

Employment Uncertainty and Fertility: A Network Meta-Analysis of European Research Findings

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Draft paper prepared for the 2019 Annual Meeting of the Population Association of America. Please do not quote or circulate.

Abstract

The relation between employment uncertainty and fertility represents a prominent topic in demographic research since ever. With the advent of the *Great Recession*, papers addressing this relation are now booming. Although uncertainty is usually deemed to have a negative effect on fertility, different fertility reactions are hypothesized by sociological theories. What is more, micro-level evidence is still fragmented and often contradictory. In this article, we perform a meta-analysis (i.e., a quantitative literature review) of previous research findings for Europe in order to synthesize the existing literature and offer general conclusions about the size and direction of the impact of employment uncertainty on fertility. Our results suggest that experiencing employment uncertainty is detrimental for fertility; nevertheless, the magnitude of such negative effect differs significantly by gender, welfare state, and parity.

1. Introduction

The role of economic uncertainty as a key driver of fertility decision-making has long been part of demographers and sociologists' research agenda. Generally speaking, the notion of economic uncertainty refers to clarity, or the lack thereof, about future economic activities (Bloom, 2014; Moore, 2016). Objective definitions of economic uncertainty exist, but it is also true that individuals may have different perceptions of uncertainty depending on feelings of anxiety and safety, which depend heavily on personal circumstances (Bossert and D'Ambrosio, 2013). Given such a complex nature, economic uncertainty cannot be directly observed and measured. Nevertheless, employment uncertainty, intended as experiencing adverse labour market conditions, can be directly observed. This is why economic uncertainty has often been operationalized as an individual risk factor, mainly related to the labour market (e.g., Mills and Blossfeld, 2003; Kreyenfeld et al., 2012). Life course circumstances characterized by precarious employment spells translate into a feeling of economic uncertainty for individuals because they are often related to economic penalties (Scherer, 2009).

Historically, the crisis of the fordist model during the 1980s led to a structural incapability of jobs creation in Europe and a dramatic increase of (especially youth) unemployment rates. On the other side of the Ocean, the United States showed successful occupational outcomes. Social observers imputed this success to the 'flexibility' of the North American labour market, as opposed to European ones that were described as too 'rigid', i.e., protecting excessively permanent jobs (Cutuli and Guetto, 2013). Consequently, in the last two decades of the past Century, European labour markets experienced a strong process of deregulation. Such "re-regulation" of the labour market and other aspects of the globalization wave (such as privatizations and liberalizations) generated an unprecedented level of structural uncertainty in contemporary societies (Mills and Blossfeld, 2005; Standing, 1997, 2014). Such condition affected many workers and has been shown to have an impact on family life as well (Blossfeld et al. 2005; Blossfeld et al., 2006; Esping-Andersen, 1999; Kreyenfeld, Andersson, and Pailhe 2012; Mills and Blossfeld 2013).

In the realm of fertility research, a growing number of studies pointed to a connection between economic uncertainty, in the form of unemployment, temporary work contracts, and unstable labour market situations and fertility (Mills et al., 2011). Since the advent of the *Great Recession*, then, papers addressing the effects of economic uncertainty on fertility intentions and behaviours are booming. Nevertheless, the economic uncertainty/fertility nexus is far from being clearly understood: theoretical premises are weak and empirical findings send conflicting messages.

In 1999, Priya Ranjan developed a theoretical model following Dixit and Pindyck (1994) and the financial option literature in which uncertainty about future income leads people to postpone childbearing to better, meaning less uncertain, times. Given the irreversible nature of the childbearing

decision itself: individuals with an income under a certain threshold will wait for uncertainty about future income to reach an acceptable level before deciding to have a child. On the other hand, the work by Debra Friedman and colleagues (1994) advocated that uncertainty may have a positive effect on fertility: when a woman has limited chances in the labour market, she might choose the “alternative career” of mother. At the micro-level, a handful of studies has recently addressed the topic (e.g., Kreyenfeld et al. 2012; Vignoli, Drefahl, De Santis 2012; Vignoli, Rinesi, Mussino 2013; Modena, Rondinelli, Sabatini 2013; Barbieri, Bozzon, Scherer 2015), but despite the prevailing conviction that economic uncertainty discourages people from having children, empirical evidence is fragmented and often contradictory (see Sobotka et al. 2011 and Kreyenfeld et al. 2012 for reviews). Some studies suggested that economic uncertainty negatively affects fertility (e.g. Pailhé, 2012, Sutela, 2012, Hofman, 2013), others found a positive effect (e.g. Gutierrez, 2008, Perelli-Harris, 2006, Kreyenfeld, 2009), while some others a non-significant effect (e.g. de Lange et al., 2014). Some observers attributed the source of such heterogeneous findings to the nature of employment uncertainty. For example, limited-time jobs, when voluntarily chosen, allow a better combination of work and family, especially when combined with reduced working hours; nevertheless, they are associated to greater career instability, higher unemployment risk, lower job satisfaction, and they are usually concentrated in less favourable segments of the labour market (OECD, 2003; Di Prete, 2005; Scherer, 2009).

Differences between micro-level findings are likely to be driven by different welfare regimes. Previous research has demonstrated that public policies play an important role in altering the effects of economic uncertainty on families (Vikat 2004; Neyer and Andersson 2008; Sobotka et al. 2011). By providing monetary support or lowering the opportunity costs of childbearing, these policies offer people some financial security and thus support them in realizing their fertility desires despite adverse economic conditions in the country. Besides family policies, labor market policies (such as assistance in job search or the level of employment protection) also influence unemployment dynamics and its duration (Adserà 2004, 2005; OECD 2006; Caroleo and Pastore, 2007). Among European countries, Nordic countries are known for providing strong support for individuals in need, reducing opportunity costs of parenting as well as implementing active labor market policies that facilitate entry into employment (Esping-Andersen 1999; Thévenon, 2011). Western Europe (Austria, Belgium, France, Germany, Luxembourg and the Netherlands) also provides strong financial support for the unemployed and has generous family policies, but this region (in particular Austria and Germany) still lags behind the Nordic countries when it comes to offsetting the opportunity costs of childbearing (Gauthier 2002; Misra et al. 2007; Thévenon 2011). The support for families in the United Kingdom and Ireland is, in turn, weaker and directed only to those in the highest need (Barbieri and Bozzon, 2016). At the same time, these two countries are characterized by highly flexible labor markets with

relatively short unemployment spells and low temporary employment (Adserà 2004; Caroleo and Pastore, 2007). Finally, the system of social protection for families and the unemployed is least generous in Southern Europe and in the post-socialist countries of Central and Eastern Europe (CEE) (Esping-Andersen, 1999; Caroleo and Pastore, 2007; Javornik, 2014). In addition, Southern Europe is known for high employment protection (mostly among the more senior workers) and the resulting phenomena of high youth unemployment, high temporary employment and high involuntary self-employment (Venn, 2009; Adserà, 2011).

In sum, micro-level studies focused each time on a specific situation constituting only a piece in the overall puzzle of the link between economic uncertainty and fertility. This article offers a meta-analysis to draw general conclusions from existing micro-level findings about the size and the direction of the impact of employment uncertainty on fertility in Europe. This methodology was developed in order to synthesize, combine and interpret a large body of empirical evidence on a given topic. It offers a clear and systematic way of comparing results from different studies, standardizing by country, method, control variables, sample characteristics, and so forth. With this approach, it is possible to take advantage of the abundance of empirical findings obtained using various data sets and a wide variety of research methods. Conducting a meta-analysis on this topic will additionally allow for a systematic inspection of the changing association between economic uncertainty and fertility across space (i.e. between different family and labour market regims) and time. The meta-analysis will help translating micro-level findings into aggregate-level conclusions and will feed further research on the topic.

First, we run classic pairwise meta-analyses to study the relationship between limited-time employment and fertility. Meta-analysis has been already successfully employed in family demography research (Matysiak and Vignoli 2008; Matysiak, Styr, Vignoli 2014). With this paper we make a step forward. As a second step, we used an extension of the classic meta-analysis, called **network meta-analysis** to compare, simultaneously, the effects of more than one type of economic uncertainty on fertility. The network meta-analysis has been only very recently proposed as an extension of pairwise meta-analysis to facilitate indirect comparisons of multiple competing treatments – here identified by different markers of economic uncertainty. Compared with pairwise meta-analyses, network meta-analyses allow the visualisation of a larger amount of evidence, estimation of the relative effectiveness among all treatments, and rank ordering of the treatments (Tonin et al., 2017). Specifically, we compare the size and direction of the impact of limited-time employment with another crucial source of employment uncertainty, that of unemployment.

While network meta-analysis is gaining ground in medical research, this paper offers the first adaptation of network meta-analysis to population research.

2. Data and methods

2.1 Meta-sample

The premise of a meta-analysis is to cover all the articles ever published about the topic of interest. In order to accomplish this goal, it is necessary to follow a systematic procedure to retrieve articles and select them through the application of some inclusion criteria.

We collected articles using the electronic database Scopus (www.scopus.com), the largest abstract and citation database of peer-reviewed literature, summing up to more than 60 million records. The documents covered in Scopus are articles, articles-in-press, books, book chapters, referred conference papers, editorials, review – and more, dating back to 1970. Book reviews and conference abstracts are not included. After the search through electronic database, we performed a backward research to find articles that were possibly not included in the database. Finally, we sent the list of articles retrieved to a group of experts, asking them to check if any important contribution was missing.

Several inclusion criteria were used to select the articles that could enter our meta-sample. First of all, we disregarded conference papers and working papers. Since the quality of a meta-analysis depends on the quality of the studies considered, we decided to include only articles and book chapters in order to ensure a high-quality meta-analysis. Next, qualitative works are excluded as they did not test the effect under interest from the statistical point of view. Third, we disregarded macro-level studies about employment uncertainty and fertility to avoid ecological correlations. Finally, we restricted the search to studies in European countries because they display an interesting variation in fertility and labour market patterns, while also sharing certain economic, social, and cultural similarities that minimize heterogeneity. We did not apply any time restriction, in order to be able to make comparison across time. So far, we considered articles in English and Italian.

A very large number of articles was retrieved through our search methods, but after having applied all the inclusion criteria, at the time of writing, only 22 articles have been coded and included in the analysis. Some articles report specific analyses for subgroups (e.g., men and women, childless individuals and parents, different countries), so that each article might include more than one effect-size. Finally, with 22 articles, we obtained a meta-sample of 43 effect-sizes about limited-time employment. The meta-sample for unemployment (versus unlimited-time employment) consists of 15 articles with 18 effect-sizes.

2.1 Pairwise meta-analysis

From each article, we take out one (or more) unit of observation, called **effect-size**. Each effect-size is the ratio between an estimated relative risk (RR) or odds ratio (OR) of childbearing for individuals with a limited-time job with respect to people with an unlimited-time job. We performed random-effects meta-analyses, thus implementing models that relaxed the assumption that the analysed studies were identical and that the collected effect sizes differed only in sampling error (Borenstein et al. 2010). Consequently, in our approach, the variance of an effect size was computed as a sum of two components: the within-study variance, which, in practice, was the squared standard error of the parameter reported in the study; and the between-study variance, caused by inter-study differences, which was estimated according to the formula proposed by DerSimonian and Laird (1986). Such a model, which accounts not only for the within-study sampling error, but also for inter-study differences, allows for a generalization of the results to studies not included in the meta-sample.

We considered key moderators of the relation between employment uncertainty and fertility in the analyses. The impact of employment uncertainty on fertility has been shown to present different connotations between genders (Blossfeld et al., 2005). In addition, it is a well-established fact that the pressures towards increasing labour market liberalizations in Europe have been moderated by country-specific institutions (Esping-Andersen, 1999). Hence, we stratified the meta-analyses by gender and welfare regimes.

After the univariate analyses obtained through the random-effects models, we performed multivariate analyses through meta-regressions. Meta-regressions are regression models in which the response variable is effect-size. We used such models to scrutinize the effect of other variables, like parity, time and cohort on the relationship between employment uncertainty and fertility, net of gender and welfare state.

2.2 Network meta-analysis

The network meta-analysis allows comparison between multiple conditions of employment uncertainty. We decided to extend the first pairwise meta-analysis about limited-time employment by adding unemployment as another marker of employment uncertainty, obtaining a three-ways comparison between unlimited time employment, limited-time employment and unemployment.

Along with the within-trial variability and the between-trial heterogeneity, network meta-analysis exhibits an additional source of variability that is called “inconsistency”. Inconsistency captures divergences that are not explained by either within study variability or standard heterogeneity. In this preliminary version of the paper we are assuming that there is no inconsistency, but an appropriate model which accounts for inconsistency (e.g., Higgins et al., 2012) will be

implemented in the final version. Similar to the pairwise meta-analysis, random-effects modelling is used for the network meta-analysis as well.

We use a Bayesian approach to the network meta-analysis using Markov chain Monte Carlo (MCMC) implemented in WinBUGS (Lunn et al., 2012) mainly due to the flexibility of the Bayesian approach, ease of implementation of models and parameter estimation in WinBUGS (Dias et al., 2018). With the Bayesian framework, the parameters to be estimated (i.e., the “true” study-specific effect sizes) are given prior distributions, which are then combined with the likelihood from observed data to obtain posterior distributions. Simulations from Bayesian posterior distributions allow a proper statistical estimation. We specify non-informative vague priors for all the hyper-parameters in the model (Normal distributions with 0 mean and large variance) so that whatever information is contained in the prior, the data should dominate it (following Buti et al., 2013).

3. Preliminary results

3.1 Search outcome

Table 1 reports some characteristics of the sample for the meta-analysis about limited-time employment and fertility, showing the distribution of the effect-sizes by gender, parity and welfare state.

Table 1 – Meta-sample

	Nr. of studies		Nr. of studies
Women	30	Nordic countries	5
Men	12	Western countries	14
Childless	34	Southern countries	15
Parents	7	German-speaking countries	5

Source: our elaboration on meta-sample

The large majority of the articles retrieved investigates the relationship between limited-time employment and fertility among women. In the same way, three quarters of the effect-sizes are about employment uncertainty and transition to parenthood, while only 7 investigates higher-order parities. As regards the geographical distribution, we grouped country in four categories, depending on their family and labour market regime: Nordic countries (Denmark, Sweden, Norway and Finland), Western countries (UK, Ireland, Netherlands, Belgium, France), Southern countries (Italy, Spain, Portugal, Greece) and German-speaking countries (Germany, Austria, Switzerland). There are more studies published for Western and Southern countries than for Nordic and German-speaking

countries. We would have liked to include Central and Eastern European countries in the analysis, but we did not find enough articles that satisfied all the inclusion criteria.

3.2 Descriptive analyses

Preliminary results about the relationship between limited-time contracts and fertility show that employment uncertainty has a significant negative effect on fertility. As reported in Table 2, the OR of having a child for people with a limited-time job with respect to people with an unlimited-time contract is on average 0.91, and it is strongly significant. Such negative effect is even stronger for women, whose OR is 12% lower if they have a limited-time job. Finally, the same effect is weakly significant for men.

Table 2 – Random-effects meta-analyses, pooled dataset and gender-specific results. ORs are reported.

	Average effect	p-value	I^2	Number of effect-sizes
Pooled dataset	0.91	<0.001	53.4%	44
Women	0.88	<0.001	20.9%	30
Men	0.98	0.077	0.5%	12

Source: our elaboration on meta-sample

For each meta-analysis, the I^2 index is also reported. The I^2 index represents the percentage of variability among the effect-sizes that exists between studies relative to the total variability among effect-sizes (Higgins and Thompson, 2002). High levels of I^2 suggest that the effect-sizes are strongly heterogeneous; hence, more specific analyses are required. Commonly used guidelines to interpret the I^2 index are the one provided by Huedo-Medina and colleagues (2006): up to 25% is considered a small amount of heterogeneity, from 25% to 75% a medium amount, over 75% a large amount. The I^2 index from the meta-analysis on the pooled dataset in Table 2 show a medium amount of heterogeneity, which could be expected since it is a computation made on the whole dataset. After dividing the sample by gender, between-studies heterogeneity decreases, sustaining the reliability of our findings.

There are important differences depending on family and labour market regimes, shown in Table 3. The OR of having a child for limited-time workers compared to unlimited-time workers goes from 0.92 in countries such as the Netherlands and the UK, to 0.86 in Southern Europe, while is not significant in Germany. As regards Scandinavian countries, our results suggest that the OR of having a child for people with a limited-time contract is 22% lower than for people with an unlimited-time

contract. This result is significant; nevertheless, the I^2 index is almost 90%, which means that there is a huge variability between studies, and the number of studies itself is quite poor.

Table 3 – Random-effects meta-analysis, results by welfare states. ORs are reported.

	Average effect	p-value	I^2	Number of effect-sizes
Nordic	0.78	0.034	89.8%	5
Western	0.92	0.017	42.2%	14
Southern	0.86	<0.001	13.9%	15
German-speaking	0.99	0.673	0.5%	5

Source: our elaboration on meta-sample

3.3 Meta-regressions

As a second step, we studied the role of other covariates by performing meta-regressions. Table 4 shows the result from three separate models, in which we tested the effect of three additional variables, always controlling for gender and welfare state. The variable “parity” is a dummy that distinguishes between childless individuals (0) and parents (1). The variable “time” is computed as the central year of the reference period of the study. For example, if the original model includes births happened between 1990 and 2000, time equals to 1995. Finally, “includes income” is a dummy variable which is 0 if the original study does not control for income, and 1 if it does.

Table 4 – Meta-regressions. All models are controlled for gender and welfare state.

	Model 1	Model 2	Model 3
Parity	-0.11 *		
Time		0.01 *	
Includes income			0.01

Source: our elaboration on meta-sample

Note: results are controlled for gender welfare state grouping

Results show that limited-time employment is more detrimental to childless individuals’ fertility with respect to those who already have a child. As regards time, there is a small – and weakly significant – positive effect, that means that the effect of limited-time employment on fertility becomes slightly weaker over time. The income variable is not significant as well. This means that studies that measured the effect of limited-time employment on fertility without controlling for individuals’ income, on average, found the same result as those studies that controlled for income.

3.4 Findings from the network meta-analysis

We use the network meta-analysis to compare the effect of limited-time employment with that of unemployment on fertility, with workers unlimited-time contracts as the reference category. For this reason, we enlarged the meta-sample adding effect-sizes from articles addressing unemployment and unlimited-time employment, retrieved using the same procedure explained in paragraph 2.1.

In the following tables, we report results from the network meta-analysis. Each network meta-analysis yields the estimates of the effects considered (limited-time versus unlimited-time and unemployment versus unlimited-time) obtained using all data available in the “network meta-sample”. With this approach, we are able to make a ranking and assess which employment condition is more detrimental for fertility. Again, we run separate models for men, women, childless individuals, parents (i.e., effect sizes relative to studies about transition to higher parities), and welfare states groups. The last column of each table (in tables 5, 6 and 7) reports a measure of reliability of the estimate. Since the Bayesian framework does not produce the usual p-value to assess the significance of the result, we reported the proportion of odds ratios simulated from the posterior distributions which are greater or less than one (depending on whether the estimate of the effect size is greater or less than one, respectively).

Overall, having a limited-time employment has a worse effect on fertility than being unemployed (with respect to unlimited-time employment). As shown in Table 5, the (average) odds ratio for limited-time versus unlimited-time employment is 0.86, while the odds ratio of unemployment versus unlimited-time employment equals to 0.91. Interestingly, this ranking is gender-specific. Table 6 reports the results for men and women separately, showing that for men being unemployed is more strongly negatively associated with fertility than having a limited-time employment. For women, the the strongest negative association is between fertility and limited-time employment. So far, all the estimates have high reliability, as shown in the last column of each table. For example, the odds ratio of having a child for unemployed men (with respect to men with unlimited-time employment) is 0.85, and the proportion of odds ratios simulated from the posterior distribution of such effect that are less than one is 99%.

As regards the differences between childless individuals and individuals who already have (at least) one child, Table 7 shows that the results from studies addressing transition to parenthood are quite similar to those obtained on the pooled dataset. Conversely, for individuals who already have one child or more, limited-time employment is negatively related to fertility, but unemployment does not seem to have any effect (the odds ratio is 1.06, but the proportion of simulated odds ratio greater than one is only 77%). In any event, studies on the transition to the first child dominate the network meta-sample.

Finally, we run meta-analyses specific by welfare states (as in Table 3), but no meaningful differences emerged. This is likely to be due to the fact that sample sizes are too small at times, but also because we are using a preliminary model that, as explained in paragraph 2.2, does not account for all the sources of variability that should be considered. An advanced version of the network model will be utilized in the final version of this work.

Table 5 – Network meta-analysis, pooled dataset. Odds ratios are reported.

rank	effect	OR	p(OR><1)
#1	limited-time	0.86	1.00
#2	unemployment	0.91	0.99

Source: our elaboration on meta-sample

Table 6 – Network meta-analysis, results by gender. Odds ratios are reported.

women				men			
rank	effect	OR	p(OR><1)	rank	effect	OR	p(OR><1)
#1	limited-time	0.85	1.00	#1	unemployment	0.85	0.99
#2	unemployment	0.94	0.94	#2	limited-time	0.90	0.97

Source: our elaboration on meta-sample

Table 7 – Network meta-analysis, results by gender. Odds ratios are reported.

childless individuals				parents			
rank	effect	OR	p(OR><1)	rank	effect	OR	p(OR><1)
#1	limited-time	0.86	1.00	#1	limited-time	0.88	0.99
#2	unemployment	0.90	1.00	#2	unemployment	1.06	0.77

Source: our elaboration on meta-sample

4. Preliminary conclusions

The relationship between employment uncertainty and fertility has attracted considerable attention among researchers. The evidence produced by these studies has been equivocal and inconsistent, however. Because micro-level studies have often focused on one country or a particular issue, they have been unable to offer findings that could be generalized. The meta-analysis reported in this paper was undertaken to remedy that problem: it was based on findings on the impact of employment uncertainty on fertility in European countries from the early 1970s to 2007.

At least four conclusions can be drawn from the findings. First, our findings revealed a **gender-specific effect**, since limited-time jobs significantly decrease fertility for women, while the effect on men is weaker and smaller. Such results could be due to many reasons: temporary employment, which is usually higher among women than among men, makes family-work reconciliation harder. Furthermore, the opportunity cost of childbearing is usually particularly high for women in non-permanent employment. Comparing the effect of limited-time employment on fertility with that of unemployment, we discovered crucial gender-specific differences. Our findings suggest that unemployment exerts a more detrimental effect on fertility for men, while limited-time employment exerts the strongest negative effect for women. We explain this result recalling the ondfashioned, but still actual, male breadwinner model: in a couple, the man is often the main earner, and being employed represents a prerequisite for childbearing and childrearing (e.g., Paihlé and Solaz, 2012 for France). Hence, having a limited-time job is always better than being unemployed for men. This outcome is, in the end, very much in line with the traditional micro-economic interpretation that emphasizes the husband's breadwinner capacity. But increasingly both partners search for employment to sustain a financially sound household budget to have children. In this vein, the precariousness of contemporary labour markets – often gendered, with women more exposed to employment uncertainties than men – poses the characteristics of women's employment as a central point in European fertility dynamics.

The **welfare state** proved to be a significant moderator of the relationship between employment uncertainty and fertility. Our findings show that the negative impact of limited-time employment on fertility is the strongest in Southern Europe countries, where social protection is lowest, while there is no effect in countries like Germany and Austria. Recently, Barbieri and Bozzon (2016) showed that the risk of entering poverty at childbirth in Southern Europe is elevated compared to other European Union welfare clusters, especially for single-earner families and dual-earner families with precarious workers or unemployed. Clearly, the under-protectiveness of the Southern European systems of family and social policies plays the crucial role here..

Our meta-analysis did not reveal any precise evidence that the relation between employment uncertainty and fertility has changed over **time**. Unfortunately, it was impossible to detect any temporal pattern in the effect size, since the studies did not differ in the periods covered. The collected works mostly covered the period from the 1990s and, especially, 2000s, when the diffusion of limited-time jobs started to become an issue. The only conclusion that can be made at this point is that no meaningful educational differences in fertility were found across Europe at the turn of the new Millennium.

On average, the effect of employment uncertainty on fertility also changes depending on **parity**. The results from the meta-regressions indicate that impact of limited-time employment on fertility is worse for individuals who already have at least a child, compared to childless individuals. The network meta-analysis confirms this difference, since we did not find any significant effect of unemployment on fertility for parents, compared to the effect of limited-time employment. This means that couples might decide to start a family even with precarious jobs, but a permanent employment is a prerequisite for having more than one child. Our results point out that future research should concentrate on the impact of economic uncertainty not only on the progression to the first child – as it standard practice in this literature – but also to higher order births. This approach is markedly different from economic studies on the same topic, which often conceptualize fertility as a single outcome variable (Del Bono et al., 2012), and therefore do not see fertility choices as a succession of transitions in one's life-course (Kravdal, 2002).

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