How international migration impacts fertility?
The role of migrant networks, spouse's migration, and own migration

----
EXTENDED ABSTRACT
PRELIMINARY INCOMPLETE VERSION

Pau Baizan

ICREA and Universitat Pompeu Fabra

Address: Universitat Pompeu Fabra, Department of Political and Social Sciences,
 25 Ramon Trias Fargas street, 08005 Barcelona, Spain

E-mail: pau.baizan@upf.edu

Abstract
Few studies have analyzed the interrelationships between migration and fertility using bi-national longitudinal data, so that the effects of selection, adaptation and the timing of these processes can be properly assessed. Furthermore, the possible fertility impact of migration networks and of couple's transnational living arrangements have been largely overlooked, in spite of its importance in many migration flows, including in particular African migrations to Europe. The availability of personal networks abroad and spouse's migration provide (future) migration opportunities for non-migrant individuals, as well as for both, the "left behind" partner and their children, that could modify fertility behavior. Here I empirically investigate the hypothesis that the presence of these migration opportunities has a negative effect on fertility.

Detailed partnership, fertility and migration histories, as well as rich information about migration networks and characteristics of both partners of the couple are obtained from the Senegalese population samples of the Migration between Africa and Europe (MAFE) surveys. These retrospective surveys took place in 2008 and 2011 in Senegal, France, Italy and Spain. I apply event history models and simultaneous equations models, that account for both, selectivity effects and timing effects arising from the migration process.

Results show that, net of selection and timing effects, women living in Senegal with networks in Europe, or with a partner living in Europe, show substantially lower fertility than other non migrant women, thus providing support to the above hypothesis. Disruption effects due to the migration process are also present, leading to a 50 per cent reduction in fertility during the migration year. Lower long term fertility of migrants in the countries of destination is present, but it is largely explained by selection effects. Overall, these results suggest that a high emigration level can speed–up the fertility transition.

Background

As in most Sub-Saharan Africa countries, the fertility transition in Senegal has followed a slow pace. Results from the Health and Fertility Surveys show that the TFR declined from 7 children per women in the 1970s to 5 in 2010 (Agence Nationale de la Statistique et de la Démographie 2012). Delayed union formation and especially birth postponement seem to have driven that modest decline. Longer birth intervals irrespective of parity fit the traditional way of controlling fertility and are likely to be a response to the uncertain personal and institutional context (Moultrie, Sayi, and Timus 2012; Schoumaker 2009). Furthermore, fertility of Senegalese migrants living in Europe has been shown to be very high (Bledsoe, Houle, and Sow 2007).

During the last three decades, international migration from Senegal has reached a much higher level than what is usually associated with a country of very low development levels (Hatton and Williamson 2003)[1]. According the 2002 Senegal Census, 479,515 Senegalese resided in another country, over a total population of about 10 million (Agence Nationale de la Statistique et de la Démographie 2006). Substantial and increasing shares of these migrants have settled in Europe (190,000) and, to a lesser extent, in North America (43,200). The main European destinations are, by far, France, Italy and Spain. Increasing migration probabilities to Europe since the mid 1980s have been recorded (Sakho 2013).

This paper focuses on the question of what role has played migration in fertility dynamics. In particular, the possible fertility impact of migration networks and of couple's transnational living arrangements is analyzed. These are issues that have been largely overlooked in previous research, in spite of their importance in many migration flows, including in particular African migrations to Europe (Baizan, Beauchemin, and González-Ferrer 2014; Liu 2013; Mazzucato et al. 2015). The availability of networks abroad and spouse's migration increase the migration opportunities for the non-migrant individuals, as well as for both, the "left behind" partner and their children. This changes the structure of costs and rewards of fertility in the country of origin by increasing the incentives to invest in education, which in turn may lead to a fertility reduction. Thus, here I empirically investigate the hypothesis that the presence of these migration opportunities has a depressing effect on fertility.

Hypotheses

Most studies on the relationship between migration and fertility focus on three main hypotheses: assimilation/adaptation, disruption, and selection (Kulu 2008; Lindstrom and Saucedo 2002). Here we also take into account these hypotheses, but expand the analyses to examine the impact of migration on the country of origin's fertility levels.

In the case of Senegalese migration to France, Italy and Spain, we expect to find adaptation effects to the destination country economic conditions and norms. In particular, the higher costs of children at destination should lead to a lower fertility than at origin.

---

[1] Senegal ranked 166 out of 182 countries in the Human Development Index in 2006 (UNDP 2009).

Disruption effects are likely to be relevant for Senegalese migration. Previous research has found that a high proportion of couples remain separated for long periods of time, leading to the formation of transnational families (Baizan et al. 2014). Trips to Senegal are not frequent since many migrants in the first few years after arrival are illegal (making crossing the borders difficult), and the cost of travelling are relatively high for most of them, as they occupy jobs with a low socio-economic status. Therefore, it is expected that separated couples show low fertility. In addition, the process of migration itself is likely to be disruptive for fertility, both for independent migrants and for family re-unifiers. Trips are often made in precarious conditions, sometimes involving several months in third countries and illegal cross-bordering. More generally, the arrival to a different country involves important changes in many dimensions of life that may be conductive to low fertility around migration time. A recovery of fertility levels can be expected afterwards.

Migrants coming from a least developed country are expected to be a highly select group with respect to both, variables observed in our survey, such as education or social class, and unobserved variables, such as risk proneness, social mobility aspirations (also for children), and fertility preferences. As a result, it is crucial to control for both types of variables. Although the nature of unobserved variables make difficult to predict their overall affect, they are unlikely to be conductive to early family formation and high fertility.

Migration and family formation not only take place in the same stage of the life course, but they are often interrelated processes. As a result, fertility spikes around the time of migration have been observed in connection to migration (Nedoluzhko and Agadjanian 2010). In the case of Senegalese migration to Europe, few women undertake independent migration, and most moves for them are made in connection to marriage and family re-unification. Since migration is often a part of the family building process in which selection and duration effects are relevant (in particular time since marriage), the modeling strategy should take into account the interrelation between union formation and fertility processes.

An issue that has being under-researched is the effect of migration on the fertility of non migrants. Here we investigate two possible mechanisms: (1) the increase in migration probabilities through network effects, and (2) the increase in the resources available in origin households provided by family members abroad.
As widely shown in the literature, the availability of personal networks abroad increases migration probabilities for non migrants. This effect is particularly sharp in the case of Senegalese migration to Europe, including partners, family members, and non-family members (Baizan and González-Ferrer 2014). It can then be hypothesized that such an increase in migration probabilities creates new incentives for human capital investment in the source country ("Brain gain" hypothesis, proposed by Mountford 1997; Stark, Helmenstein, and Prskawetz 1997). Higher prospective returns to skills in a foreign country rise the incentives for skill acquisition decisions at home, because individuals

invest in education in view of a possible migration. In addition, more education provides easier access to and better paid jobs in developed counties.

It only takes a step further to hypothesize that the above new incentives for human capital formation also impact fertility. The increase in prospective migration probabilities change the structure of costs and rewards of fertility at home, as it increases the incentives to invest in human capital, that will be better rewarded in case of migration. The probability of migration must be, however, sufficiently high to affect human capital investment. If this is the case, a fertility reduction can be expected, to account for the increased costs of rearing children derived from higher investments in human capital. The reduction in fertility will be especially visible among the groups with higher migration probabilities, i.e. among transnational couples and among individuals with networks abroad.

A second mechanism that affects educational investments at home is the increase in economic resources provided by network members abroad. This mechanism should be especially relevant for close family members, in particular migrants' partners. For them, a reduction of fertility can be expected if the increase in educational investments changes the balance of costs and rewards from fertility (Caldwell 1978).

Data
The empirical analyses in this paper are based in the survey «Migrations between Africa and Europe» (MAFE Senegal-Biographical Survey)[2]. This transnational dataset results from the use of identical questionnaires, that were administered to representative samples of the Senegalese population residing in France, Italy and Spain, as well as in the region of Dakar (Senegal). In 2008 1,067 persons were interviewed in the region of Dakar and about 200 in each of the European countries involved. In 2011, a second survey took place in Spain, adding 405 individuals to the dataset. A weighting scheme is applied to obtain a representative sample of the Senegalese populations concerned.

The data used here are time-varying by nature, since they result from individual life-histories collected in retrospective biographical questionnaires. The questionnaire was designed to collect longitudinal retrospective information on a yearly basis from birth until the time of survey (2008 or 2011), for each sampled individual, whatever his/her country of residence at the time of the survey. The data collected include a large range

---

[2] The Senegalese part of the Migration between Africa and Europe (MAFE) project is coordinated by INED (C. Beauchemin), in association with the Université Cheikh Anta Diop (P. Sakho). The project also involves the Universitat Pompeu Fabra (P. Baizán), the Consejo Superior de Investigaciones Científicas (A. González-Ferrer), and the Forum Internazionale ed Europeo di Ricerche sull'Immigrazione (E. Castagnone). The 2008 surveys were conducted with the financial support of INED, the Agence Nationale de la Recherche, the Région Ile de France and the FSP programme 'International Migrations, territorial reorganizations and development of the countries of the South'. The Spanish survey of 2011 was conducted by the Universitat Pompeu Fabra, in collaboration with the Centro de Investigaciones Sociológicas, and benefitted from the financial support of the Spanish Ministry of Science. The MAFE-Senegal project has now being enlarged to Ghanaian and Congolese migrations, thanks to a funding from the European Community's Seventh Framework Programme under grant agreement 217206. For more information (including the questionnaires), see: http://www.mafeproject.com/

of information on the individual's life course, including detailed fertility histories, partnerships histories (including both marriage and informal unions), migration, education, and occupational histories. In all countries, the eligibility criteria for selection into the sample established that individuals had to be between 25 and 75 years of age (to have long enough life histories), born in Senegal (to exclude second generation in Europe) and of present or past Senegalese nationality (to exclude immigrants in Senegal).

The places covered by the MAFE Senegal survey offer a good coverage of Senegalese migrants. On one hand, in Europe, France, Spain and Italy accounted for 45 percent of the international Senegalese migrants declared in the 2002 Senegal Census. On the other hand, the region of Dakar is home to about a quarter of the national population in the 2002 Senegal Census and is the region of origin of 31% of the international migrants declared in 2001-2002 by Senegalese households in the ESAM-II survey. Varied sampling methods were used to select the individuals. In Senegal, a stratified probabilistic sample was drawn. The municipal register in Spain (Padrón) offered a national sampling frame from which documented and undocumented migrants could be randomly sampled. Respondents in France and Italy were sampled through varied non-probabilistic methods (e.g. snowballing, intercept points, contacts obtained from migrant associations) in order to fill pre-established quotas by sex and age. Additional information can be found in (Beauchemin and González-Ferrer 2011) or on the website of the MAFE project: http://www.mafeproject.com/.

The measurement of social networks is very detailed in MAFE data. Respondents were first asked to name all close family members (parents, siblings, partners and children) who had lived at least one year abroad, and construct a year-by-year itinerary of the countries where they had lived. Subsequently, they were asked to provide the itineraries of other relatives, friends and acquaintances on whom they could count on (or could have counted on) to receive or help them to migrate out of Senegal, who had also lived at least one year abroad.

Methods

Event history techniques are used to model the determinants of women's fertility. In their discrete-time event history version of these techniques, the hazard function is modeled as the probability of the event taking place in a given interval, conditional on the fact that the event did not occur before for an individual and on a set of covariates. A logistic specification is used, which can be viewed as a latent-response model (Rabe-Hesketh and Skrondal 2012). Underlying the observed dichotomous behavior y_{it} (whether or not an individual i has a child in a given duration t), there is an unobserved or latent continuous response y_{it}^* representing the propensity to bear a child. If the latent response is greater than 0, then the observed response is 1; otherwise is 0. A linear regression model is specified for the latent response y_{it}^*

$$y_{it}^* = \beta_0 + \beta' x_{it} + \varepsilon_i + u_{it}$$

where x_{it} is a vector of covariates, including the baseline hazard function (individual's age for childless women; the duration since previous birth for parity 1 or more), with β denoting the value of the estimated coefficients of the model for each variable, the women-specific random term ε_i , and the random term u_{it} assumed to follow a logistic distribution. In order to apply discrete-time event history models, a person-year file is constructed. Women enter the risk set when they reach age 12 and they leave it when they reach age 45 or year 2008 (survey time).

Several "clocks" and simultaneity effects are distinguished in the analyses: age, duration since previous birth, the effect of union formation and duration since start of union, and the effect of migration and duration in the country of destination.

In order to analyze the possible interrelationship between the events of fertility, partnership formation and migration, we use structural-equation event history models with correlated unobserved heterogeneity of the type introduced by (Lillard 1993). The equations for union formation and migration are similar the one presented above for fertility. Repeated spells for migration and union formation are modeled with the inclusion of a women-specific heterogeneity term.

Results

Table 1 shows the estimated standard deviations of the heterogeneity terms and correlation coefficients between the three unobserved components. Each of the standard deviations is statistically significant, providing evidence of unobserved heterogeneity for each of the processes. The heterogeneity components of the processes of fertility and migration have a significant negative correlation: -0.85. This indicates the existence of common unobserved factors affecting the two processes (selection effects). Women who are more likely to have a birth are also less likely to migrate. Similarly, the random terms for union formation and migration show a negative correlation: -0.54. The correlation between fertility and union formation does not show significant results.

Table 1.Hetrogeneity terms & correlations

Fertility, standard deviation ε	0.44***
Migration, standard deviation δ	0.87***
Partnership formation, s.d. λ	0.79***
Corr. ε δ	-0.85***
Corr. ε λ	0.02
Corr. δ λ	-0.54***

Table 2. Estimation results: fertility

	No simultaneous equations	Simultaneous equations
Partner in Senegal (ref.)	1	1
Partner in Europe	0.56***	0.55***
No network in Europe (ref.)	1	1
Network in Europe	0.82***	0.78***

Controls : age, age sq, parity, duration since last birth, duration squared, union status and log of union duration, birth-cohort, education, country of residence, duration of residence.

As shown in table 2, women living in Senegal with a migrant partner in Europe (transnational couples) and women with networks abroad show much lower fertility. These effects are of similar size when selection effects of migration and union formation are accounted for. Transnational couples have a particularly low fertility as their probabilities of having a child are reduced by 44 per cent with respect to couples with both members living in Senegal. As explained above, this fertility reduction can be related to disruption effects due to separation, to the high migration probabilities, and to the increases in resources provided by the migrant partner. Unfortunately, is not possible to disentangle each of the effects. In table 2 it can also be seen that women with networks in Europe (including both family and non family members) show substantially lower childbearing probabilities than women without such networks. In this case, lower fertility can be mainly attributed to the increased migration probabilities linked to the availability of a network in Europe, thus providing support to the hypothesis that the presence of these migration opportunities has a negative effect on fertility.

The possible existence of disruption effects on fertility due to the migration process has been measured by including an indicator of the migration year, which shows a strong reduction of migration probabilities (table 3). Once this temporary effect of migration is taken into account, fertility of migrants in Europe recovers, albeit still remaining to significantly lower levels (with respect to non migrant women) as the duration of stay in Europe increases. Nevertheless, this lower long term fertility of migrants is to a large extent explained by selection effects, as shown by the results for the simultaneous equations.

Table 3. Estimation results: fertility

Migration status	No simultaneous equations	Simultaneous equations
In Senegal (ref.)	1	1
Migration year	0.48***	0.58**
In Europe 1-3 years	0.93	1.13
In Europe 4-9 years	0.73**	0.92
In Europe 10+ years	0.67***	0.86

Controls : age, age sq, parity, duration since last birth, duration squared, union status and log of union duration, birth-cohort, education, partner location, network in Europe.

References

Agence Nationale de la Statistique et de la Démographie. 2006. *Rapport National de Présentation Des Résultats Du Troisième Recensement Général de La Population et de L'habitat En 2002*. Dakar: Ministère de l'Economie et des Finances, Sénégal.

Agence Nationale de la Statistique et de la Démographie. 2012. *Enquête Démographie et de Santé à Indicateurs Multiples (EDS-MICS)*. Dakar: Agence Nationale de la Statistique et de la Démographie.

Baizan, Pau, Cris Beauchemin, and Amparo González-Ferrer. 2014. "An Origin and Destination Perspective on Family Reunification: The Case of Senegalese Couples." *European Journal of Population* 30(1):65–87.

Baizan, Pau and Amparo González-Ferrer. 2014. *What Drives Senegalese Migration to Europe ? The Role of Economic Restructuring , Labor Demand and the Multiplier Effect of Networks*. DemoSoc Working Paper 51. Barcelona: Universitat Pompeu Fabra, Department of Political and Social Sciences.

Beauchemin, Cris and Amparo González-Ferrer. 2011. "Sampling International Migrants with Origin-Based Snowballing Method: New Evidence on Biases and Limitations." *Demographic Research* 25:103–34.

Bledsoe, Caroline, R. Houle, and P. Sow. 2007. "High Fertility Gambians in Low Fertility Spain: Mutually Entailed Lives across International Space." *Demographic Research* (16):375–412.

Caldwell, John C. 1978. "A Theory of Fertility: From High Plateau to Destabilization." *Population and Development Review* 4(4):553–77.

Hatton, Timothy J. and Jeffrey G. Williamson. 2003. "Demographic and Economic Pressure on Emigration out of Africa." *Scandinavian Journal of Economics* 105(3):465–86.

Kulu, Hill. 2008. "Fertility and Spatial Mobility in the Life Course: Evidence from Austria." *Environment and Planning A* 40(3):632–52.

Lillard, Lee A. 1993. "Simultaneous Equations for Hazards: Marriage Duration and Fertility Timing." *Journal of Econometrics* 56(1-2):189–217.

Lindstrom, David P. and Silvia Giorguli Saucedo. 2002. "The Short-and Long-Term Effects of U . S . Migration Experience on Mexican Women 's Fertility." *Social*

Forces 80(4):1341–68.

Liu, Mao-Mei. 2013. "Migrant Networks and International Migration: Testing Weak Ties." *Demography* 50(4):1243–77.

Mazzucato, Valentina, Djamila Schans, Kim Caarls, and Cris Beauchemin. 2015. "Transnational Families Between Africa and Europe." *International Migration Review* 49(1):142–72.

Moultrie, T., A. Sayi, and I. Timus. 2012. "Birth Intervals, Postponement, and and Fertility Decline in Africa: A New Type of Transition?" *Population Studies* 66(3):241–58.

Mountford, Andrew. 1997. "Can a Brain Drain Be Good for Growth in the Source Economy?" *Journal of Development Economics* 53(2):287–303.

Nedoluzhko, Lesia and Victor Agadjanian. 2010. "Marriage, Childbearing, and Migration in Kyrgyzstan: Exploring Interdependencies." *Demographic Research* 22(7):159–88.

Rabe-Hesketh, Sphia and Anders Skrondal. 2012. *Multilevel and Longitudinal Modeling Using Stata*. Third Edit. edited by Stata Press. Stata Press.

Sakho, Papa. 2013. *New Patterns of Migration between Senegal and Europe (France , Italy and Spain)*. Paris.

Schoumaker, Bruno. 2009. *Stalls in Fertility Transitions in Sub-Saharan Africa : Real or Spurious ?* Louvain-la-Neuve: Université Catholique de Louvain, Département des Sciences de la Population et du Développement.

Stark, O., C. Helmenstein, and a Prskawetz. 1997. "A Brain Gain with a Brain Drain." *Economics letters* 55:227–34.