.63	1.23	7.77	2.50	0.64	1.66	4.00
Muslims[ii)]	56	7.6	4.24	1.73	1.84	7.96	3.17	1.19	1.46	5.58
Catholics[ii)]	190	11.4	3.14	1.68	0.90	7.96	2.61	1.01	1.40	5.58

Notes: Non Weighted averages based on fertility (WDI) and migration data (Parsons et al., 2007).

i) MENA: Middle East & North Africa; LAC: Latin America & Caribbean; SSA: Sub-Saharan Africa; EAP: East Asia & Pacific; ECA: Europe & Central Asia; SAR: South Asia Region *ii)* Categories "Muslims" and "Catholics" are in percentages of total population and thus some country may have both measured categories. This explains why the number of countries with Catholics is greater than the total number of countries.

5 Empirical Results

Tables 2 to 5 report the results for the benchmark regressions for the full sample and for the sub-sample of developing countries. Estimation of model (1) is performed by OLS (in Tables 2 and 4) and by instrumental variables (IV) (in Tables 3 and 5) to account for potential endogeneity of the migration rate p_0. Tables 6 and 7 deal with the potential endogeneity of migrants' destination choices, a key variable used to construct the fertility norm. Finally, Tables 8 and 9 provide results obtained with a dynamic specification.

5.1 Full Sample

OLS regressions. Let us start with OLS regressions in Table 2 using the benchmark specification (1). The interaction term $p_0 \log(\overline{n}^d)$ tests whether the impact of the fertility norm depends on the intensity of migration or not.

As mentioned in Section 4, data are incomplete for several variables. The major constraint is due to the remittance variable which is unavailable for fifty-three countries. Hence, we estimate the model both with and without remittances. The estimation results without (with) remittances are presented in columns (1) and (2) (columns (3) and (4)). Missing data for other control variables (e.g. share of Catholics and selection ratio) also reduce sample size, with 175 (145) countries when remittances are excluded(included). For each sample, we estimate a full specification (columns 1 and 3) as well as a parsimonious one (columns 1 and 4) in order to increase efficiency in the estimation.

Table 2 reports the estimation results. All estimations point to a positive and significant impact of fertility norms $\overline{n}^d$on fertility rates n. For the two samples (with and without remittances), we obtain an elasticity of n with respect to $\overline{n}^d$ that ranges between 0.273 and 0.383, with an average value of 0.323. These estimates suggest that a one percent decrease in the fertility norm reduces home country fertility by about 0.3 percent. Given the relative stability of bilateral migration stocks over time, this elasticity may reflect a longer term impact of fertility norms on home country fertility. In contrast, in all regressions, the interaction term $p_0 \log(\overline{n}^d)$ turns out to be insignificant. It is worth noting that Spilimbergo (2008) reached a similar conclusion in his paper on democracy.[8]

The fact that the transmission of the norms does not directly depend on the intensity of emigration suggests that the transfer channels are complex. For instance, this might be the case if norms are transmitted by migrants through media coverage, as in La Ferrara et al. (2008). Another possible explanation for this finding is that the transfer of fertility norms takes place mainly between younger people as they tend to be more open to new ideas and habits, and because they are the ones who are faced with the decision regarding the timing and number of (additional) children they might have. This would not affect the results if their share in the total number of migrants were approximately constant at the bilateral level. However, this is highly unlikely for three reasons at least: i) different

[8]The interaction term is significant at a level of 1% or 5% in only two of fifteen regressions and at the 10% level in another two regressions.

age distributions across source countries, ii) as a substantial share of migrants leave when they are young, their share in older countries of immigration is likely to be smaller than in countries where immigration is more recent; and iii) similarly, the share of young migrants is likely to be smaller in older source countries than where emigration is more recent. Thus, cross-country variation in migration rates may not be a good proxy for the variation in the rates that are relevant for the transmission of fertility norms. Unfortunately, data on age-specific bilateral migration are unavailable.

The estimation results also point to a negative incentive effect (a negative parameter a_3 of $\log(p_0)$) in the parsimonious regressions (columns 2 and 4), though not in the full regressions. The results support the idea that higher migration prospects may reduce fertility at home, possibly because of a higher investment in education. The selection ratio coefficient (a_4) is not significant and is deleted in the parsimonious regressions. The adults' education level (a_6) is only weakly significant and is also deleted in the parsimonious specifications.[9] As for the impact of remittances (a_5), we find moderate support for a positive impact on fertility in the parsimonious specification. This suggests that the income effect slightly dominates the negative impact associated with old-age security concerns. Onthe other hand, one might expect old-age security to play a greater role in developing countries than in developed countries. We check this point below when restricting the sample to developing countries only.

As for the control variables included in regression (1), our results are mostly in line with the expected impact. Fertility rates are found to decrease with income per capita and with urbanization. They are found to increase with the share of Muslims and Catholics in the country. Compared to the Europe and Central Asia-South Asia regions, fertility rates are higher in Sub Saharan Africa, Latin America and East Asia and Pacific.

[9]The correlation between adults' human capital and income per capita is 0.67, which might explain the weakly significant coefficient, especially given the cross-country dimension of the data.

Table 2. OLS regressions (dep = log of fertility rate) - All countries

	(1)	(2)	(3)	(4)
Constant	1.200	1.037	1.459	1.432
	(5.51)***	(6.23)***	(5.11)***	(5.92)***
Log of fertility norm ($\log(\overline{n}^d)$)	0.343	0.383	0.273	0.291
	(3.35)***	(4.37)***	(2.40)**	(2.76)***
$p_0.\log(\overline{n}^d)$	-0.202		-0.405	
	(0.77)		(1.54)	
Emigration rate ($\log(p_0)$)	-0.025	-0.040	-0.018	-0.053
	(0.78)	(1.90)*	(0.59)	(2.44)**
Selection ratio (sec+tert)	0.001		0.001	
	(0.04)		(0.02)	
Log of remittances			0.018	0.032
			(1.16)	(2.18)**
Urbanization	-0.005	-0.005	-0.004	-0.003
	(2.62)***	(2.88)***	(2.54)**	(2.24)**
GDP per capita	-0.076	-0.079	-0.100	-0.117
	(2.46)**	(3.32)***	(2.80)***	(3.86)***
Adult's education	-0.256		-0.190	
	(1.70)*		(1.09)	
East Asia & Pacific	0.272	0.277	0.308	0.272
	(2.85)***	(2.99)***	(3.29)***	(2.90)***
Sub-Saharan Africa	0.427	0.420	0.537	0.521
	(4.67)***	(4.72)***	(4.75)***	(5.40)***
Latin Am. & Carib	0.350	0.323	0.451	0.486
	(5.13)***	(5.31)***	(6.49)***	(8.03)***
MENA	0.115		0.159	
	(1.21)		(1.26)	
High-income	0.089		0.229	0.239
	(0.96)		(2.22)**	(2.70)***
Muslims (% of pop)	0.004	0.004	0.003	0.003
	(4.40)***	(5.59)***	(2.96)***	(4.55)***
Catholic (% of pop)	0.001	0.002	0.001	
	(1.81)*	(2.68)***	(1.43)	
Observations	175	175	145	145
R-squared	0.78	0.77	0.83	0.81

Robust t statistics in parentheses. *: significant at 10%; **: significant at 5%; ***: significant at 1%.

IV regressions. The OLS estimation rests on the assumption that all covariates are independent of ε. Nevertheless, some variables might depend on fertility, thus invalidating this assumption. In particular, higher fertility rates should increase labor supply and depress wages in domestic countries, thereby affecting international migration. In other words, $\log(p_0)$ might depend on the level of home country fertility $\log(n)$ and reverse causality might affect the estimation of a_3.[10] Hence, we estimate equation (1) by instrumental variable (IV) method.[11]

Table 3 reports the results for the whole sample of countries. We consider the following instruments for $\log(p_0)$: a dummy variable for islands, the log of the geographic size of the country measured by its surface, and the log of the distance to migrants' main destination.[12] It is worth emphasizing that the two necessary conditions for instrumentation are fulfilled in our regressions.[13]

The main findings of the IV estimations are extremely close to those of the OLS ones. In particular, the average value of the elasticity of home country fertility with respect to the fertility norm is 0.323 under OLS and 0.321 under IV.

[10]Theoretically speaking, the existence of reverse causality between migration and fertility implies that the interaction term $p_0 \log(\overline{n}^d)$ should also be instrumented. However, it is never significant in any of the regressions (whether for all countries or for developing ones) and we focus on the instrumentation of the migration rate.

[11]Note that since we are using migration shares across destination countries (θ_d) rather than stocks of migrants to build the norm variable, reverse causality from $\log(n)$ to $\log(\overline{n}^d)$ can be ruled out.

[12]The first-stage IV estimates are in line with intuition. In particular, migration rates decrease with country size and with distance to main destination, and are higher for islands. For the sake of brevity, first-stage estimation results are not reported here but are available upon request.

[13]First stage estimation results indicate that we have strong instruments. The F statistics of the first stage regressions are most of the time above ten. Moreover, as suggested by the p-value of the Hansen overidentification test, the instruments are found to be independent of the fertility rates.

Table 3. IV regressions (dep = log of fertility rate) - All countries

	(1)	(2)	(3)	(4)
Constant	1.253	1.116	1.482	1.101
	(5.99)***	(5.90)***	(6.30)***	(5.86)***
Log of fertility norm ($\log(\overline{n}^d)$)	0.385	0.390	0.236	0.273
	(3.44)***	(4.18)***	(1.91)*	(2.57)**
$p_0.\log(\overline{n}^d)$	-0.223		-0.090	
	(0.41)		(0.23)	
Emigration rate ($\log(p_0)$)	-0.020	-0.019	-0.060	-0.075
	(0.28)	(0.52)	(1.12)	(2.45)**
Selection ratio (sec+tert)	-0.005		-0.017	
	(0.18)		(0.58)	
Log of remittances			0.019	0.032
			(1.29)	(2.17)**
Urbanization	-0.005	-0.005	-0.005	-0.005
	(2.79)***	(2.69)***	(2.97)***	(2.88)***
GDP per capita	-0.075	-0.072	-0.107	-0.063
	(2.17)**	(2.81)***	(3.18)***	(2.74)***
Adult's education	-0.282		-0.204	
	(1.87)*		(1.24)	
East Asia & Pacific	0.238	0.245	0.268	0.220
	(2.51)**	(2.63)***	(2.70)***	(2.38)**
Sub-Saharan Africa	0.372	0.434	0.499	0.495
	(4.35)***	(5.15)***	(4.69)***	(5.22)***
Latin Am. & Carib	0.321	0.371	0.435	0.412
	(4.57)***	(6.27)***	(5.92)***	(7.18)***
MENA	0.076		0.238	
	(0.73)		(2.39)**	
High-income	0.169	0.191	0.205	0.134
	(1.81)*	(2.26)**	(1.98)**	(1.62)
Muslims (% of pop)	0.235	0.220	0.227	0.210
	(4.17)***	(4.02)***	(3.88)***	(3.68)***
Catholic (% of pop)	0.001		0.001	
	(1.17)		(1.21)	
Partial Corr First Stage	0.174	0.342	0.212	0.400
F-stat First Stage	12.39	20.27	11.26	36.36
Hansen J Test (p-value)	0.130	0.319	0.63	0.67
R-squared	0.77	0.76	0.82	0.80
Observations	174	175	144	144

Robust t statistics in parentheses. Instruments for $\log(p_0)$: island, log(size), log(distance to main destination). *: significant at 10%; **: significant at 5%; ***: significant at 1%

5.2 Developing Countries

The results of the benchmark regressions for the full sample showed a transfer of fertility norms between migrants' home and host countries. In this section, we assess the sensitivity of the results to the choice of the countries included in the sample by restricting the analysis to the developing countries. One might expect the effect of remittances associated with old-age security concerns to be stronger in developing countries in which pension systems are much less developed, suggesting a smaller impact of remittances on fertility rate.

Table 4 and Table 5 report the results for OLS and IV estimations, respectively. The results are very similar to those obtained with the full sample. They show a strongly significant transfer of fertility norms in all regressions, with an elasticity averaging 0.30 in both the OLS and IV estimations. They also provide moderate evidence of an incentive effect of migration through investment in education (col. 4, Table 5). As hypothesized, we find a smaller impact of remittances on fertility rates for developing countries.

In summary, the regression results on the transfer of fertility norms in the case of developing countries confirm those obtained for all countries in Section 5.1.

Table 4. OLS regressions (dep = log of fertility rate)

Developing countries

	(1)	(2)	(3)	(4)
Constant	1.270	1.267	1.587	1.525
	(5.40)***	(6.20)***	(5.17)***	(6.29)***
Log of fertility norm ($\log(\overline{n}^d)$)	0.337	0.338	0.267	0.261
	(3.28)***	(3.65)***	(2.26)**	(2.34)**
$p_0.\log(\overline{n}^d)$	-0.181		-0.368	
	(0.60)		(1.21)	
Emigration rate ($\log(p_0)$)	-0.019	-0.028	-0.009	-0.034
	(0.54)	(1.17)	(0.28)	(1.49)
Selection ratio (sec+tert)	-0.001		-0.013	
	(0.02)		(0.41)	
Log of remittances			0.008	0.016
			(0.52)	(1.14)
Urbanization	-0.004	-0.003	-0.005	-0.004
	(1.97)*	(1.84)*	(2.87)***	(2.38)**
GDP per capita	-0.088	-0.094	-0.112	-0.116
	(2.67)***	(3.25)***	(2.85)***	(3.81)***
Adult's education	-0.375	-0.422	-0.350	-0.383
	(2.30)**	(2.67)***	(1.91)*	(2.15)**
East Asia & Pacific	0.406	0.387	0.407	0.363
	(3.50)***	(3.40)***	(3.98)***	(3.66)***
Sub-Saharan Africa	0.428	0.387	0.519	0.439
	(4.55)***	(4.34)***	(4.52)***	(4.40)***
Latin Am. & Carib	0.335	0.298	0.414	0.344
	(4.81)***	(4.38)***	(6.15)***	(5.23)***
Middle East & North Africa	0.115		0.192	
	(1.11)		(1.40)	
Muslims (% of pop)	0.004	0.005	0.004	0.004
	(4.51)***	(5.44)***	(3.11)***	(4.93)***
Catholic (% of pop)	0.002	0.002	0.002	0.003
	(2.62)***	(2.86)***	(3.03)***	(3.30)***
Observations	143	143	119	119
R-squared	0.77	0.76	0.84	0.83

Robust t statistics in parentheses. *: significant at 10%; **: significant at 5%; ***: significant at 1%.

Table 5. IV regressions (dep = log of fertility rate)

Developing countries

	(1)	(2)	(3)	(4)
Constant	1.319	1.388	1.529	1.422
	(5.35)***	(6.02)***	(5.62)***	(6.42)***
Log of fertility norm ($\log(\overline{n}^d)$)	0.375	0.360	0.219	0.229
	(3.45)***	(3.70)***	(1.91)*	(2.12)**
$p_0.\log(\overline{n}^d)$	-0.695		0.041	
	(1.14)		(0.10)	
Emigration rate ($\log(p_0)$)	0.048	0.005	-0.070	-0.069
	(0.62)	(0.12)	(1.24)	(2.22)**
Selection ratio (sec+tert)	0.016		-0.024	
	(0.44)		(0.71)	
Log of remittances			0.015	0.024
			(1.07)	(1.67)*
Urbanization	-0.004	-0.003	-0.005	-0.004
	(2.06)**	(1.41)	(2.95)***	(2.62)***
GDP per capita	-0.070	-0.099	-0.118	-0.107
	(1.81)*	(3.29)***	(3.28)***	(3.69)***
Adult's education	-0.413	-0.482	-0.318	-0.321
	(2.55)**	(3.01)***	(1.83)*	(1.82)*
East Asia & Pacific	0.425	0.396	0.364	0.334
	(3.93)***	(3.72)***	(3.33)***	(3.26)***
Sub-Saharan Africa	0.445	0.378	0.502	0.451
	(4.43)***	(4.08)***	(4.99)***	(4.97)***
Latin Am. & Carib	0.353	0.276	0.390	0.361
	(4.78)***	(3.96)***	(5.62)***	(5.62)***
MENA	0.098		0.179	
	(0.88)		(1.47)	
Muslims (% of pop)	0.004	0.004	0.004	0.004
	(4.31)***	(5.20)***	(3.51)***	(5.61)***
Catholic (% of pop)	0.002	0.002	0.003	0.003
	(2.22)**	(2.87)***	(3.38)***	(3.35)***
Partial Corr First Stage	0.150	0.336	0.183	0.367
F-stat First Stage	9.46	19.00	8.03	25.40
Hansen J Test (p-value)	0.298	0.420	0.803	0.623
R-squared	0.76	0.76	0.83	0.82
Observations	142	142	118	118

Robust t statistics in parentheses. Instruments for $\log(p_0)$: island, log(size), log(distance to main destination). *: significant at 10%; **: significant at 5%; ***: significant at 1%

5.3 Testing for linearity of migration weights

Bilateral migration weights θ_d, which measure the (relative) importance of each destination country in the fertility norm $\overline{n}^d$ might have a non-linear impact on it. For instance, bilateral migration should exhibit diminishing returns if the diffusion of fertility norms possesses strong public good characteristics. On the other hand, bilateral migration might exhibit increasing returns if fertility norms diffusion required a minimum migration threshold. The same might also hold for home countries' migration rate p_0.

This issue was examined empirically. The term $\overline{n}^d = \sum_d \theta_d n_d$ was replaced by $\sum_d \theta_d^\phi n_d$ and $p_0.\log(\sum_d \theta_d n_d)$ by $p_0^\phi.\log(\sum_d \theta_d^\phi n_d)$ in the estimation equation and grid estimation was performed for values of ϕ equal to 0.50, 0.75, 0.90, 1.00, 1.10, 1.25, 1.50, 2.00, and 3.00. The best results in all the specifications and for both country groupings (all countries and developing ones) were obtained for values of ϕ equal to 1.00, 1.10, and 1.25 in one OLS estimation case. Thus, the non-linearity assumption seems to be rejected by the data. This result provides additional confidence in the fertility norm being used in the estimation of equation (1). Finally, the interation term $p_0^\phi.\log(\sum_d \theta_d^\phi n_d)$ was not significant for any values of ϕ.

5.4 Endogeneity of fertility norm

The correlation between home country fertility and the fertility norm might be driven other forms of endogeneity, too. Endogeneity of the norms might create some spurious correlation between the fertility rates and the fertility norms. Basically, three different sources of endogeneity might be considered. In this section, we address subsequently these three endogeneity aspects. Each one is treated using a different approach. The results are found to be robust to endogeneity treatments.

5.4.1 Interdependence of norms

A first source of endogeneity of norms is related to what is called endogenous effects. These endogenous effects have been identified by several authors including Manski (1993). They are part of the so called reflection problem. In our analysis, norms are by construction interdependent because one country's fertility norm includes its partners' fertility rates. And partners' fertility rates are also influenced by their fertility norms, this means that equation (1) gives rise to a system in which each country's fertility rate ultimately depends on the other countries' rates. This in turn implies endogeneity due to reverse causality.

In order to test the robustness of our results with respect to this issue, we run a new set of regressions, assuming that some countries are not influenced by the norms of the other countries. In particular, we assume that the norms that influence fertility are made up only of fertility rates of developed countries. In other words, we assume that the fertility behaviour of developing countries are not absorbed by their migrants and sent back to the origin countries. Practically, we recompute the fertility norms excluding the fertility rates of the non OECD destinations and reestimate equation (1). As before, we consider the full sample and a sample of developing countries. For the sample of developing countries, interdependence is fully accounted for since none country included in the regression influences the fertility norms of the other countries considered in the sample. The results are reported in columns (1) and (2) of Table 6. The results show that our main findings are robust to the issue of interdependence of norms, although the elasticity of the fertility norm and its significance are somewhat reduced, especially in the case of developing countries.

5.4.2 Correlation between migration and fertility

Another source of endogeneity might arise if migration choices are influenced by cultural proximity and if cultural proximity includes preferences with respect to fertility. Theoretically speaking, people can migrate preferably to one particular destination because this destination has fertility preferences that are close from those prevailing in their origin country. In that case, bilateral migration weights used to define the fertility norms might depend on the prevailing fertility rates in the origin country. This in turn might lead to some correlation between the norms and the error term of equation (1). One way of dealing with that issue is to use predicted bilateral migration weights as done below. An alternative way is to exclude from the computed norms the destination for which we expect a stronger cultural proximity between the destination and the origin. We follow this route here. We exclude those destinations on two different grounds. First, for former colonies, we recompute the norms by excluding the colonizer as a destination. The idea is that colonization has over time reduced the cultural distance and has maybe led to similar preferences in terms of fertility.

Table 6 : Robustness to computation of the fertility norm

(Dep=Log of Fertility rate)

	To high-income		Excl. main destination		Excl. colonizer(s)	
	(1)	(2)	(3)	(4)	(5)	(6)
	Full	Dev	Full	Dev	Full	Dev
Constant	1.064	1.318	1.010	1.079	1.095	1.255
	(4.97)***	(5.42)***	(5.24)***	(4.51)***	(5.86)***	(5.53)***
Log of fertility norm	0.351	0.264	0.396	0.444	0.362	0.378
	(2.28)**	(1.78)*	(3.50)***	(3.67)***	(3.64)***	(3.59)***
Emigration rate	-0.049	-0.040	-0.041	-0.033	-0.036	-0.028
	(2.17)**	(2.10)**	(1.92)*	(1.39)	(1.68)*	(1.13)
Urbanization	-0.004	-0.003	-0.004	-0.003	-0.004	-0.003
	(2.33)**	(1.97)*	(2.59)**	(2.01)**	(2.47)**	(1.81)*
GDP per capita	-0.043	-0.066	-0.049	-0.062	-0.054	-0.075
	(1.70)*	(2.02)**	(2.05)**	(2.05)**	(2.23)**	(2.51)**
Adult's education	-0.516	-0.696	-0.391	-0.531	-0.429	-0.604
	(3.38)***	(3.75)***	(2.65)***	(3.22)***	(2.84)***	(3.62)***
East Asia & Pacific	0.214	0.299	0.195	0.304	0.207	0.304
	(2.24)**	(3.50)***	(2.09)**	(2.68)***	(2.23)**	(2.57)**
Sub-Saharan Africa	0.540	0.495	0.344	0.308	0.322	0.283
	(7.43)***	(6.42)***	(4.25)***	(3.93)***	(3.69)***	(3.24)***
Latin Am. & Carib	0.271	0.250	0.268	0.244	0.258	0.235
	(4.50)***	(2.85)***	(4.35)***	(3.58)***	(4.07)***	(3.35)***
Muslims	0.275	0.287	0.251	0.248	0.238	0.246
	(4.75)***	(4.49)***	(4.47)***	(4.25)***	(4.24)***	(4.17)***
Catholics	0.001	0.001	0.001	0.001	0.001	0.002
	(1.01)	(1.46)	(0.82)	(1.54)	(1.14)	(1.88)*
R-squared	0.75	0.73	0.77	0.76	0.77	0.75
Observations	175	143	175	143	175	143

Robust t statistics in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. Full = full sample; Dev = sample of developing countries.

Second, we recompute the norms for all origin countries, excluding the main destination in 2000. The idea is that the main country of destination tends to diffuse its culture back to the country of origin of migrants, reducing thereby the cultural distance between the two countries. The results of this procedure are in columns (3) through (6) of Table 6. As before, we run the regressions for both samples, including respectively all countries and developing countries only. The results suggest that the exclusion of the main destination and of the colonizers in the computation of the fertility norm does not affect the main results. In particular, we find similar effects of the fertility norms of migrants on the fertility rates of the origin country.

5.4.3 Endogeneity of migration weights in the norm

Another kind of endogeneity might be related to the fact that migration flows could respond to variables directly related to fertility rates. In that case, the previous results might be affected by endogeneity bias. For instance, migrants might select their destination and fertility behavior because of the influence of another variable. In that case, our key explanatory variable $\log(\overline{n}^d) = \log(\sum_d \theta_d n_d)$ might be considered endogenous with respect to the home country fertility rate because of the endogeneity of the θ_d's.

Given the fact that the possible endogeneity of $\log(\overline{n}^d)$ is related to the endogeneity of θ_d, no standard econometric procedure (such as instrumental variable estimation) exists to deal with this issue. One intuitive econometric strategy, used also by Spilimbergo (2007), is to use the predicted values of θ_d obtained with a gravity model relating bilateral migration stocks to some exogenous variables. The econometric procedure therefore involves two steps. In the first step, we predict the bilateral migration weights on the basis of a set of bilateral exogenous variables. In turn, these predicted weights are denoted by $\widehat{M_{id}}$ allow us to build an alternative measure of the fertility norm. This alternative measure is denoted by $\widehat{n}_i^d$. In the second step, we estimate the previous regressions using this alternative measure of the norm rather than the one based on observed bilateral migration weights. The details and results of the first step are provided in Appendix 2.

In the second step, we use $\log(\widehat{n}^d)$ instead of $\log(\overline{n}^d)$ to reestimate equation (1).[14] We start from the parsimonious specifications. The results are presented in Tables 7, with those for the whole sample in columns (1) and (2) and those for the developing countries in columns (3) and (4). Columns (1) and (3) report OLS estimates while columns (2) and (4) use instrumental variable estimation in order to account for the possible endogeneity of the migration rate p_0. Thus, those IV estimates account simultaneously for two sources of bias: one due to the endogeneity of bilateral migration rates used in the fertility norm and the other due to the endogeneity of each source country's overall migration rate. Results of OLS estimations are fairly similar to those in Tables 2 and 4. The elasticity of fertility with respect to the fertility norm varies from 0.35 to 0.40 in the full sample and is somewhat larger for developing countries. These values are well in line with those estimated in Section 5.1. The IV results exhibit a lower level of significance of $\log(\widehat{n}^d)$. This decrease is related to the instrumenting procedure of the overall migration rate. A similar result is observed in Tables 3 and 5. To sum up, we find that the impact of fertility norms transferred by migrants survives any concerns about the endogeneity of bilateral migration weights. In fact, we show in the following section that the estimation results of a dynamic version of the model are very similar, irrespective of whether the fertility norm is based on the observed or predicted bilateral migration weights.

[14] Note that since this IV estimation involves a two-step procedure, the standard errors and t-statistics of the estimated parameters should be taken with cautious. In that respect, attention should be paid more to the size of the point estimates.

Table 7 : Regressions based on predicted bilateral stocks

(Dep=Log of Fertility rate)

	OLS	IV	OLS	IV
Constant	0.890	0.977	1.138	0.849
	(4.16)***	(3.70)***	(4.72)***	(3.88)***
Log of fertility norm ($\log(\widehat{n}^d)$)	0.352	0.406	0.398	0.445
	(2.19)**	(1.91)*	(2.39)**	(1.71)*
Emigration rate ($\log(p_0)$)	-0.050	-0.024	-0.032	-0.019
	(2.82)***	(0.61)	(1.76)*	(0.46)
Urbanization	-0.006	-0.006	-0.004	-0.005
	(3.75)***	(3.23)***	(2.47)**	(3.15)***
GDP per capita	-0.059	-0.053	-0.081	-0.073
	(2.38)**	(1.92)*	(2.61)**	(2.12)*
Adult's education			-0.449	-0.723
			(2.40)**	(4.25)***
East Asia & Pacific	0.275	0.228	0.391	0.271
	(3.71)***	(2.32)**	(4.51)***	(2.45)**
Sub-Saharan Africa	0.546	0.546	0.487	0.457
	(6.77)***	(6.96)***	(5.58)***	(5.24)***
Latin America & Carib	0.364	0.400	0.350	0.297
	(5.04)***	(6.60)***	(3.98)***	(3.96)***
MENA	0.178	0.230	0.150	0.185
	(2.06)*	(2.48)**	(1.48)	(1.78)*
Muslims	0.005	0.241	0.004	0.213
	(6.16)***	(4.35)***	(4.55)***	(4.01)***
Catholics	0.002		0.002	
	(2.70)***		(2.32)**	
Partial Corr First Stage		0.353		0.323
F-stat First Stage		18.14		14.51
Hansen J Test (p-value)		0.932		0.667
R-squared	0.74	0.740	0.76	0.73
Observations	174	174	142	146

Robust t statistics in parentheses. significant at 10%; ** significant at 5%; *** significant at 1%. Instruments for $\log(p_0)$: island, log(size), log(distance to main destination). Col (1) and (2) : all countries; Col (3) and (4) : developing countries only.

5.5 Dynamic Specification

Finally, we supplement our cross country evidence by estimating a dynamic model of fertility. Though we are unable to estimate a panel regression model due to lack of times series data for the bilateral migration stocks, it might be useful to estimate a model linking the change in fertility rates with the difference between the prevailing fertility rate and the fertility norm. Introducing inertia in a dynamic model might enable us to estimate the short-term impact of fertility norms and compare it to the longer-term value obtained in the cross-country estimation. We estimate the following equation:

$$\begin{aligned} \log(n_{t+1}) - \log(n_t) &= a_0 + a_1.\left[\log(n_t) - \log(\overline{n_t}^d)\right] + a_2.\log(p_{0,t}) \\ &\quad + a_3.\log(S_t) + \varepsilon_t \end{aligned} \tag{3}$$

The key coefficient is a_1. Our model of transfer of norms implies $a_1 < 0$: countries with fertility rates higher (lower) than their fertility norm are expected to see a decrease (increase) in their fertility rate. We use the change in fertility rates between 2000 and 2005 as our dependent variable. Tables 9 and 10 summarize the main findings. Table 8 (10) uses the observed (predicted) migration stocks to construct $\overline{n_t}^d$. Equations for all countries are in column 1 (OLS) and 2 (IV) and those for developing countries are in columns 3 (OLS) and 4 (IV). In order to maximize the size of the sample, the remittances variable is excluded from the regressions. The results in Tables 8 and 9 are then compared with those in the corresponding regressions (columns (1) and (2) in Tables 2 to 5).

The impact of the fertility norm is very similar in both Tables 8 and 9 and for OLS and IV, with significance levels of 1%. The average elasticity is 0.123 or about 1/8. These results confirm the existence of a β-convergence process, with a_1 averaging about -1/8. Focusing on the terms in n and $\overline{n}^d$, equation (3) can be rewritten as:

$$\log(n_{t+1}) = (1 + a_1).\log(n_t) - a_1 \log(\overline{n_t}^d) + ... = \frac{7}{8}.\log(n_t) + \frac{1}{8}\log(\overline{n_t}^d) + ... \tag{4}$$

Equation (4) indicates that an equal proportionate increase in the 2000 fertility rate and the 2000 fertility norm raises the 2005 fertility rate by the same proportionate amount, with 7/8 of that increase due to the increase in the 2000 fertility rate and 1/8 due to the increase in the fertility norm.

Table 8: Dynamic specification (dep = $\log(n_{t+1}) - \log(n_t)$)

	OLS	IV	OLS	IV
Constant	0.008	-0.055	-0.014	-0.055
	(0.37)	(1.54)	(0.57)	(1.52)
$\log(n_t) - \log(\overline{n_t}^d)$	-0.122	-0.118	-0.121	-0.117
	(5.43)***	(5.25)***	(4.73)***	(4.68)***
$\log(p_{0,t})$	0.015	-0.005	0.019	0.008
	(1.54)	(0.38)	(1.67)*	(0.51)
$\log(S_t)$	-0.014	-0.012	-0.002	0.003
	(1.44)	(1.71)*	(0.19)	(0.36)
Partial Corr First Stage		0.326		0.334
F-stat First Stage		18.23		15.84
Hansen J Test (p-value)		0.179		0.169
Observations	192	184	153	149
R-squared	0.24	0.17	0.18	0.19

Robust t statistics in parentheses significant at 10%; ** significant at 5%; *** significant at 1%. Instruments in IV reg. for $\log(p_0)$: island, log(size), log(dist to main destination). Col (1) and (2) : all countries; Col (3) and (4) : developing countries only.

Table 9: Dynamic specification with predicted bilateral migration stocks

	OLS	IV	OLS	IV
Constant	-0.019	-0.089	-0.041	-0.090
	(0.85)	(2.17)**	(1.65)	(2.16)**
$\log(n_t) - \log(\widehat{n}_t^d)$	-0.124	-0.124	-0.128	-0.127
	(6.00)***	(5.32)***	(5.38)***	(4.91)***
$\log(p_{0,t})$	0.012	-0.012	0.017	0.002
	(1.22)	(0.82)	(1.53)	(0.16)
$\log(S_t)$	-0.004	-0.004	0.009	0.013
	(0.44)	(0.57)	(0.77)	(1.62)
Partial Corr First Stage		0.314		0.320
F-stat First Stage		16.83		14.74
Hansen J Test (p-value)		0.203		0.287
Observations	188	182	151	147
R-squared	0.23	0.13	0.18	0.17

Robust t statistics in parentheses. significant at 10%; ** significant at 5%; *** significant at 1%. Instruments in IV reg. for $log(p_0)$: island, log(size), log(dist to main destination.) Col (1) and (2) : all countries; Col (3) and (4) : developing countries only.

The corresponding elasticities in the cross-country regressions for all countries are about 0.36 (0.35) for OLS and 0.38 (0.40) for IV when the fertility norm is constructed with actual (predicted) bilateral migration stocks. In the case of developing countries, they are about 0.34 (0.40) for OLS and 0.36 (0.44) for IV. In other words, the elasticities in the cross-country regressions are about three times those in the dynamic ones. This seems to confirm the fact that the elasticities derived from cross-country regressions reflect a longer-term impact of the fertility norm on home country fertility while a shorter term impact is obtained in the dynamic specification (4).[15]

6 Conclusion

Though numerous studies have examined the impact of migration on the fertility of migrants and their household, this paper is the first one to provide a systematic analysis of the impact of migration on fertility in migrants' home countries. Its main objective was to identify migration's impact on the transfer of destination countries' fertility norms to migrants' home countries and hence its impact on home countries' fertility rates.

The paper provides a theoretical analysis of the various channels through which international migration might impact fertility in migrants' home country. The model shows that the transfer of norms from low- (high-) fertility destination countries reduces (raises) fertility in migrants' countries of origin, that migration raises adults' incentive to invest in their own and their children's education and thus reduces fertility, and that the increase in remittance levels has an ambiguous impact on fertility.

Controlling for the other channels, the model's predictions regarding the impact of the transfer of norms are supported by the empirical results. We found in a cross-country analysis for the year 2000 that a one percent decrease in the fertility norm to which migrants are exposed reduces home country fertility by over 0.3 percent for all countries as well as for developing countries. We also found that a one percent decrease in the fertility norm in 2000 results in a decrease in home country fertility in 2005 by 0.125 or 1/8. Thus, the estimation results confirm the main hypothesis of the paper, namely that through the transfer of fertility norms, migration from high (low)-fertility sending countries to low (high)-fertility destination countries reduces (raises) fertility in the former.

The findings presented here have a number of policy implications. Developing countries' authorities that have experienced rapid population growth continue to be greatly concerned with the potential social, economic and political problems associated with it. These countries have typically looked at migration as one of the (static) ways of reducing population pressure. This paper has shown that South-North migration can lead to a reduction in fertility rates in migrants' home countries and thus contribute to a reduction in home country population pressure by serving as a channel for the transfer of low-fertility norms.[16]

Thus, developing source countries could reduce population pressure by directing a larger

[15] One caveat is that some of the variables differ in the cross-country and dynamic specifications.

[16] Migration may also reduce home country fertility by raising the incentive to acquire education. This was found in some, though not in all regressions.

share of its emigrants towards developed host countries. One possible way of achieving this would be to negotiate cooperative agreements with these host countries whereby they would obtain a larger quota of legal immigrants in exchange for helping control illegal migration.

Source countries could further reduce population pressure by finding ways of directing emigrants towards the host countries with the lowest fertility rates. This endeavor should be made easier by the fact that these countries are likely to be more open to migration than those with higher fertility.

Developed host countries would benefit by taking the intertemporal tradeoff implicit in the impact of migration on source countries' fertility into account, with the tradeoff related to the fact that accepting more migrants in the short run should reduce migration pressure over time. Moreover, the higher level of development associated with the lower fertility rates should have a similar impact.

Further research on various aspects of this issue is on our research agenda, including, for instance, possible differences in the home country fertility impact of a transfer of host country norms by men and by women. We hope that this paper will trigger other people's interest in contributing to the research effort in this area.

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8 Appendix 1: Theoretical model of fertility

Section 2 provides several hypotheses about the mechanisms through which migration might affect fertility in migrants' home countries: parents' incentive to invest in their own and their children's education, remittances and transfer of norms. The model from which these hypotheses are derived is presented in this section.

We consider an overlapping generations economy populated by two-period lived agents (adult and children). Following De la Croix and Doepke (2003, 2004), Galor and Mountford (2006), Moav (2005) or Mountford and Rapoport (2007), adults' utility function has two arguments, the amount of consumption and the total expected income of children. The second component of the utility function reflects parental altruism but it could also be compatible with the fact that parents care about old-age security if children transfer money to their parents when the latter retire. We have

$$U_t = \log(c_t) + \beta \log(\widetilde{w}_{t+1} h_{t+1} n_t) \tag{5}$$

where c_t denotes parent's consumption, n_t is the number of children (fertility), h_{t+1} is the human capital of each child and $\widetilde{w}_{t+1}$ is the expected wage per efficiency unit of labor of children. Uncertainty about future children wages arises from the fact that children may stay in their origin country or emigrate to a richer country.

Adults are endowed with one unit of time that they can spend in supplying labor, raising children or investing in their own education. Raising each child requires ϕ units of time. Given their inherited level of human capital h_t (resulting from their own parents' decisions), adults may spend a fraction E_t of their time in higher education to increase their human capital. The training technology is given by

$$H_t = \Theta(E_t, h_t) \tag{6}$$

such that $\Theta^{'}_E, \Theta^{'}_h \geq 0$. In the next sub-sections, we will consider variants where $\Theta(.)$ has a Cobb-Douglas analytical form and variants disregarding parents human capital decisions, $\Theta(E_t, h_t) = h_t$.

Parents can also invest in the human capital of their offspring. Investing e_t dollars in children's basic education increases their human capital. We assume that

$$h_{t+1} = \theta(e_t) \tag{7}$$

where $\theta^{'}_e \geq 0$ and $\theta^{'}_e \leq 0$. In the next sub-sections, we will consider variants with $h_{t+1} = e_t^{\gamma}$ with $\gamma \in [0, 1]$ and variants with exogenous education choices, $h_{t+1} = \overline{h}$.

The adult budget constraint is given by:

$$c_t = (1 - E_t - \phi n_t) w_t H_t - n_t e_t + r_t \tag{8}$$

where r_t stands for non labor income (including remittances received in adulthood) and w_t denotes adult's wage.

Assuming that adult education arises before employment, adults are uncertain about their future place of work. If they stay in the South (with probability p_t), the wage rate is given by $w_t = w_t^h$. If they move to the North (with probability $1 - p_t$), the wage rate becomes $w_t = w_t^f > w_t$. The production functions in the South and in the North are linear in labor (in efficiency unit). It implies that the local and foreign wage rates w_t^h and w_t^f are time invariant. Without loss of generality, w_t^h can be normalized to unity and we can write $\omega = w^f - 1$.

Adults are also uncertain about the place of work of their children. Children will become adult at time t+1 and will be able to emigrate with a probability p_{t+1}. The expected wage for each child in (5) is given by

$$\widetilde{w}_{t+1} = p_{t+1}w^f + (1 - p_{t+1})w^h = 1 + p_{t+1}\omega. \tag{9}$$

The migration probability depends on country characteristics (such as geographical position, colonial links, linguistic proximity, etc.) and individual characteristics. In particular, it can be reasonably assumed that the probability increases in human capital. We have:

$$p_t = p_0.\pi(H_t) \tag{10}$$

where p_0 captures country characteristics and $\pi(H_t)$, such that $\pi^{'} \geq 0$ and $\pi^{''} \leq 0$, reflects the fact that educated agents have a higher probability to emigrate.

Let us now solve particular variants of this general model, based on particular analytical specifications for our technological functions $\Theta(.)$, $\theta(.)$ and $\pi(.)$.

Migration and adults' higher education

We first focus on the relationship between migration prospects and human capital formation, as stated in the new brain drain literature (Mountford, 1997, Beine et al., 2001 and 2008, or Docquier et al., 2008). To, address this issue, let us consider a simplified model in which children's human capital $\overline{h}$ is exogenous. Think about a mandatory education system totally subsidized by the government. The cost of education can therefore be removed from the budget constraint ($e_t = 0$). We also disregard remittances ($r_t = 0$).

Parents can invest E_t in higher education to increase their productivity and their own probability to emigrate. After education, they will work abroad and earn a wage w^f with a probability p_t. They will work at home and earn a wage equal to one with a probability $1 - p_t$.

The timing is the following. First, parents decide whether or not to invest. Second, they emigrate or stay in their home country. Third, they work, have children and consume. Parents thus take tow decisions, E_t and n_t. The choice of E_t is made under uncertainty about the place of work.

Parents care about the expected income of their offspring. For mathematical tractability, we assume that the probability that a child will live abroad do not depend on parents' location. This implies that $\widetilde{w}_{t+1}$ is given in (5). Considering that children born abroad have a much higher probability to stay would induce parents to invest more in human capital. This would simply reinforce our mechanism. As h_{t+1} is also exogenous, the second component of the utility function (5) only depends on the number of children, n_t.

The following specifications are used:

- Parents' probability to emigrate in (10) has a logarithmic form: $\pi(.) = \log(H_t)$.
- Parents' productivity is endogenous and (6) has a Cobb Douglas form: $\Theta(.) = AE_t^\sigma \overline{h}^{1-\sigma}$.
- Children's human capital in (7) is fixed: $\theta(.) = \overline{h}$.
- remittances are nil: $r_t = 0$.

Let us solve the model in two steps and proceed backward. First, for a given location, parents choose their optimal number of children. Second, after substituting this number in the utility function, parents decide how much to invest in education taking into account the endogenous probability to emigrate.

In case of migration, the 'conditional' utility function is given by

$$U_t^f = \log\left[(1 - E_t - \phi n_t) AE_t^\sigma \overline{h}^{1-\sigma} w^f\right] + \beta \log[n_t] + C.$$

where the constant term C stands for the given levels of human capital and expected wage of their children.

The optimal fertility rate amounts to

$$n_t^* = \frac{\beta(1 - E)}{(1 + \beta)\phi}, \tag{11}$$

and is clearly decreasing with the time spent by adults in higher education (before having children). Substituting the optimal fertility rate in the utility function gives the quasi-indirect utility function depending on parents' education choice:

$$V_t^f(E_t) = (1 + \beta)\log(1 - E_t) + \sigma \log(E_t) + \log(w^f) + \Gamma$$

where $\Gamma \equiv \beta \log\left[\frac{\beta}{(1+\beta)\phi}\right] - \log(1 + \beta) + \log(A) + (1 - \sigma)\log(\overline{h}) + C$ is a constant.

In case of staying, their conditional utility function is given by

$$U_t^h = \log\left[(1 - E_t - \phi n_t) AE_t^\sigma \overline{h}^{1-\sigma}\right] + \beta \log[n_t] + C$$

The optimal fertility rate is identical to the one of migrants[17] and the quasi-indirect utility function becomes

$$V_t^h(E_t) = (1 + \beta)\log(1 - E_t) + \sigma \log(E_t) + \Gamma$$

Agents then maximize the expected utility function, $(1 - p_t)V_t^h + p_t V_t^f$. The choice of higher education solves the following optimization problem

$$\{E_t\} = \arg\max (1 + \beta)\log(1 - E_t) + \sigma \left[1 + p_0 \log(A\overline{h}^{1-\sigma} w^f)\right] \log(E_t)$$

[17]We could easily extend the model to account for the fact that fertility is lower in rich countries.

The optimal investment in higher education is given by

$$E_t^* = \frac{\sigma\left[1 + p_0 \log(w^f)\right]}{1 + \beta + \sigma\left[1 + p_0 \log(A\overline{h}^{1-\sigma} w^f)\right]}$$

Parents' investments in higher education increase with the probability to emigrate ($\partial E_t^*/\partial p_0 > 0$). Hence, given (11), openess induces human capital and reduces fertility at origin since $\partial n_t^*/\partial E_t^* < 0$. The mechanism is simple. As argued in the new brain drain literature, migration prospects to richer countries stimulates human capital formation. This reduces the maximal amount of time that parents can devote to children education and labor. In empricial regressions, this first effect of migration on fertility can be easily accounted for by controlling for parents' human capital.

Migration and children's education

Let us now focus on the links between children's human capital and their probability to emigrate. In the second variant, we assume that parents have no possibility to invest in human capital: equation (6) is such that $E_t = 0$ and $H_t = h_t$ is predetermined. They do not receive remittances. For simplicity, we assume that the probability that a child will emigrate is linearly increasing in human capital. The following specifications are used:

- Parents' probability to emigrate in (10) has a linear form: $\pi(.) = H_t$.
- Parents' productivity in (6) is predetermined: $\Theta(.) = h_t$.
- Children's human capital in (7) is endogenous: $\theta(.) = e_t^\gamma$.
- Remittances are nil: $r_t = 0$.

The optimization problem for remaining adults can thus be written as following:

$$\{n_t, e_t\} = \arg\max \left\{\log\left[(1 - \phi n_t)H_t - n_t e_t\right] + \beta \log\left[n_t e_t^\gamma \left(1 + \omega p_0 e_t^\gamma\right)\right]\right\}$$

The first order conditions (with respect to n_t and e_t) can be expressed as

$$\begin{aligned} \frac{\phi H_t + e_t}{(1-\phi n_t)H_t - n_t e_t} &= \frac{\beta}{n_t} \\ \frac{n_t}{(1-\phi n_t)H_t - n_t e_t} &= \frac{\beta\gamma}{e_t} + \frac{\beta\omega p_0 \gamma e_t^{\gamma-1}}{1 + \omega p_0 e_t^\gamma} \end{aligned}$$

The first condition is standard and implies that the total cost of children (raising cost + education) is proportional to the parent's maximal wage at the equilibrium

$$n_t(\phi H_t + e_t) = \frac{\beta}{1+\beta} H_t,$$

This implies

$$n_t^* = \frac{\beta H_t}{(1+\beta)(\phi H_t + e_t)}, \tag{12}$$

i.e. fertility decreases with education for a given wage.

Combining the conditions yields an implicit polynomial solution for the optimal investment in education

$$(1-2\gamma)\omega p_0 e_t^{\gamma+1} + (1-\gamma)e_t - 2\gamma\phi H_t \omega p_0 e_t^{\gamma} - \gamma\phi H_t = 0$$

Assuming $\gamma = \frac{1}{2}$, the implicit function above becomes quadratic in e_t and gives rise to an explicit solution[18]. The optimal investment in children education becomes

$$e_t^* = \left[\phi H_t \omega p_0 + \sqrt{(\phi H_t \omega p_0)^2 + \phi H_t}\right]^2$$

Clearly, in the absence of migration ($p_0 = 0$), we have $e_t^* = \phi H_t$ and $n_t^* = \frac{\beta}{(1+\beta)2\phi}$. The fertility rate is independent on parental income. With migration prospects, the optimal investment in education increases in p_0. Hence, for a given wage rate, fertility decreases with migration. This result contrats with Chen (2006) who shows that when the probability to emigrate is exogenous, it does not affect the optimal education of children and fertility. In our framework with endogenous probability of migration, it comes out that $p_0 > 0$ implies the optimal fertility rate decreases with parental income. In empirical regressions, this second effect of migration on fertility can be accounted in two ways. First, average rate of migration of the sending country, as a proxy for p_0, can be introduced as a direct determinant of the home country fertility. Second, it is desirable to control for parents' human capital, which might be measured by the residents' education level.

Remittances

Migration also impacts on fertility through remittances sent by previous generation of migrants and /or members of the community. Indeed, We can reasonably consider that the amount of remittances positively depends on the stock of contemporaneous compatriots living abroad. In the third variant, we assume that parents have no possibility to invest in human capital ($E_t = 0$ and H_t is predetermined) and that children face an exogenous probability to emigrate. However, we now introduce non labor income, which can be here interpreted as the amount of remittances. The following specifications are used:

- Parents' probability to emigrate in (10) has a linear form: $\pi(.) = 1$.
- Parents' productivity in (6) is predetermined: $\Theta(.) = h_t$.
- Children's human capital in (7) is endogenous: $\theta(.) = e_t^{\gamma}$.
- Remittances are positive and exogenous: $r_t > 0$.

[18]Similar qualitative results would be obtained with $\gamma \neq \frac{1}{2}$.

The optimization problem of remaining adults can thus be written as the following

$$\{n_t, e_t\} = \arg\max \{\log([(1-\phi n_t)H_t - n_t e_t + r_t] + \beta \log [n_t e_t^{\gamma} (1+\omega p_0)]\}$$

The first order conditions (with respect to n_t and e_t) can be expressed as

$$\begin{aligned} \frac{\phi H_t + e_t}{(1-\phi n_t)H_t - n_t e_t + r_t} &= \frac{\beta}{n_t} \\ \frac{n_t}{(1-\phi n_t)H_t - n_t e_t + r_t} &= \frac{\beta\gamma}{e_t} \end{aligned}$$

As usual, the optimal cost of children is proportional to the parent's maximal income

$$n_t(\phi H_t + e_t) = \frac{\beta}{1+\beta}(H_t + r_t).$$

Combining the first order conditions yields the following explicite solution for human capital investments

$$e_t^* = \frac{\gamma\phi H_t}{1-\gamma},$$

and for the fertility rate

$$n_t^* = \frac{\beta(1-\gamma)\left(1+\frac{r_t}{H_t}\right)}{(1+\beta)\,\phi} \tag{13}$$

The optimal fertility rates increases with the amount of remittances (linked to the number of migrants abroad).

The latter result is closely linked to the choice of the utility function and the timing of remittances. Assume that the second component of the utility function (5) is not due to parental altruism but to the fact that parents care about old-age security. Assuming that working-aged children transfer a fraction τ of their income to their parents and parents also receive other transfers when old, the utility function would become:

$$U_t = \log(c_t) + \beta \log(\tau \widetilde{w}_{t+1} h_{t+1} n_t + r_{t+1}^o) \tag{14}$$

where r_{t+1}^o includes remittances sent by extra-family members to old parents.

Adults' optimization problem can thus be written as the following

$$\{n_t, e_t\} = \arg\max \left\{\log([(1-\phi n_t)H_t - n_t e_t] + \beta \log \left[\tau n_t e_t^{\gamma} (1+\omega p_0) + r_{t+1}^o\right]\right\}$$

The first order conditions (with respect to n_t and e_t) can be expressed as

$$\begin{aligned} \frac{\phi H_t + e_t}{(1-\phi n_t)H_t - n_t e_t} &= \frac{\tau\beta e_t^{\gamma}(1+\omega p_0)}{r_{t+1}^o + \tau n_t e_t^{\gamma}(1+\omega p_0)} \\ \frac{n_t}{(1-\phi n_t)H_t - n_t e_t} &= \frac{\beta\gamma n_t \tau e_t^{\gamma-1}(1+\omega p_0)}{r_{t+1}^o + \tau n_t e_t^{\gamma}(1+\omega p_0)} \end{aligned}$$

Combining the first order conditions yields the following explicite solution

$$e_t^* = \frac{\gamma\phi H_t}{1-\gamma}$$

and for the fertility rate,

$$n_t^* = \frac{\beta(1-\gamma)}{1+\beta} - \frac{r_{t+1}^o}{(1+\beta)\tau e_t^\gamma (1+\omega p_0)} \tag{15}$$

Under the old-age security hypothesis, the optimal fertility rates decreases with the expected amount of remittances received when old. In sum, the effect of extra-family remittances is thus ambiguous. It can be positive of the income effect dominates or negative if the old-age security effect dominates.

Transfers of norms

As argued in Fargues (2007), one could also argue that migrants transfer fertility norms to those left behind. To model this hypothesis, let us consider the altruistic variant of our model and introduce alternative preferences regarding fertility. The novelty is that, in deciding on the number of children, parents internalize the gain of utility from conformity to the norm for fertility. Katav-Herz (2003) applied this idea to the choice of fertility, child education and child labor.

It is well documented that migrants abroad progressively assimilate in terms of fertility choices. In particular, the average fertility rate of first-generation immigrants from developing countries is lower than the fertility rate at origin, although higher than the average fertility rate of natives at destination. Just as migrants facilitate transfers of knoweldge and ideas, they are also likely to transfer fertility norms to those left behind. We formalize this idea by introducing a reference level $\widetilde{n}_t$ of fertility (or norm) in the utility function and assume that adults derive utility from $n_t - \widetilde{n}_t$ (instead of obtaining utility from n_t, adults derive utility from having generally more children than the reference number of children).

In this variant, we consider that parents cannot invest in education ($H_t = h_t$ is predetermined) and the probability of migration is exogenous (for parent and children). The following specifications are used:

- Parents' probability to emigrate in (10) has a linear form: $\pi(.) = 1$.
- Parents' productivity in (6) is predetermined: $\Theta(.) = h_t$.
- Children's human capital in (7) is endogenous: $\theta(.) = e_t^\gamma$.
- Remittances are nil: $r_t = 0$.

Introducing the norm in the utility function (5), the optimization problem of non-migrant adults becomes

$$\{n_t, e_t\} = \arg\max \left\{\log([(1-\phi n_t)H_t - n_t e_t] + \beta \log\left[(n_t - \widetilde{n}_t)\, e_t^{\gamma}\,(1+\omega p_0)\right]\right\}$$

The first order conditions (with respect to n_t and e_t) become

$$\begin{aligned}\frac{\phi H_t + e_t}{(1-\phi n_t)H_t - n_t e_t} &= \frac{\beta}{n_t - \widetilde{n}_t}\\ \frac{n_t}{(1-\phi n_t)H_t - n_t e_t} &= \frac{\beta\gamma}{e_t}\end{aligned}$$

From the second condition, we can easily derive the optimal investment in children education as a function of the fertility rate

$$e_t = \frac{\gamma\phi H_t(n_t - \widetilde{n}_t)}{n(1-\gamma) + \widetilde{n}\gamma}$$

Substituting this equation in the first conditions gives, after straightforward manipulations, an quadratic implicit function in n_t:

$$\phi(1+\beta)n_t^2 - \left[\phi\widetilde{n}_t + \beta(1-\gamma)\right] n_t - \beta\gamma\widetilde{n}_t = 0$$

The single positive root of this equation is the optimal fertility rate:

$$n_t^* = \frac{\phi\widetilde{n}_t + \beta(1-\gamma) + \sqrt{\left[\phi\widetilde{n}_t + \beta(1-\gamma)\right]^2 + 4\beta\gamma\phi(1+\beta)}}{2\phi(1+\beta)} \tag{16}$$

When $\widetilde{n} = 0$, we have $n_t^* = \frac{\beta(1-\gamma)}{\phi(1+\beta)}$ as in the usual model. When $\widetilde{n}$ is positive, it is obvious that the optimal fertility is an increasing function of $\widetilde{n}$ (and is independent on parental income). Hence, if a transfer of norms reduces the reference level of fertility in the origin society, it impacts negatively on the optimal fertility rate.

9 Appendix 2: First-step procedure to generate predicted bilateral weights.

This appendix gives some details and the results of the first-step procedure implemented to predict the bilateral migration weights as done in the IV estimation of section 5.4.3. Those predicted weights, denoted by $\log(\widehat{n}^d)$ are used to compute predicted norms alternative to the ones used in the benchmark regressions. The results of the second step involving the alternative norms are provided in section 5.4.3.

We start from the bilateral stocks of migrants from each origin country i to destination country d observed in 2000, M_{id}. We regress $\log(M_{id})$ on a set of three types of variables[19]: geographic distance in kilometers (DIS_{id}); existence of a colonial relationship after 1945 (COL_{id}); and since South-South migration constitutes an important part of the phenomenon being examined, a dummy variable equal to one if the two countries shared a common colonizer (CCO_{id}), and another dummy variable for linguistic proximity (LIN_{id}). In a first specification, the dummy variable captures whether the two countries have the same official language. In a second specification, the dummy variable is equal to one if nine percent or more of the population in the two countries speak the same language. The regression model includes also country fixed effects for both source and destination countries. The first-stage model is:

$$\begin{aligned} \log(M_{id}) &= \beta + \beta_i + \beta_d + \beta_1 \log(DIS_{id}) + \beta_2 \log(COL_{id}) \\ &\quad + \beta_3 \log(CCO_{id}) + \beta_4 \log(LIN_{id}) + \epsilon_{id} \end{aligned} \tag{17}$$

Table A1 reports the first-stage estimation results. Not surprisingly, our explanatory variables are strong determinants of migration stocks. Distance, as a proxy of migration costs is negatively related to those stocks while colonial links and linguistic proximity favor migration. The R^2 is 0.78 in both regressions. Both specifications yield very similar results, in the first as well as in the second step. In the subsequent analysis, we use the predicted weights based on results reported in column (1) but the results are strikingly similar under results reported in column (2). Using specification (17), we predict the log of bilateral stocks, $\log(\widehat{M}_{id})$. This enables us to build an alternative measure of the fertility norm, which is given by $\widehat{n}_i^d = \sum_d \overset{\wedge}{\theta}_{id} n_{id}$ where $\overset{\wedge}{\theta}_{id} = \widehat{M}_{id} / \sum_d \widehat{M}_{id}$.

[19]The data come from the CEPII database dist_cepii including a large set of bilateral distance measures.

Table A1 : Gravity regressions - All countries (dep = log of bilateral migration stocks)

	(1)	(2)
Constant	14.123	15.399
	(71.06)***	(78.39)***
Log(distance)	-1.067	-1.070
	(70.57)***	(71.46)***
Colonial Link	2.061	2.086
	(14.00)***	(14.16)***
Common colonizer	0.328	0.373
	(9.49)***	(10.98)***
Common official language	0.499	
	(17.15)***	
Linguistic Proximity		0.512
		(16.75)***
Origin dummies	Yes	Yes
Destination dummies	Yes	Yes
Observations	39800	39800
R-squared	0.78	0.78

Robust t statistics in parentheses. *: significant at 10%; **: significant at 5%; ***: significant at 1%.