The Role of Disruptive Events in Shaping Fertility Preferences: The case of Rwanda

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Abstract

Sub-Saharan Africa countries have witnessed a stall in fertility decline during the last decades. Explanations put forward for this phenomenon are: high levels of infant and child mortality, economic stagnation, deterioration of reproductive health services, and lack of educational expansion. A small literature points to the effects of severe disruptive events like natural disasters, civil wars, etc. on these social and economic conditions that may account for the stall in fertility decline.

This paper focuses on the case of Rwanda where the total fertility rate decreased very rapidly in the eighties (from 8.5 in 1983 to 6.2 in 1992) but stalled at that level in the nineties (6.1 in 2005). Recent data show that the demographic transition might have resumed its course (5.5 in 2008, 4.6 in 2010). Part of the stall can be attributed to a lack of fertility control, but disruptive events will also affect fertility preference. We identify three mechanisms through which disruptive events may lead to a change in the preference for larger families. sl. The first mechanism, mortality experience, is the direct consequence of major crises. The second mechanism, modernization, refers to trends like further educational expansion and rapid urbanization, which are known to lead to desires for smaller families and which are interrupted as a result of major crises. The third mechanism, pro natalism, refers to the attitudes of third parties that may account for the change of fertility preferences after a disruptive event.

Using ordinal logistic regression and location-scale models to analyze data from the Demographic Health Surveys of 1992, 2000, 2005 and 2008, we tested the contribution of these mechanisms to the preference for small, medium and large families. The results show that there is an impact of the disrupting event on the preference of women for large families in Rwanda. This persist to be the case even after controlling for other risk factors such as individual mortality experience (offspring mortality or respondents' siblings mortality),

current and childhood place of residence, education and approval or discussion of family planning by the partner.

1. Introduction

The second phase of demographic transition is the period in which fertility declines rapidly and ends when the total fertility rate reaches replacement level. Most countries in the world have gone through this phase and many, like China, actually have below replacement fertility. Sub-Saharan Africa is the only continent where the DT develops differently. In eight countries the fertility decline stalled at the early phase of the transition in the nineties of the previous century (Shapiro & Gebreselassie 2008). Various explanations have been put forward for this phenomenon: high levels of infant and child mortality, economic stagnation, deterioration of reproductive health services, and lack of educational expansion (Bongaarts 2007, Schoumaker 2009). Some literature points to the effects of severe disruptive events like natural disasters and civil wars on these social and economic conditions that may account for the stall in fertility decline. For Rwanda this approach seems to be appropriate. The total fertility rate decreased very rapidly in the eighties (from 8.5 in 1983 to 6.2 in 1992) but stalled at that level in the nineties (6.1 in 2005). Recent data show that the demographic transition might have resumed its course recently (5.5 in 2008 and 4.6 in 2010).

In a previous paper (Rutayisire, Broekhuis and Hooimeijer, forthcoming) we described how this stall in fertility decline coincided with changes in mortality experience, marriage patterns and discontinuation of family planning programs during the disruptive events in the early nineties (civil war, 1994 genocide, massive population movements). It is clear that the high fertility is at least partly due to a lack of fertility control. The actual use of modern contraceptive devices decreased after 1992 and the levels of unmet needs for reproductive health services increased. It is less clear to what extent higher fertility preferences play a role as well. The aim of this contribution is to isolate the role of fertility preferences by analyzing the shifts in desired family size in the period 1992-2008. We will indentify various mechanisms that could account for the change in the preference for small, medium and large family size in Rwanda.

2. Theoretical background and hypotheses

Desired family size or ideal number of children can be used an as important indicator of fertility preferences (De Silva 1991; Bankole and Westoff 1998). The more often cited determinants of desired family size are grouped into demographic factors such as age at marriage, mortality experience or gender preference, as well as socio-economic factors like level of education, current or childhood place of residence. This paper will take up these issues but grouping them in three main mechanisms that are mortality experience, modernization process and the attitudes or influence of third parties.

2.1 Mortality experience mechanism

The early contributions on the decline in mortality and fertility from Frank Notestein (1953) saw *societal modernization* as the dominant cause. However, as early as 1963 Kingsley Davis stated the *improved survival* to be the central cause. An abundance of empirical evidence on the relationship between mortality and fertility has been gathered since. LeGrand et al. (2003) distinguish three pathways by which women or couples are going from child mortality to fertility: physiological, replacement and insurance (or holding) mechanisms. The first two mechanisms deal with individual (conscious or not) response by the woman who lost her child. The proper way to study that is to look at the birth intervals and the desire to have an additional child. The concern in this paper is the third mechanism that is more focused on people's perceptions and understandings and on reconciling the desired number of children with their risks of dying.

In other words, the insurance hypothesis implies that the fear of losing children influences the ideal number of births (Chowdhurry 1988). In countries like Rwanda this hypothesis can be extended to the loss of siblings, because this loss could contribute to the perception of the risk of losing one's own children. Siblings, just as adult children, are an important part of the social support system in hard times. The high prevalence of deaths in the period 1992-1995 might account for the peak in fertility preferences in the years after.

2.2 The modernisation mechanism

Without going into detailed argumentations on the modernization theory our analysis refers to the modernisation mechanism in two ways. The first is to relate it with the role of woman's education. The relation between women's education and the family size has been analyzed in various ways. Those include direct and indirect effect of women's education on actual family

size (Janowitz, 1976; McCarthy and Oni, 1987; Jejeebhoy, 1995), the interrelation between woman's education, child survival and family size desires (Jejeebhoy, 1995) and the expected longer duration of education for the children that reduces the number women want (McCarthy and Oni, 1987). There is some evidence that the real change in women's preferences occur among those who reached secondary or higher levels of education (Uche and Isugo, 1994).

Furthermore, this relationship changes overtime and depends on contextual factors being stronger or remaining the same in countries at early stages of fertility transition rather than being reduced except for the more developed countries characterized by a consistent fertility decline (Jejeebhoy, 1995).

Based on this evidence from the literature, women's level of education will be included in our analyses in order to investigate how the fertility preferences can change with or remain constant without further educational expansion.

Women's occupation as well as husband or partner's occupation could be used as proxy of socio-economic factors related to the ideal number of children. For women the occupation does not only constitute an indicator of household wealth, but it also illustrates her autonomy in decision making. The type of occupation could also lead to a different valuation of children as either a cost or a benefit in terms of an extra hand on the farm.

The education and occupation of the husband would add to the wealth effects and together they are expected to lead to a desire for smaller families, because an increase in wealth shifts the quantity/quality trade-off of children, and because more educated couples will easily discuss family planning and will be open to the use of contraceptive methods (Cochrane 1990, Ezeh et al. 1993).

The second factor related to the modernization mechanism is urbanization which links the childhood and current place of residence. It has been documented that women living in rural areas have distinctly higher fertility preferences than urban women, even after accounting for the difference in occupation and educational level (Knodel et al. 1996). The additional impact of place of residence on fertility intentions could be due to socio-cultural factor linked to modernization and to different urban and rural labour market conditions.

Yamanaka et al.(1982) working on Taiwan found the impact of the respondent's place residence on fertility preference to be limited due to the rapid urbanization of the island. This raises the question whether migrants from the countryside bring to the city more traditional values on fertility or assimilate to more modern views either before or after the move to the city. This is known as adaptation hypothesis which relies on the idea that fertility behaviour of migrant will change from childhood dominant behaviour to resemble the fertility preferences

dominant at destination (Brockerhoff and Yang 2004; Kulu 2005). For rapidly urbanizing countries like Rwanda this is an important issue, and we will categorize women according to their place of residence at the moment of interview and to where they spent the childhood in our models.

2.3 Attitudes of third parties

The attitudes of the husband or partner as well as other community members, like parents or mothers in law, are the third mechanism that may account for the change in fertility preferences in developing countries. Third parties might have an effect on the reported fertility preferences of women as they are affected by the society which is a patriarchy in most of the cases in sub-Saharan Africa. It is therefore unlikely that the fertility preference could be explained by individual characteristics only, even for educated and employed women as the role of male still preponderate over (Woldemicael, 2007). The complication of including in research and reproductive health programs direct measurement of women's autonomy has encouraged scholars to expand their analysis on other variables like religion, access to media and partner's individual characteristics such as approval of family planning or even discussion about it. As it is a multi-dimensional concept it has been defined in relation with men or other women in terms of culture, religious beliefs, traditions and economic environments and sometimes as women status, thus it is difficult to capture with a single measure (Goni and Saito, 2009). In this paper, we expect the attitudinal variables related to third parties such as approval of family planning or its discussion among partners would be a way of regulating the future fertility by reducing the fertility preferences as a joint decision making may bring women close to expected results than individual characteristics.

2.4 Some control variables

The ideal number of children could also related to age of women as their reproductive capacity declines dramatically after the fourth decade of life (Klein and Sauer 2001). One could think about a positive relationship between the desire for larger families and age in two ways. The first mechanism could be that young women cope better with the modern reproductive means than their older sisters who may replicate more traditional reproductive norms. The second is the rationalisation of the actual number of children into a preferred number.

Based on the fact that in Rwanda almost all the births occur in marriage we expect the fertility preference to be higher for married women than those formerly married or those who declare to be single.

There is evidence in the literature that marriage formation slows down in the period of crisis and catching up directly after the disrupting event (Galloway 1988; Palloni et al. 1996; Nobles & Buttenheim, 2006). Assuming conscious fertility control within marriage, women or couples will delay births voluntarily and those who are not married will delay the formation of a stable partnership and will favour smaller family as a consequence of economic hardships (Palloni et al. 1996; Lindstrom et al. 1999).

The central hypothesis of this paper is that the increase in desired family size in Rwanda in the aftermath of the 1994 genocide can be attributed at least in part to a rise in mortality experience, both of children and siblings, but is also supported by the slowing down of the urbanization process and the fact that educational expansion came to a halt. However, these mechanisms may not fully account for the change in fertility preferences over the years. There might be an extra effect of the disrupting event itself on the mindset of women involved either trough third party effects which favour more pro-natalist attitudes or because the loss of family through war brings about extra uncertainty in deciding on the ideal number of children.

3. Data description and methods

In his classical contribution Pullum (1983) described some characteristics to be considered when analyzing the desired family size in less developed countries. In the latter the ideal number of children can be illustrated a *projected ideal* (e.g. for one's daughter), as a *personal ideal* (what is best for one's family) or as a *generalized ideal (*what is best for the community or country). Even if it is measured as a personal ideal, more general considerations might come into play. The desired size will be more indicative of the mindset, than a prediction of the actual fertility over the life course.

Depending on the level of autonomy of the woman in the country of survey, third parties might influences the response consciously (if present at the interview) or subconsciously, and the declared number would basically indicate the one with a relative convenience for the respondent.

As we are not using the desired family size as a predictor of future actual fertility, but are interested in whether personal and collective experience affect the mind-set when it comes to fertility preferences, these issues do not hamper our analyses but will be taken into account in defining the models and used in the interpretation of generated results.

In this paper, we use the Rwanda Demographic Health Surveys (RDHS) of 1992, 2000, 2005 and the interim RDHS of 2008. In addition to data on the birth histories of women, background characteristics of women aged 15 to 49 years old and their husband if any were collected at the moment of the survey.

The dependent variable used in this study is a question in the RDHS designed to measure the fertility preferences using the *ideal number of children* as stated by both women having children or not. The question in the RDHS is phrased as: "*If you could go back to the time when you did not have any children and could choose exactly the number of children to have in your whole life, how many would that be? Or if you could have exactly the number of children you want, what would that be*?" This variable has responses from zero children to twenty and more and one category of nonnumeric responses. Women who stated that their ideal number of children is twenty or more as well as those who expressed it as a non numerical answer (e.g. "*it is God's will*"), are taken together with women who declared a very high number of family size desire.

There are two reasons to doubt that the dependent variable is of ratio level. The first reason is that the intervals between the numbers listed are not proportional. In a context were practically no one wants less than three children, one might wonder about the difference between one, two and three. At the other end of the distribution the difference between seven, eight, nine, or more might not be a deliberate choice, but to be triggered by the need to give a finite number. The second reason is the relative utility of any given number. One more or one less could be acceptable. We solved this by treating the ideal number of children as an ordinal variable, taking *Zero-Three* children as one category, *Four* and *Five* as separate categories and *Six and over* as a measure of wanting many children.

The explanatory factors as stated in the theoretical background are grouped into mortality experience, modernization process, and attitudes of third parties. The first independent variables are mortality of offspring and siblings' mortality which are grouped into three

categories each: no mortality experience, the respondent experienced between one and two deaths, and those who experienced the death of three or more. The mortality of offspring is related to all children who died as stated by the respondents whereas the death of siblings is associated to brothers and sisters of respondents that died in the period of the genocide (1993, 1994 and 1995). The second group of explanatory variables are education and urbanisation. Women's highest level of education is categorized as non educated, incomplete primary, completed primary, incomplete secondary, secondary or plus. The migration history s combines the actual place of residence with the childhood place of residence and is used measure the extent to which the place where one's lives has impact on the fertility preference in terms of individual or collective choices. The third group is the approval of family planning by the partner and the discussion of family planning by the couple. In addition age or marital status are included as control variables. Women selected for the purpose of this study are aged from 20 years to 49 years old.

We used ordinal logistic regression to model the woman's ideal number of children because of the ordinal nature of the outcome variable, but also because it offers interesting analytic options such as going beyond simple significance testing, summarizing the association of interest of all levels of outcome and assessing confounding and interaction effects for all independent variables (Scott et al. 1997).

The ordinal logistic regression, often referred to as the proportional odds model (Norris et al. 2006), or cumulative logit, is an extension of the binary logistic regression and an appropriate method of analysis for grouped continuous response variable (Lall, R. et al. 2002). This ordinal model consists of n-1 logit equations, assuming the odds of each equation to be proportional, also known as the parallel lines assumption (Jansen M. et al. 2009). Its functional form is:

$$Ln\,(\theta j) = \alpha j - \beta i \mathrm{X}\, i$$

Where j ranges from 1 to the number of categories minus one

And (θ_j) = probability (score $\leq$ j) / (1- probability (score $\leq$ j))

The α_j's is referred to as a threshold or intercept. Each category of the independent variables except the highest (here: reference category) has its own threshold. In our analysis, α_1 = the

log-odd of wanting three or less children, α_2 = the log-odd of wanting four or less and α_3 = the log-odd of wanting five or less. The rest wants six or more children.

A positive parameter is subtracted from this threshold, indicating lower chances of wanting few children and higher chances of wanting more. The higher the parameter the more children women desire. As the model is proportional each logit has the same β coefficient.

Allison (1999) concluded that this approach may be invalid and even misleading when comparing groups, as the dispersion in the response probabilities could not be uniform across groups, violating the assumption of parallel lines. The risks of violating this assumption are reduced if the model is well specified and includes interaction effects to account for heterogeneity within groups (Williams 2009), but there is no guarantee that it captures unequal dispersion.

Therefore we use the heterogeneous choice models also known as location-scale models. The location model gives the shift in the response probability to either right or left, while the scale model explicitly models the dispersion in the response probabilities (Jansen M. et al. 2009). This model offers, in addition to the shifts in the ideal number of children, more clarity about the heterogeneity within certain specified groups. The model is extended and redefined as follows:

$$Logit\ [P(Y \leq \mathrm{j} \mid \mathrm{x})] = \frac{\alpha \mathrm{j} - \beta \mathrm{x}}{\exp(\gamma \mathrm{x})}$$

With γ being a vector of parameter estimates referring to the scale model (Jansen M. et al. 2009). This shows that when γ=0 the location-scale model is reduced to the cumulative logit model. The higher γ, the larger is the dispersion for the groups defined by the explanatory variables and when it is lower than zero this means the groups defined by the explanatory variables are more homogeneous in terms of ideal number of children. Using PLUM from SPSS we have come up with the models and results detailed below.

4. Results

Four data sets (1992, 2000, 2005 and 2008) of women aged from 20 to 49 years old have been used for the analysis (Table 1). Unfortunately no data were collected in 1996, which would

have given information directly after the disruptive of the 1994 genocide. Collecting data was clearly not the first priority in the years after the traumatic event.

Graph 1 shows the shifts in family preferences between the years in the form of cumulative percentages of the desired number of children. In 1992 close to 30% wanted no more than 3 children, 70% see four or less as the ideal and 85 want less than six children. In 2000 the ideal number of children is much higher. Less than 20% want to stop at three and 50% indicate that they want more than 4 children, and 30% even want 6 or more. In 2005 the pattern illustrates that the fertility preference of women is close to the one in 1992. The fertility preference in 2008 is radically different if compared to previous years. Of all women aged 20-49 no less than 60% state that three children or less is the ideal number and 90% indicate a maximum of four. This huge shift raises some methodological doubt. The 'sensitizing' campaign of the government of Rwanda after 2005 promoting three children as the ideal family size might have led to socially desirable responses in the 2008 interim RDHS rather than an expression of a consciously change in the fertility behaviour of women. An additional analysis of the 2010 RDHS when available will give a clearer picture of the fertility trend in Rwanda for the coming years.

Graph 1: Relation between year of interview and ideal number of children

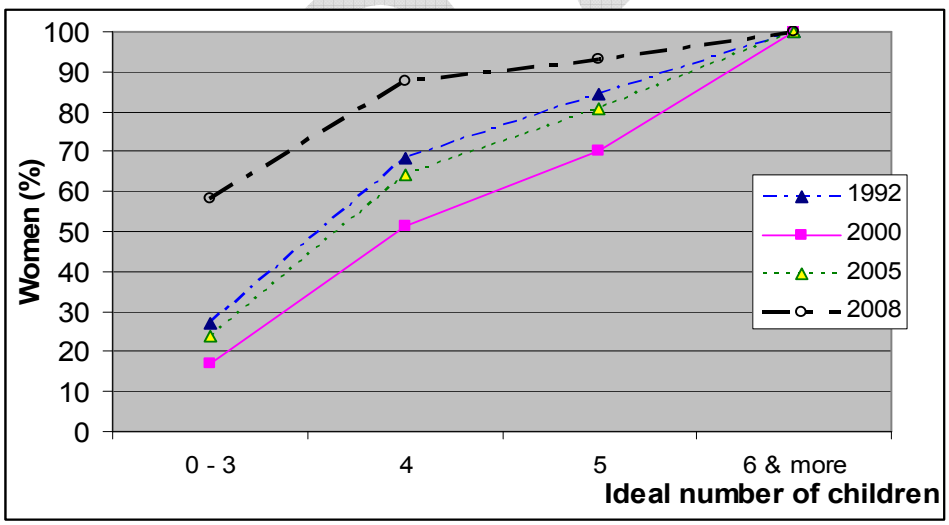

Table 1 gives the descriptive statistics for each year of interview. We expected to observe more women that had lost at least one child in the 2000 set, in particular compared to both 1992 and 2008. We found out that infant and child mortality rates were already very high in 1992 and in 2000 and they deviated only marginally from the first Rwanda demographic and health survey. We do find much higher numbers of formerly married (widowed or separated) women in 2000 and 2005 than in 1992 and in 2008. The data show that urbanization, which is

expected to lead to a smaller number of ideal children over time, is on its way in Rwanda but only at a slow pace. The proportion of respondents in the rural neighbourhoods gradually decreases as people prefer to leave in small cities or in the capital as those areas are relatively well equipped in terms of infrastructures and offer more socio-economic opportunities. This proportion in small cities increased gradually whereas in Kigali the increase is particularly important in 2000. In general, the educational expansion seems to have increased steadily as the proportion of no educated went from 40.4% in 1992 to 24% in 2008. But a closer look at all types of level of education show that the main changes appear in 2000 where the proportions of women with primary and secondary level education have more than doubled. This might be an effect of the return of large numbers of Rwandese living in exile in Burundi, Uganda and Congo before the regime change in 1994. Efforts to stimulate enrolment in primary education have been a major priority of the new administration and could account for the rising levels of (completed) primary education after 2000.

Table1: Descriptive statistics by year of interview

Variables	**1992**	**2000**	**2005**	**2008**
Ideal number of children				
0 - 3	26.7%	17.5%	23.1%	54.2%
4	40.8%	35.7%	41.8%	31.8%
5	15.6%	17.7%	15.3%	6.1%
6+	16.9%	29.1%	19.8%	7.9%
Mortality experience (Children)				
0	61.5%	59.8%	63.2%	71.8%
1	19.6%	20.7%	19.5%	16.3%
2	9.6%	10.0%	9.3%	6.9%
3	4.8%	5.2%	4.3%	3.0%
4+	4.5%	4.3%	3.7%	2.1%
Level of education				
No education	40.4%	32.2%	27.3%	23.9%
Inc. primary	42.2%	36.0%	49.5%	45.0%
Primary	6.7%	17.8%	11.6%	18.1%
Inc. secondary	8.9%	10.0%	7.7%	7.2%
Secondary	1.3%	3.1%	2.9%	4.1%
Higher	0.5%	0.9%	1.0%	1.7%
Type of Place of residence				
Countryside	82.5%	75.9%	77.4%	74.1%
Small cities	6.4%	10.2%	13.2%	15.5%
Kigali	11.1%	13.9%	9.4%	10.4%
Marital status				
Never married	16.5%	15.7%	20.7%	22.1%
Currently married	70.5%	61.4%	61.8%	63.4%
Formerly married	13.0%	22.8%	17.5%	14.5%
Age				
20 – 29	46.2%	45.9%	47.0%	49.8%
30 – 39	34.6%	31.5%	29.7%	28.8%
40 – 49	19.2%	22.6%	23.3%	21.4%
Siblings Mortality				

None	-	23.5%	20.2	-
One or more	-	76.5%	79.8	-
Migration status				
Countryside < Countryside	-	74.8%	76.0%	-
Countryside < Small City	-	0.6%	0.5%	-
Countryside < Kigali	-	0.3%	0.4%	-
Small City < Countryside	-	6.4%	9.6%	-
Small City < Small City	-	3.4%	3.3%	-
Small City < Kigali	-	0.3%	0.3%	-
Kigali < Countryside	-	8.9%	6.1%	-
Kigali < Small City	-	1.9%	1.2%	-
Kigali < Kigali	-	3.1%	2.0%	-
Husband approves FP				
Disapprove	-	18.3%	15.8%	-
Approve	-	54.0%	62.4%	-
Don't know	-	27.7%	21.8%	-
Discussion about FP				
Never	-	42.1%	30.5%	-
Once or twice	-	23.2%	27.0%	-
More often	-	34.7%	42.5%	-
Valid	5079	7694	8726	5879

Unfortunately we do not have data on the attitudes on family planning for 1992 and 2008, but the data show the low level of approval in 2000. Only 54% of the women indicate that theirs husbands approve of family planning and more than 40% has never discussed it. Five years later approval rates have gone up to 62% and 70% has discussed family planning at least once. When the data of the 2010 RDHS become available it can be judged if there is significant attitudinal change in Rwanda.

The outcomes from the location-scale models illustrate two different models (Table 2 and 3). The first model (Table 2 and Model 3) is a general model that tests the assumptions from Demographic Transition Theory and here illustrated by the estimates from the location model that addresses the shift in terms of ideal family size. All mechanisms defined in that theory show up with the correct sign. The year of interview, the mortality experience (death of own children), the level of education, the place of residence, the marital status and the respondent's age are all related to the ideal number of children. The mortality experience, the age of respondent and place of residence (with Kigali as reference category) are clearly positively related to large family size preference. Women who experienced many deaths of their own children are more likely to desire a large family size than the one who lost fewer or did not loose any child meaning that the more women lose the higher will be the likelihood of wanting a large family. Women aged 30 and over are more likely to prefer large family size than their younger sisters and living outside Kigali increases the likelihood of preferring a large number of children.

Table 2: Risk factors of large family size preference (1992 – 2008)

Parameter	Model 1		Model 2		Model 3	
	Location	Scale	Location	Scale	Location	Scale
Threshold [0 - 3]	-0.800***		-0.423***		-0.265***	
Threshold [4]	1.122***		1.608***		1.682***	
Threshold [5]	1.988***		2.517***		2.549***	
Year [1992]	0[a]	0[a]	0[a]	0[a]	0[a]	0[a]
Year [2000]	0.702***	0.053*	0.853***	0.042	0.824***	0.036
Year [2005]	0.223***	0.035	0.251***	0.039	0.254***	0.041
Year [2008]	-1.420***	0.049	-1.499***	0.142***	-1.430***	0.140***
Child mortality [None]	0[a]	0[a]	0[a]	0[a]	0[a]	0[a]
Child mortality [1-2]	0.288***	-0.018	0.139***	-0.002	0.100***	0.007
Child mortality [3 +]	0.366***	0.020	0.156***	0.038	0.119**	0.066
Age [20 - 29]	0[a]	0[a]	0[a]	0[a]	0[a]	0[a]
Age [30 - 39]	0.362***	0.125***	0.312***	0.141***	0.264***	0.149***
Age [40 - 49]	0.356***	0.101**	0.292***	0.129***	0.277***	0.153***
[2000] * [20-29]	0[a]	0[a]	0[a]	0[a]	0[a]	0[a]
[2000] * [30-39]	-0.150*	-0.040	-0.133	-0.018	-0.077	-0.023
[2000] * [40-49]	0.071	0.145**	0.041	0.161***	0.120	0.149
[2005] * [20-29]	0[a]	0[a]	0[a]	0[a]	0[a]	0[a]
[2005] * [30-39]	-0.166**	-0.118**	-0.092	-0.102**	-0.073	-0.117**
[2005] * [40-49]	0.007	0.011	0.062	-0.005	0.109	-0.028
[2008] * [20-29]	0[a]	0[a]	0[a]	0[a]	0[a]	0[a]
[2008] * [30-39]	0.275***	-0.002	0.422***	-0.036	-0.073	-0.117**
[2008] * [40-49]	0.502***	0.098	0.607***	0.072	0.109	-0.028
[None + Inc. Primary]			0[a]	0[a]	0[a]	0[a]
[Primary]			-0.292***	-0.067***	-0.282***	-0.065***
[Inc. Secondary]			-0.693***	-0.106***	-0.659***	-0.109***
[Secondary +]			-1.260***	0.033	-1.213***	-0.029
Kigali			0[a]	0[a]	0[a]	0[a]
Small city			0.351***	-0.016	0.334***	-0.023
Countryside			0.740***	0.009	0.673***	0.008
Never married					0[a]	0[a]
Currently married					0.309***	-0.077***
Formerly married					-0.190***	-0.040
- 2LL	747.111		3729.035		6617.854	
df	26		36		40	
Difference in ch^2			2981.924		2888.819	
Difference in df			10		4	
P value			**< 0.0001**		**< 0.0001**	
Valid cases	**27379**		**27379**		**27379**	

Lastly, taking into consideration the marital status, the category of women "*currently married*" shows log odds ratios of 0.309 and the category of "*formerly married*" women is negatively deviating (-0.190) from the reference category ("*Never married*") in terms of ideal number of children. The culture and the policy in Rwanda are not in favour of extramarital

births and remarriage for widowed or separated women. It is a phenomenon which is affected by a very low social acceptance. Formerly married women might therefore equate their ideal number to their actual number of children.

The relevant fact is that preference for large family size is very high in 2000 compared to all other years regardless of the level the level of mortality experience. The variable year of interview shows the very high increase in the preference for large families in the year 2000 and a very steady drop in the years after. The loss of explanatory power of the mortality experience after inclusion of education and urbanisation variables indicates that its role maybe different in exceptional circumstances.

As stated in the methodology section, the scale model offers the opportunity to address the issue of heterogeneity in the ideal number of children within groups of women. On the whole most scale effects are either not significant or small, with the exception of the parameters for the year 2008 and the higher age groups. As these parameters are positive it means that heterogeneous responses are more common in 2008, indicating that here might be minority groups that still favour large families. The dispersion in the higher age groups might indicate unobserved heterogeneity between cohorts that might be linked to experience of the genocide not captured by the actual loss of children. The scale parameter is in particular substantial for the highest age group in 2000.

Model 6 differs from Model 3 in two aspects. The first is that 1992 and 2008 data-sets are excluded as information on mortality of siblings as well as family planning approval and its discussion by the couple were not included. The second is that Model 6 includes a variable that reflects the migration history combining the current and the childhood place of residence and interaction terms between year of interview and age of respondents were integrated.

Table 3: Risk factors of large family size preference (2000 – 2005)

2000–2005 Parameter	Model 4		Model 5		Model 6	
	Location	Scale	Location	Scale	Location	Scale
Threshold [0 - 3]	-1.459***		-1.894***		-2.272***	
Threshold [4]	0.332***		-0.050		-0.506***	
Threshold [5]	1.134***		0.778***		0.315***	
Year [2000]	0[a]	0[a]	0[a]	0[a]	0[a]	0[a]
Year [2005]	-0.442***	-0.012***	-0.551***	-0.008	-0.528***	0.078**
Child mortality [None]	0[a]	0[a]	0[a]	0[a]	0[a]	0[a]
Child mortality [1-2]	0.254***	-0.021	0.093***	-0.005	0.054	-0.002
Child mortality [3 +]	0.328***	0.015	0.100	0.026	-0.142**	0.016
Siblings' mortality [None]	0[a]	0[a]	0[a]	0[a]	0[a]	0[a]
[1-2]	-0.143***	-0.071***	-0.095***	-0.058***	-0.096***	-0.049*
[3+]	-0.345***	-0.061*	-0.150***	-0.054	-0.123*	0.001
Age [20 - 29]	0[a]	0[a]	0[a]	0[a]	0[a]	0[a]
Age [30 - 39]	0.212***	0.091***	0.179***	0.120***	0.286***	0.202***
Age [40 - 49]	0.418***	0.252***	0.325***	0.289***	0.364***	0.389***
[2005] * [20-29]	0[a]	0[a]	0[a]	0[a]	0[a]	0[a]
[2005] * [30-39]	-0.016	-0.085**	0.034	-0.075*	0.045	-0.186***
[2005] * [40-49]	-0.054	-0.158***	0.023	-0.164***	0.075	-0.277***
[None + Inc. Primary]			0[a]	0[a]	0[a]	0[a]
[Primary]			-0.296***	-0.082***	-0.300***	-0.055*
[Inc. Secondary +]			-0.615***	-0.145***	-0.494***	-0.154***
[Secondary +]			-1.197***	-0.098*	-1.132***	0.047
[Countryside - Countryside]			0[a]	0[a]	0[a]	0[a]
[Countryside -Small city]			-0.093	0.164	-0.093	0.312*
[Countryside - Kigali]			-0.375**	-0.339**	-0.479**	-0.351**
[Small city - Countryside]			-0.331***	-0.124***	-0.272***	-0.104**
[Small city - Small city]			-0.444***	0.000	-0.230*	0.138*
[Small city - Kigali]			-0.658***	-0.137	-0.484**	-0.193
[Kigali - Countryside]			-0.711***	-0.080**	-0.739***	-0.070
[Kigali - Small city]			-0.474***	0.017	-0.516***	0.085
[Kigali - Kigali]			-0.923***	-0.050	-0.774***	-0.001
Partner [Disapproves]					0[a]	0[a]
Partner [Approves]					-0.353***	-0.194***
[Don't know]					-0.086	-0.057
Discuss FP [Never]					0[a]	0[a]
Discuss FP [Once or twice]					-0.054	0.006
Discuss FP [More often]					-0.254***	-0.083**
- 2LL	931.717		5318.976		8777.654	
df	18		40		48	
Difference in ch^2			4387.259		3458.678	
Difference in df			22		8	

P value		*<0.0001*	*<0.0001*	
Valid cases	**16420**	**16352**	**9918**	

The period 2000 and 2005 is close to the period of the genocide and could therefore give a better image of the short-term impact of that disruptive event on fertility preference. Although the offspring mortality appears to be positively (0.254 to 0.328) related to family size preferences, this relationship it progressively loses its significance when including variables related to modernisation progress and even become negatively when attitudes of the partner enter the model.

We hypothesized that the loss of siblings would also lead to a higher desired number of children. The death of siblings shows a limited and negative significant relationship with the preference for a large family. This means that women who lost their siblings due to the civil war and the genocide do not particularly desire a high number of children. As expected there is a negative association between partners who approve or discuss family planning as well as the education level along with the ideal family size.

Again as expected the age of respondents is positively related with the fertility preference meaning that younger women are less likely to prefer large family size than there elder sisters. As in the previous model with the four data sets (table 2) we that found that the women aged 30-39 and 40-49 years old are not homogeneous in terms of ideal number of children as the scale model shows clear positive and significant estimates. Again, this could mean that these age groups consist both of people that have been witness to the genocide and of people that returned to the country afterwards. Unfortunately the data does not allow a classification of people that left the country previously and returned after the period of atrocities, but we can well reconstruct variable showing that whether people remained in the countryside, moved to a small city or to the capital Kigali, testing the hypothesis that urbanization corresponds to a desire for smaller families.

The migration history does have the expected effect. In particular people moving to Kigali from the countryside show lower numbers of desired children (-0.739), compared to those that stayed. The smaller cities are indeed somewhere in between, but those who moved to these places from Kigali clearly want fewer children (-0.484). Again, as expected, women who live in Kigali and did not move since their childhood have the lowest estimates of preference for large family size (-0.774).

Model 6 pertains to currently married women which enables the inclusion of the husband approval of family planning and discussion with partner about the family planning. Even though Rwanda is not a very strict patriarchal society we did expect a substantial influence of the husband attitudes towards reproductive health on the desired number of children as reported by women. The parameters are in line with this hypothesis and indicate a significant effect if both approve (-0.353) the family planning and if partners discuss it as a couple (-0.254). Women who declared that they had a discussion only once or twice with their partner about family planning are not significantly different from those who had never discussed the matter.

Even after controlling for mortality experience and other risk factors, the year 2000 stands out as the year in which ideal family size is higher. Although this might be the result of unobserved heterogeneity, it could mean that the mindset in general is more in favour of more children after a disruptive event.

5. Conclusions

This paper aims to contribute to the debate on the stalling fertility decline in Sub-Saharan Africa, by analyzing the role of disruptive events in shaping the fertility preferences in Rwanda using the Rwanda DHS datasets from 1992 to 2008.
We are not measuring ideal family size as a proximate determinant of actual fertility but as a general opinion as to how much children would be appropriate to women in Rwanda either prospectively for young women or retrospectively for their elder sisters. This relative definition emphasizes the orientation of this study not to the extent to which the fertility preference may have been impacted by the civil war and the genocide in Rwanda.

This paper captures mechanisms through which disruptive events may account for the change in the fertility preference level. The first mechanism, which is in most cases the direct consequence of major crises, is the mortality experience. The proxies used in this study to capture the mortality experience that is expected to lead to desire a large family were the mortality of own children and the mortality of respondents' siblings. The second mechanism refers to common trends like further educational expansion and rapid urbanization, which are

known to lead to desires for smaller families and are generally interrupted as a result of major crises. The third mechanism expands our views to the attitudinal variables of third parties that may account in the change of fertility preferences after a disruptive event. These variables are husband's approval of family planning and its discussion within the couple.

Using data from four consecutive Demographic and Health Surveys we were able to show for Rwanda over a period of sixteen years that infant and child mortality remained at a high level, with only slight improvements after 2005. Educational expansion slowed down in this period. Urbanization progressed at a relatively slow but steady pace during this period.

The multivariate analyses indeed corroborate the existing insights that these factors play a decisive role in the desired family size, and part of the stall in the fertility decline can therefore be related to the fact that the determinants of the fertility preferences hardly changed over time. The expected influence of mortality experience on the fertility preference related to the insurance hypothesis was not found as important as the modernization process. The migration status stresses the facts that living or having lived in Kigali contributes a lot to desire smaller families and furthermore, the level of education has a strong effect on the desired family size. Young generations are less likely to prefer large families. The approval or the discussion of family planning within the couple is also contributing significantly to lower fertility preference.

The scale model does show that the highest age groups in particular are heterogeneous in their fertility preferences in 2000. We speculated that this might be linked to their country of residence during the genocide. Many people returned from exile after the end of the civil war and this might account for the heterogeneity within this group. Unfortunately the data do not allow us to bring this distinction into our models. Even after controlling for the factors that contribute to the explanation of the ideal family size, the year 2000 and to a lesser extent 2005 stand out in having exceptional high levels of desired fertility. This provides some support that the violent death of family members changes the overall mind-set of the population to more pro-natalist attitudes. A more in depth analyses of the effects of children's mortality showed that these are indeed stronger in the aftermath of the genocide in Rwanda. However, we found no support that the loss of siblings also contributes to the explanation of wanting more children.

Fertility decline may resume in the years to come. Further educational expansion and urbanization and decreasing levels of infant and child mortality will certainly bring down the

desired number of children. Also the mind-set seems to have shifted, considering the huge shift in the reported ideal family size in 2008. This might be result of the 'sensitizing' campaign by the Rwandan government, which could have led respondents in the questionnaire to include "what is good for the country" in their response to the question on the personal ideal with respect to the number of children. However, a decrease in ideal family size alone is not enough to bring down actual fertility. Access to reproductive services is a requisite to arrive at the ideal family size. The provisional outcomes of the RDHS 2010 are hopeful in this respect.

6. References

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