Effect of migration to Cotonou on interpregnancy transition rate: Application of episode splitting method

Background, rational, and objective

One of the most important steps forward in event history analysis has been to explicitly measure and include time-dependent covariates in transition rate models. Particularly, when analysing the empirical study of social change, covariates can change their values over process time. Time-dependent covariates may stay constant for finite periods of time or change continuously.

The literature identifies in general three basic approaches to include time-dependent covariates in transition rate models (Blossfeld et al., 2019). A first approach consists of including time-dependent covariates by using a piecewise constant exponential model. On can also include time-dependent covariates by applying the method of episode splitting in parametric and semiparametric transition rate models. Lastly, time-dependent covariates can be included by specifying the distributional form of the time-dependence and directly estimating its parameters using the maximum likelihood method. This study examines the effect of migration to Cotonou (the largest city of Benin) on interpregnancy transition rate using the method of episode splitting.

The study addresses the issue of reverse causality often cited in the methodological literature of the migration-fertility relationship analysis. In the analysis of the effect of migration on fertility, the migration variable is considered as internal time-variant covariate (Banougnin et al., 2018). Internal time-variant covariates are referred to as being problematic for the causal analysis with event history models. Where migration has been used as time-dependent covariate in the migration-fertility relationship, the issue of reverse causality has remained and yet to be solved adequately (Andersson, 2004; Kulu, 2006; Rokicki et al., 2014). Authors from (migration-fertility relationship) studies using migration as time-variant covariate reckon that migration and fertility autonomously affect each other. In dealing with interdependence also called dynamic system, scholars have suggested two main approaches: the “system approach” and the “causal approach”. Due to the limitations of the system approach in analysing interdependence processes (see Blossfeld et al., 2019 for more details), I used the causal approach, especially the episode splitting method.

The literature identifies four hypotheses to give insight to the migration-fertility relationship: the socialisation, selection, adaptation and disruption hypotheses. I particularly focus on the literature on migration from rural areas and small cities to larges cities in this study. First, the selection hypothesis proposes that migrants in large cities are selected in their place of origin (rural areas and small cities) amongst the most prone to low fertility. Indeed, migrants must prepare to adapt to low-fertility settings’ standards (of large cities) (Chattopadhyay et al., 2006; Rokicki et al., 2014; Khan et al., 2016; Dupray & Pailhé, 2017; Banougnin et al., 2018). Second, the disruption hypothesis stresses the fact that migration *per se* tends to reduce fertility. The hypothesis maintains that certain types of migration may disrupt fertility. The migration may either lead to separation of spouses, or be stressful so as to actually interfere with physiological capacity to bear children (Goldstein & Goldstein, 1983; Hervitz, 1985; Brockerhoff & Yang, 1994; Brockerhoff, 1998; Chattopadhyay et al., 2006; Sevoyan & Agadjanian, 2013; Dupray & Pailhé, 2017). These and other factors may cause a reduction in fertility of recent migrants. The disruptive hypothesis suggests that fertility reduction attributable to disruption is expected to be only in a relatively short term, and the

resulting delay in childbearing would be compensated for after a longer period of settlement (Majelantle & Navaneetham, 2013). Third,
the migrants' fertility behaviour may gradually converge to that of non-migrants following exposure after migration at the destination. This adaptation effect is observed over time (i.e. with time passing in the new environment), and can only present if there is a difference between the fertility of non-migrants and the fertility of migrants just after their arrival (Hervitz, 1985; Chattopadhyay et al., 2006; Afulani & Asunka, 2015). Lastly, the socialisation effect postulates that norms and behaviours acquired at the place of origin, in particular during childhood, persist in later life whatever the new environment the migrant is exposed to. In this case, the adaptation process takes longer than expected so that the fertility reduction among migrants (from rural areas and small cities to large cities) happens after (at least) a generation of migrants has elapsed. The high-fertility norms acquired in rural areas and small cities could persist some considerable time after migration (Milewski, 2010; Afulani & Asunka, 2015; Roopnarine & Yildirim, 2016).

Methodology

Data: This study uses data from the 2011-2012 Benin Demographic and Health Survey (DHS). Data on migration (for every household member) were collected through the household questionnaire. Questionnaire for individual women contained information on women's socioeconomic and demographic backgrounds, and their birth histories among other. Identification variables (cluster number, household number, and household member's line number) existing from both households and women datasets enable to merge information in order to obtain a unique database. The unit of analysis is women's birth episodes over their reproductive life (15-49 years). The complete record consists of 2,283 live births occurred among 1,222 women of reproductive age.

Variables: The dependent variable of the analysis is the interpregnancy transition defined as the time from a live birth to a woman to her next conception. The main independent variable is the migration status. The death of the previous child and woman's age are the control variables. The level of education is used to adjust for selective migration.

Statistical methods: The idea of the episode splitting method adopted in this study can be described as follows: migration status change its value only at discrete points in time. At all points in time, when migration status changes its value, the original migration episode is split into pieces—called splits (of a migration episode) or subepisodes. For each subepisode a new record is created containing (1) information about the origin state of the original migration episode, (2) the value of the migration status at the beginning of the subepisode, (3) the starting and ending times of the subepisode (information about the duration would only be sufficient in the case of an exponential model), and (4) Information indicating whether the subepisode ends with the destination state of the original episode or is censored. All subepisodes, apart from the last one, are regarded as right censored. Only the last subepisode is given the same destination state as the original episode. The study employed exponential model.

Preliminary results and discussion

Results from the exponential models (Table 1) show that migrant women are in general significantly more likely to accelerate their transition to the next pregnancy as compared to

non-migrant women (HR: 1.20, 95%CI: 1.09-1.33, $p < 0.01$). This means that migration to Cotonou increases the interpregnancy transition rate by about 20%[1].

Then, when taking into account the duration and the migration nature (in-migrant or return migrant), Table 1 (Model 2) reveals three major findings. Firstly, in-migrant women in Cotonou remain more likely to transit to the next pregnancy than non-migrant women. Secondly, the higher the duration spent (by in-migrant women) in Cotonou, the lower the acceleration of the transition to the next pregnancy (HR ranging from 3.5 for in-migrant women who spent between 6 and 24 months in Cotonou to 1.1 for those who spent more than 10 years in Cotonou). Thirdly, return migrant and non-migrant women do no differ significantly in terms of interpregnancy transition.

Table 1. Exponential models

	Model 1		Model 2		Model 3	
	HR	95% CI	HR	95% CI	HR	95% CI
Migrant						
No (Ref.)	1					
Yes	1.20***	(1.09–1.33)				
Migration						
Non-migrant (Ref.)			1		1	
In-migrant						
6 – 24 months in Cotonou			3.51**	(1.30–9.44)	3.58**	(1.33–9.63)
25 – 59 months in Cotonou			1.56*	(1.00–2.44)	1.58**	(1.01–2.46)
60 – 119 months in Cotonou			1.51***	(1.18–1.93)	1.54***	(1.20–1.97)
120 + months in Cotonou			1.13**	(1.01–1.27)	1.14**	(1.01–1.28)
Return migrant						
6 – 24 months in Cotonou			0.81	(0.21–3.15)	0.78	(0.20–3.05)
25 – 59 months in Cotonou			1.37	(0.58–3.24)	1.52	(0.64–3.60)
60 – 119 months in Cotonou			0.85	(0.54–1.33)	0.82	(0.52–1.29)
120 + months in Cotonou			1.09	(0.91–1.30)	1.08	(0.90–1.29)
Education						
No education (Ref.)					1	
Primary					1.03	(0.91–1.16)
Secondary					0.88*	(0.77–1.01)
Higher					0.92	(0.65–1.29)
Previous child has died						
No (Ref.)	1		1		1	
Yes	1.17*	(0.98–1.39)	1.17*	(0.98–1.39)	1.17*	(0.98–1.39)
Woman's age	0.99***	(0.98–0.99)	0.99**	(0.98–1.00)	0.99**	(0.98–1.00)
Observations	1,226		1,226		1,226	

***p < 0.01, **p < 0.05, *p < 0.1; HR: hazard ratio; CI: confidence interval; Ref.: reference category

[1] Calculated as $(HR - 1) \times 100\,\% = 20.0\%$

Finally, after adjusting for women socioeconomic characteristics (Table 1, Model 3), findings from Model 2 in Table 1 prevail. Other variables, namely the death of the previous child, the woman's age, and her level of education affect the interpregnancy transition rate as well. For example, the death of the previous child increases the interpregnancy transition rate by about 17%. These findings suggest that the adaptation of in-migrant women to low fertility behaviour is taking time to happen. The adaptation effect still exists but not sufficient to counterbalance the socialisation effect. This highlights the persisting effect of fertility norms (in urban areas and small cities of Benin) prior to migration.

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