Academic Careers and Fertility Decisions

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Abstract. *We investigate how academic promotions affect the propensity of women to have a child. We use administrative data on the universe of female assistant professors employed in Italian universities from 2001 to 2018. We estimate a model with individual fixed effects and find that promotion to associate professor increases the probability of having a child by 0.6 percentage points, which translates into an increase by 15% of the mean. The effect varies by age, geographic area and scientific field. Importantly, the impact of promotion increases to 1 percentage point under the new university recruiting system brought about in 2012 by the Gelmini Reform. This latter result is robust to employing a Regression Discontinuity Design in which we exploit the eligibility requirements in terms of research productivity introduced since 2012 by the Italian National Scientific Qualification (NSQ) as an instrument for promotion to associate professor. Our finding provides important policy implications in that reducing uncertainty on career prospects may lead to an increase in fertility.*

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1. Introduction

Do career prospects affect fertility choices? Researchers have long been concerned with the economic factors driving the decision to have a child, typically looking at such decision as the result of a utility maximization process that takes into account costs and benefits of children, subject to income constraints and individual's preferences (Becker, 1981).[1] Women's fertility decisions interact with those regarding employment as they are the solution of a common constrained maximization problem (Del Boca and Sauer, 2009; Del Boca et al., 2009; Francesconi, 2002; Cigno, 1991; Hotz and Miller, 1988; Moffitt, 1984; Rosenzweig and Wolpin, 1980). On the one hand, better employment prospects, by increasing opportunity costs, reduce fertility. On the other hand, higher income may lead to an increase in fertility. The ambiguity of this relationship (depending on whether the income effect prevails over the substitution effect) is confirmed by the changing correlation between fertility and female labour market participation observed in recent years (Ahn and Mira, 2002).

An important aspect that has been attracting greater attention, especially in explaining the persistently low fertility rates of many advanced countries, is the increased labour market insecurity (Kreyenfeld and Andersson, 2014; Goldstein et al., 2013; Sobotka et al., 2011; McDonald, 2006). As individuals are typically risk averse, higher economic insecurity and more uncertain career prospects might push them to decrease the number of children in order to reduce risk (Ranjan, 1999). There is growing empirical evidence on how economic uncertainty affects fertility decisions. Prior studies have shown a negative impact of aggregate unemployment on fertility (Currie and Schwandt, 2014; Adsera, 2005).[2] Other studies have investigated the impact of unemployment at the individual level, providing evidence of a strong negative effect that is mostly caused by the career shock rather than the income shock induced by unemployment (Huttunen and Kellokumpu, 2016; Del Bono et al., 2015, 2012; Lindo, 2010). Some other works have looked at the fertility consequences of job instability focusing on temporary contracts (Modena and Sabatini, 2012; Vignoli et al., 2012; Santarelli, 2011; De La Rica and Iza, 2005; Ahn and Mira, 2001) or on employment protection (De Paola, Nisticò and Scoppa, 2019; Fahlén and Olah, 2018; Prifti and Vuri, 2013; Bratti et al., 2005; Adsera, 2004).

An alternative reason why the increased economic insecurity may affect fertility is that women might decide to postpone childbearing due to their desire to pursue a career: a higher economic instability might induce people, in particular the young, to defer family formation until they achieve full integration into the labour market. Unsurprisingly, the mean age of women at birth of first child has increased remarkably in most OECD countries, rising from an average of 24 in 1970 to 30 in 2017.[3] A number of recent papers find very relevant child penalties and women might consider these costs in their fertility decisions (see Bertrand, 2018 for a survey). While previous research has documented negative effects of

[1] Previous empirical studies on the determinants of fertility have investigated the effect of the division of work within households (Del Boca et al., 2003; Ichino and Sanz de Galdeano, 2003), of the availability of childcare services (Marenzi and Pagani, 2008; Del Boca, 2002; Chiuri, 2000), and of the cultural variables (Hacker and Roberts, 2017; Kohler, 2000; Friedlander et al. 1991).
[2] See also Inanc (2015), Adsera and Menendez (2011), Adsera (2010) and Meron and Widmer (2002).
[3] In Italy this figure has reached 32 years in 2018.

fertility on a woman's career, little is known on the extent to which promotion affects fertility. The present research aims at filling this gap by addressing how career advancements within academic positions of women employed in the Italian University system affect fertility decisions.

In Italian universities, only 21% of full professors are women, while 36% of associates and 47% of researchers are women. The low representation of women at the top of the hierarchical ladder can be due to many factors, such as differences in productivity, but they may also be related to the fact that promotion procedures favour men rather than women. For example, some previous works examining promotions and pay in the academic labour market show that women suffer a disadvantage in promotions and a within-rank pay gap (Blackaby et al. 2005; Ginther and Kahn 2004; McDowell et al., 1999). Moreover, a number of papers looking at gender differences in career prospects in Italian academia provide evidence of a lower success probability of women compared to men in career advancement (Bagues et al., 2017; De Paola et al., 2017; Jappelli et al., 2017; De Paola and Scoppa, 2015). There is also evidence that the average number of years required for the transition from researcher to associate is greater for women (SIE gender commission, 2016).

Due to domestic responsibilities, which include among others child-rearing and household keeping, women might have less time to perform the research and teaching necessary for advancement (Becker, 1981). Many studies show, in fact, that women do much more household labor than men (e.g. Press and Townsley, 1998; Shelton and John, 1996) and that this extends to academics (Comer and Stites-Doe, 2006; O'Laughlin and Bischoff, 2004; Ward and Wolf-Wendel, 2004; Suitor, Mecom, and Feld, 2001).[4] These delays and difficulties might induce women that want to consolidate their professional position to postpone motherhood with negative consequences on their total fertility rate. This can also lead to involuntary childlessness, also because of the health-related risks associated with delaying entry into motherhood (Beaujouan and Berghammer, 2019; te Velde et al., 2012). The proportion of childlessness among women at the end of their reproductive period has increased dramatically in many OECD countries, especially in Italy where, the fraction of childlessness for those born in 1978 has doubled up (22.5%) with respect to that for women born in 1950 (11.1%).[5]

This paper contributes to the existing research on economic uncertainty and fertility decisions by focusing on the impact of improvements in career prospects, which has been so far overlooked. More specifically, we analyse how the transition from the entering position in the Italian academia ("Researcher") to the position of Associate professor changes the propensity to have children. We use administrative data gathered by the Italian Ministry of Education and from the National Agency for the Evaluation of the University and Research Systems (ANVUR) providing information on both fertility decisions and career

[4] Evidence that the work-family conflict adversely affects women's academic careers is found for instance by Mason et al. (2006) who, using US data, find that women that have children within 5 years of PhD receipt are less likely to have tenure than either men or women who delay or renounce childbirth.

[5] The number of women working in the Italian academia who do not have children is particularly high. According to the report produced by the Gender Commission of the Italian Economic Society (2016), based on a survey proposed in 2014 and 2016 to the members of the Italian Economic Society, about 33.9% of female economists aged above 50 have no children, while this percentage is only 13% for their male counterparts. A similar gap is found also for individuals aged 40-50, with this figure being 32% and 23.4% for women and men, respectively.

advancement. Our investigation relies on two different estimation strategies. The first one considers the whole sample of women hired by an Italian University as researchers starting from 2001 to 2018. For these women we have yearly information both on Compulsory Maternity Leave (which we use as a proxy of fertility decision) and on their career advancements: exploiting the panel structure of our dataset we estimate an individual fixed-effect model that allows us to control for time invariant individual characteristics to investigate the impact of promotion to the position of associate professor on the probability of having a child. The second estimation strategy exploits the eligibility requirements in terms of research productivity imposed by Italian National Scientific Qualification (NSQ) to advance in the academic ladder from assistant to associate professor. This institutional feature allows us to adopt a Fuzzy Regression Discontinuity Design and estimate the causal effect of career advancement on fertility by comparing the propensity to have a child for women who just got the Qualification with that of women who just missed it.

Our empirical analysis shows that women who experience career advancements have a higher probability of having a child. More specifically, we document that promotion to associate professor positions increases the likelihood of child birth of about 0.6 percentage points, which translates into an increase by 15% of the mean. This finding is robust to a battery of checks, including a specification that allows either age or years of experience to enter non-linearly in order to flexibly control for the fact that both promotion and maternity could be related to age or seniority, respectively. Also, the size of the impact remains fairly stable when accounting for scientific field*year fixed effects and when trimming the sample.

We also find that the estimated effect is highly heterogeneous by age, geographic area of the individual's university, scientific field area. In particular, we find that the effect of promotion of fertility decisions is mostly driven by women aged below the median age of 41, women who work in a university which is located in the North of Italy, and women in Engineering and Social Sciences. In addition, we document that the effect is more salient immediately after promotion and gradually vanishes with the number of years from promotion. Furthermore, we find heterogeneous effects depending on whether promotion occurs before or after 2012, i.e. when the recruiting system changed due to the Gelmini Reform. More thoroughly, we show that the effect of promotion is significant (and larger in magnitude) only after 2012, indicating that promotion increases the probability of having a child by 1 percentage point (i.e. by 23% of the mean). Importantly, this result is confirmed when we apply a Fuzzy Regression Discontinuity Design and estimate the impact of promotion by exploiting the requirements for obtaining the National Scientific Qualification. The size of the impact is consistent in magnitude with that obtained using the individual fixed effects model, though the estimates become relatively imprecise.

The paper is organized as follows. In Section 2 we discuss the institutional background. In Section 3 we describe the data we use in the analysis and show some descriptive statistics. In Section 4 we present the results of the effects of promotion on fertility using the individual fixed-effects model. In Section 5 we illustrate the estimates obtained from our alternative estimation strategy based on a Fuzzy Regression Discontinuity Design. Section 6 offers some concluding remarks.

2. Institutional Background

In this section we provide some information on the institutional setting of the Italian Academia. The rules governing careers in Italian universities have changed over time. The sample of individuals we consider was interested by two different systems. According to the first system, before 2012, there were three academic positions: Assistant Professor or Researcher ("Ricercatore"), i.e., the entry level; Associate Professor ("Professore Associato"); Full Professor ("Professore Ordinario"). All three were permanent positions: formally there was a probationary period of 3 years, but tenure was very rarely denied.

In the first system, a university willing to fill a vacancy initiated a competition, and a committee of five members was selected to choose a shortlist of candidates (the so-called "idonei"). Four members out of five were randomly selected (among all the full professors in each field), while one member was appointed by the university opening the vacancy. While in competitions to full professor, candidates were evaluated exclusively on the basis of their CV, and there were no interactions between committee members and candidates, in competitions to associate professor, skills shown by candidates in a teaching lecture were also taken into account. In addition, candidates had to present and discuss with the evaluation committee the methodology and results obtained in their research activity. Once the process was concluded, the university that initiated the competition could decide to appoint one of the winning candidates as professor, while the other could be appointed by another university within three years. This mechanism remained in place until 2011.

In 2012, a new system was introduced, following a major reform of the university system in 2010 (the so-called Gelmini Law). The reform was aimed at increasing transparency and meritocracy through a two-stage procedure: a first stage, in which candidates aiming for promotion to associate or full professor positions are required to qualify in a centralized national competition held at the field level, the so called National Scientific Qualification (NSQ), in which candidates' publications and CVs are evaluated in relation to a field specific minimum standard; and a second stage, in which effective promotions (or new hiring) are managed at the local level by each university.

Obtaining the NSQ is only the first step to get a promotion. In fact, university departments can autonomously choose full and associate professors to hire among individuals who have obtained the NSQ, through an open competition for both internal and external candidates or, alternatively, through a competition limited to internal candidates. Then, the probability of being effectively promoted for individuals who gained the NSQ depends on the number of vacancies opened by university departments, which in turn depends on resources obtained from the central government.

As a consequence of the "Gelmini Reform", since 2012 the entering positions have become temporary with two main types of contracts, "Ricercatore di tipo A" and "Ricercatore di tipo B" with different contractual length but similar teaching duties. The position of "Ricercatore di tipo A" (type-A Researcher) may last for up to 3 years and is temporary, with no career path. The position of "Ricercatore di tipo B" (type-B Researcher) lasts for three years and is a tenure-track position towards Associate Professorship, conditional on the researcher obtaining the National Scientific Qualification as Associate

Professor. In our analysis we do not consider individuals in these temporary positions because we do not have data on their fertility decisions, so we focus on individuals who were hired by an Italian University with a permanent contract in the position of assistant professors starting since 2001. Since we observe these individuals for a period of about 20 years (from 2001 to 2018), we are able to detect any change in their position in the hierarchical ladder.

In this study, we consider the procedure for obtaining the NSQ launched in 2012. We focus on individuals who have already a permanent position as Assistant Professor who apply in the NSQ for the Qualification of Associate Professor. In case of failure to obtain the promotion, they remain at the same level of the academic ladder. Promotion is quite relevant in terms of salary: the yearly gross salary for assistant professors is about €41,000, while it rises to €54,000 for associate professors and about €72,000 for full professors. As regards other aspects, Italian academics have similar obligations and constraints at all the hierarchical levels and carry out similar tasks. However, prestigious positions such as rector, dean, head of department, are open only to full professors.

Italian academia is organized into 14 different scientific areas (e.g., physics, medicine, economics and statistics); each area is in turn divided into different scientific fields (e.g., applied physics, econometrics, private law), for a total of 184 fields. The NSQ is awarded by a committee (specific to each field) of five members, randomly selected from the full professors in each field who have reached some scientific productivity standards and volunteered for the task. Committee members evaluate candidates for both associate and full professor positions and award the NSQ. There are no limits to the number of qualifications awarded in each field. Committees have full autonomy on the criteria to be used in the evaluation, but some criteria were suggested by the Italian Ministry of Education, Universities and Research (MIUR) in relation to the research productivity of candidates in the previous 10 years, as measured by some bibliometric indicators (see Section 4 for details).

3. Data

The analysis of the present project will use administrative data from the universe of women working in Italian universities since 2001 until 2018. The dataset is collected by ANVUR, the Italian National Agency for Evaluation of University and Research, and was provided to us in anonymized form for our empirical analysis at the Laboratory of ANVUR headquarters. The dataset provides detailed information on the academic position covered by each woman in each year, her *Age*, the years since hiring (*Experience*), Compulsory Maternity Leave, the geographical area of the University in which the individual is employed. Data are structured as an individual-year panel data set. Due to the features of our dataset that only provides information on maternity leaves, we will focus exclusively on women aged up to 46.

We build the dependent variable $ChildBirth_{it}$ a dummy equal to one for woman *i* who have a birth at year *t* (and zero otherwise). In our dataset we have available the following variables: age, years of experience (years since hiring in the University), academic position, academic fields (84 “macro-settori”) and university’s geographic areas (North-West, North-East, Center, South, Islands).

The main explanatory variable is *Promotion to Associate Professor*, a dummy equal to one if an individual obtains a promotion in year t (or has obtained a promotion in the past k years).[6] In the second part of our analysis we will use as alternative explanatory variable *Qualification*, a dummy variable taking value one if the individual has been awarded the NSQ in the previous year or earlier (and zero otherwise). The NSQ introduces explicit thresholds in three productivity indicators (e.g., # of publications, # of citations, h-index, etc.) which vary across academic sectors, and scholars have to meet at least two out of three indicators in order to gain the eligibility for career advancements. We will exploit data for the NSQ in 2012 that provide for each candidate the score in each of the three productivity indicators and the outcome of the qualification procedure.

In Table A2 in the Appendix we report some descriptive statistics for the universe of women who were hired by an Italian University as assistant professor in the period from 2001 to 2018 (excluding women who were already Associate and Full Professors in 2001) – whom our individual fixed effects estimates are based on (descriptive statistics for the sample used in the RDD analysis are provided in Table A2). Women included in our sample are on average 40.17 years old (with a minimum of 24 years and a maximum of 46). The vast majority of them have an age ranging from 36 to 46. The probability of having a child is of 4%. About 15% of women who started they career as assistant professor have been promoted to associate professor in the period covered by our data.

4. The Effect of Promotion on Fertility: An Individual Fixed Effects Approach

In this section we investigate the impact of being promoted to the position of associate professor on the fertility decision of women working as assistant professors in Italian Universities. In order to try to handle confounding factors deriving from unobserved heterogeneity, we exploit the panel structure of our dataset (with about 12,000 individuals observed on average for nearly 9 years) and estimate the following model including individual fixed effects:

$$ChildBirth_{it} = \beta_0 + \beta_1 Promotion_{it-k} + \beta_2 X_{it} + \mu_i + \lambda_t + \varepsilon_{it} \quad (1)$$

where the dependent variable is a binary variable $ChildBirth_{it}$ which takes the value of one if the researcher i in the year t had a child and zero otherwise. Among the independent variables, we consider the step variable $Promotion_{it-k}$ which takes the value of one starting from year t in which the researcher has been promoted to a higher position and zero otherwise (for k years). X_{it} is a vector of the candidate's characteristics including age and years of experience. μ_j and λ_t are individual and year fixed effects, respectively. In all the regressions, standard errors are robust to heteroskedasticity and allowed for clustering at the individual level. Unfortunately, we are not able to control for individual scientific productivity. However, by estimating our model with individual fixed effects, we are able to take into account time-invariant heterogeneity in productivity across individuals.

[6] We experiment with different values of k.

We estimate our model on the sample of women who were hired by an Italian University as assistant professor in the period from 2001 to 2018. We exclude women already in a position of Associate or Full Professor in 2001. We also restrict the sample to women under the age of 46, therefore ending up with 11,825 individuals and a total of 101,146 observations, one for each year since hiring.

Results from our individual fixed effects regressions are reported in Table 1. Reading across columns of Table 1, our estimates indicate that promotion to the position of associate professor leads to an increase in the probability of having a child of about 0.6 percentage points, which is statistically significant at the 5 percent level. Results are quite stable across specifications. In column 1 we only control for *Age*, while in column 2 we also include *Age Squared*. The effect remains the same both in terms of magnitude and statistical significance also when we include *Years of Experience* (column 3), year dummies (column 4) and university*year dummies (column 5).

Table 1. The Effect of Promotion on Child Birth. LPM with Individual Fixed Effects

	(1)	(2)	(3)	(4)	(5)
Promotion to Associate Prof.	0.006**	0.006**	0.006**	0.005*	0.006**
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Age	-0.000	-0.002	-0.005	-0.004	-0.004
	(0.000)	(0.003)	(0.003)	(0.003)	(0.003)
Age Sq.		0.000	0.000	0.000	0.000
		(0.000)	(0.000)	(0.000)	(0.000)
Experience (yrs.)			0.002**	0.002*	0.002**
			(0.001)	(0.001)	(0.001)
Individual fixed effects	Yes	Yes	Yes	Yes	Yes
Year fixed effects	No	No	No	Yes	Yes
University*Year fixed effects	No	No	No	No	Yes
Observations	101146	101146	101146	101146	101146
Clusters (Individuals)	11825	11825	11825	11825	11825

Notes: Estimates from individual panel fixed effects regressions are reported in each column. The dependent variable is *Child Birth*. Sample includes all female hired as assistant professors (RU) in Italian Universities after 2001 who are aged up to 46 followed until 2018. Standard errors clustered by individual are reported in parentheses. $^{*}p< 0.10$, $^{**}p< 0.05$, $^{***}p< 0.01$.

In the interest of comparing our main results with the OLS estimates, in Table A3 in the Appendix of the paper we report results from a Linear Probability Model in which we do not control for individual fixed effects. Results obtained when estimating a simple pooled OLS model might be biased due to the fact that women who are more likely to be promoted have peculiar features (for instance, they are characterized by a higher scientific productivity) which might also affect their probability of having a child. If these unobserved features positively affect the probability of both being promoted and having a child, we would expect an upward bias. In contrast, if these unobserved features are negatively correlated to fertility decisions, we will end up with a downward bias. A downward bias would emerge, for instance, if more productive women tend to postpone fertility or decide to have no children at all. This could well be the case if their higher productivity depends on the fact that, being free from duties related to childbearing, they devote more time to research. Estimates reported in Table A3 show that failing to account for individual unobserved heterogeneity leads to an insignificant effect of promotion on fertility when we control for years of experiences (column 3), year dummies (column 4) and university*year dummies (column 5).

Next, we test the robustness of our main results in Table 1 to several checks. To begin, column 1 in Table 2 shows the results obtained from a specification in which instead of controlling for age we include a saturated set of age dummies to flexibly control for the fact that both promotion and maternity could be related to age in a complex non-linear form. Notwithstanding the inclusion of age dummies, the impact of promotion on fertility is unchanged.

Table 2. The Effect of Promotion on Child Birth. Robustness checks

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Using Age dummies	Using Exper. dummies	Adding Field area* Year FE	Adding Field*Year FE	Excluding top 1% Exper.	Excluding bottom 1% Age	Excluding both
Promotion to Associate Prof.	0.006**	0.006**	0.005*	0.006**	0.005*	0.006**	0.005*
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Observations	101146	101146	101146	101146	99664	100122	98640
Clusters (Individuals)	11825	11825	11825	11825	11795	11825	11795

Notes: Estimates from individual panel fixed effects regressions are reported in each column. The dependent variable is *Child Birth*. Sample includes all female hired as assistant professors (RU) in Italian Universities after 2001 who are aged up to 46 followed until 2018. All regressions include individual, year and university*year fixed effects. Standard errors clustered by individual are reported in parentheses. $^{*}p< 0.10$, $^{**}p< 0.05$, $^{***}p< 0.01$.

Second, we redo the same exercise and test whether results hold when replacing the variable *Experience* with the full set of dummies for the number of years of experience. This allows accounting for the fact that both promotion and maternity could be related to seniority in a complex way. Reassuringly, the estimates reported in column 2 of Table 3 are in line with our baseline results both in terms of magnitude and statistical significance.

Third, we augment our main specification by adding field area*year (column 3) or field*year fixed effects (column 4) to account for potential time-varying factors at the level of field area or specific field researcher belong to, respectively.[7] The estimates in columns 3-4 are similar to the baseline results.

Fourth, we carry out a robustness check excluding from our sample women too senior (as captured by years of experience) or too young in age (respectively, top 1% in experience and bottom 1% in age). The estimates in columns 3 to 4 of Table 3 do not change qualitatively with respect to those shown in Table 2. Finally, in column 5 we exclude both at the same time and the results are unchanged.

In Table 3 we investigate whether the effect of promotion on fertility takes place immediately after promotion or in the subsequent years. In column 1 we restrict the sample in order to include only observations within a year after promotion. We find that the probability of having a child increases by 1 percentage point immediately after promotion. In column 2 we consider a period up to three years after

[7] Field areas are 14: Maths, Physics, Chemistry, Earth Science, Biology, Medicine, Agrarian & Veterinarian Sciences, Civil Engineering & Architecture, Industrial & Information Engineering, Philology & Art History, History, Philosophy & Psychology, Law, Economics & Statistics, Political Science & Sociology. Fields (*settori concorsuali*) are 190.

promotion and the impact reduces to an increase of 0.6 percentage points, while it reaches a lower bound of 0.5 percentage points when considering a period up to seven years after promotion (column 3). Finally, in columns 4 and 5 we test whether the impact of promotion on the probability of having a child extends to the two-three years following promotion (column 4) or to the period between four to seven years after promotion (column 5), respectively. As expected, the estimates in columns 4-5 are lower in magnitude than the ones in column 1, though they are not statistically significant at conventional levels. The result showing that the impact of promotion reduces over time might depend on the fact that, since women in our sample are on average 37 years old, the time left for childbearing is limited.

Table 3. The Effect of Promotion on Child Birth. Short versus Long Run Effects

	(1)	(2)	(3)	(4)	(5)
	Up to 1 year from promotion	Up to 3 years from promotion	Up to 7 years from promotion	2 to 3 years after promotion	4 to 7 years after promotion
Promotion to Associate Prof.	0.011***	0.007**	0.006**	0.004	0.003
	(0.004)	(0.003)	(0.003)	(0.004)	(0.004)
Observations	89449	94611	99480	91368	91075
Clusters (Individuals)	11825	11825	11825	11824	11823

Notes: Estimates from OLS regressions are reported in each column. The dependent variable is *Child Birth*. We include individual fixed effects. Sample includes all female hired as assistant professors (RU) in Italian Universities after 2001 who are aged up to 46 followed until 2018. All regressions include individual, year and university*year fixed effects. Standard errors clustered by individual are reported in parentheses. $^{*}p< 0.10$, $^{**}p< 0.05$, $^{***}p< 0.01$.

In Table 4 we estimate our model (the specification with the full set of controls) separately for women aged below and above 40 (i.e. the median age). This permits to compare women who are more similar in terms of age and then as regards the probability of having a child. We find that the effect of promotion on fertility is mainly driven by younger women.

Table 4. The effect of promotion on child birth. Heterogeneous Effects by Age (Above/Below Median)

	(1)	(2)
	Age<=41	Age>41
Promotion to Associate Prof.	0.013***	0.001
	(0.005)	(0.004)
Observations	57348	43798
Clusters (Individuals)	9102	10817
Mean of dependent variable	0.049	0.028

Notes: Estimates from OLS regressions are reported in each column. The dependent variable is *Child Birth*. We include individual fixed effects. Sample includes all female hired as assistant professors (RU) in Italian Universities after 2001 who are aged up to 46 followed until 2018. All regressions include individual, year and university*year fixed effects. Standard errors clustered by individual are reported in parentheses. $^{*}p< 0.10$, $^{**}p< 0.05$, $^{***}p< 0.01$.

This is consistent with the hypothesis that younger women, by facing lower time pressure to have a child, have greater incentives to postpone childbearing in the interest of pursuing a professional career. Thus, according to this prediction, the fertility response to promotion for younger women should be larger than that for older women.[8] In Table 5 we investigate whether effects are heterogeneous according to geographic areas in which university is located. We find that women affected by promotion in their fertility decisions are mainly those working in the North of the country. This might be due to the fact that the income constraint is more binding in a more developed area, where the supply of nurseries and kindergartens are relatively more limited or more expensive.

Table 5. The Effect of Promotion on Child Birth. Heterogeneous Effects by Geographic Area

	(1)	(2)	(3)
	North	Centre	South
Promotion to Associate Prof.	0.012**	-0.001	0.001
	(0.005)	(0.005)	(0.005)
Observations	46676	22931	32539
Clusters (Individuals)	5305	2743	3777
Mean of dependent variable	0.055	0.025	0.029

Notes: Estimates from OLS regressions are reported in each column. The dependent variable is *Child Birth*. We include individual fixed effects. Sample includes all female hired as assistant professors (RU) in Italian Universities after 2001 who are aged up to 46 followed until 2018. All regressions include individual, year and university*year fixed effects. Standard errors clustered by individual are reported in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

In Table 6 we verify if the impact of promotion on fertility is heterogeneous across macro-fields (Natural Sciences, Medicine & Agrarian/Veterinarian Sciences, Engineering, Humanities and Social Sciences). Results in Table 7 show that the promotion differentially affects the fertility decisions of women across macro-fields.

Table 6. The Effect of Promotion on Child Birth. Heterogeneous Effects by macro-field

	(1)	(2)	(3)	(4)	(5)
	Natural Sciences	Medicine & Agr./Vet. Sciences	Engineering	Humanities	Social Sciences
Promotion to Associate Prof.	-0.008	0.019	0.030**	0.004	0.016*
	(0.010)	(0.014)	(0.014)	(0.011)	(0.010)
Observations	23279	15286	8389	15866	17694
Clusters (Individuals)	3208	2329	1208	2456	2624
Mean of dependent variable	0.040	0.042	0.045	0.031	0.042

Notes: Estimates from OLS regressions are reported in each column. The dependent variable is *Child Birth*. We include individual fixed effects. Sample includes all female hired as assistant professors (RU) in Italian Universities after 2001 who are aged up to 46 followed until 2018. All regressions include individual, year and university*year fixed effects. Standard errors clustered by individual are reported in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

In particular, we find that the effect is significant only in Engineering and Social Sciences, with the coefficient being two times as large (3 percentage points) in Engineering than in the Social Sciences (1.6 percentage points). Moreover, we test whether the effect varies depending on the academic field being a

[8] Note that in our sample the average age at promotion is 43.

bibliometric versus non-bibliometric one, and we find similar effects (results not shown).[9]

Finally, Table 7 reports the estimated effect of promotion on child birth depending on whether promotion took place in the period before 2012, i.e., during the old recruiting system, or in the period starting from 2012 when promotion is regulated by the Gelmini Reform. According to our data, the percentage of women who got promoted during the old regime (i.e. before 2012) is 11%, while this figure increases to 21% during the new regime (i.e. since 2012). Results in Table 6 highlight that the effect of promotion is larger in the more recent period, i.e., under the new regime regulating career advancements in the Italian academia. This seems to point towards the conclusion that reforms aimed at reducing uncertainty on career prospects can ultimately increase fertility.

Table 7. The Effect of Promotion on Child Birth. Heterogeneous Effects by University Regulation

	(1)	(2)
	Promotion under old regime (pre-2012)	Promotion under new regime (post-2012)
Promotion to Associate Professor	0.003	0.010**
	(0.003)	(0.005)
Observations	63366	80514
Clusters (Individuals)	10582	9658
Mean of dependent variable	0.032	0.044

Notes: Estimates from OLS regressions are reported in each column. The dependent variable is *Child Birth*. We include individual fixed effects. Sample includes all female hired as assistant professors (RU) in Italian Universities after 2001 who are aged up to 46 followed until 2018. All regressions include individual, year and university*year fixed effects. Standard errors clustered by individual are reported in parentheses. $^{*}p< 0.10$, $^{**}p< 0.05$, $^{***}p< 0.01$.

5. The Effect of Qualification on Fertility: A Fuzzy Regression Discontinuity Approach

In this section we investigate the impact of improved career prospects on women fertility decisions using an alternative identification strategy which exploits the eligibility requirements in terms of research productivity imposed by the Italian National Scientific Qualification (NSQ) to advance in the academic ladder to positions for associate and full professor. As explained in Section 3, currently in order to get promoted to associate and full professors, candidates need first to obtain a National Scientific Qualification (NSQ), awarded by a national committee who consider candidates' publications and CVs in relation to a field-specific minimum standard.

Obtaining the NSQ is only the first step to get promotion. In fact, university departments can autonomously choose full and associate professors to hire among individuals who have obtained the NSQ, through an open competition for both internal and external candidates or, alternatively, through a competition limited to internal candidates. Then, the probability of being effectively promoted for

[9] Bibliometric fields include mathematics, physics, chemistry, earth sciences, biology, medicine, agricultural and veterinary sciences, civil engineering and architecture, industrial and information engineering, and psychology.

individuals who gained the NSQ depends on the number of vacancies opened by university departments, which in turn depends on resources obtained from the central government.

To award the qualification, the committee members in each scientific field first consider three measures of candidates' scientific productivity (in the 10 years preceding the evaluation) in relation to some field specific cut-offs (defined on the basis of the median values of these measures in the target position). In bibliometric (mainly scientific) fields, the productivity indicators used are: (1) the number of articles published in scientific journals, (2) the total number of citations, and (3) the h-index. In non-bibliometric fields (social sciences and humanities), the indicators are: (1) the number of articles published in scientific journals, (2) the number of articles published in high-quality journals, and (3) the number of books.

The fact that Italian researchers have to meet at least two out of three productivity thresholds to qualify for associate and full professor allows us to employ a Fuzzy Regression Discontinuity Design and exploit the discontinuity in the likelihood of being awarded the qualification when two out of three indicators are equal or above the relative thresholds. Then, we estimate the causal effect of *Promotion* on fertility by comparing the likelihood to have a child for women who just achieve and just miss the qualification. In this way, any jump in fertility in proximity of the cut-off point of productivity indicators can be interpreted as evidence of a treatment effect.[10]

Following most of the papers in the literature, we use a parametric approach. Formally, we estimate the following first-stage equation:

$$Promotion_{it} = \alpha_0 + \alpha_1 Above_{it} + \sum_{m=1}^{3} \delta_m f(distance_{itm}) + \alpha_2 X_{it} + \mu_j + \gamma_u + \lambda_t + \varepsilon_{it} \qquad (2)$$

where $Above_{it}$ is a dummy variable equal to one when at least 2 of the 3 indicators are above (or equal) the relative thresholds, $f(distance_{itm})$ are three flexible functions of the distance of each *m* running variable (individual productivity indicator) from its respective cut-off, X_{it} is a vector of individual characteristics (e.g. age, seniority) and μ_j, γ_u, λ_t are dummies for scientific fields, university and year, respectively. ε_{it} is an error term. We will allow standard errors for clustering at the individual level.

Then, we use the discontinuity in the probability of achieving the qualification as an instrumental variable in the following second-stage equation:

$$Fertility_{it} = \beta_0 + \beta_1 \widehat{Qualification}_{it-k} + \sum_{m=1}^{3} \delta_m f(distance_{itm}) + \beta_2 X_{it} + \mu_j + \gamma_u + \lambda_t + \varepsilon_{it} \qquad (3)$$

where β_1 is the local average treatment effect (LATE) of being awarded the NSQ on the subsequent propensity to have a child.

We estimate our model on the universe of female assistant professors who have applied for the Associate Professor Qualification at the NSQ in 2012. We apply the same restrictions discussed in Section

[10] For a similar strategy exploiting the discontinuity in productivity indicators from ASN to analyse a different outcome (productivity after promotion) see Nieddu and Pandolfi (2018).

3 and focus exclusively on women aged up to 46, thus ending up with a sample of 3,949 individuals and 19,260 observations. As shown in Table A3 in the Appendix, women included in this sample are on average 41.74 years old with the majority of them being older than 41 (67%). The probability of having a child is of 5% (higher compared to the probability of 4% observed on the full sample, see Table A2 in the Appendix). About 87% of them have a scientific productivity above the cutoff point for being considered for the National Scientific Qualification, about 69% of them have obtained the Qualification as Associate Professor (this percentage rises to 80% among those whose productivity is above the threshold). On the other hand, only 23% of women applying for the NSQ have been effectively promoted to the position of Associate Professor.

In Table 8 panel B we report First Stage estimation results in which the dummy *Promotion* is used as a dependent variable in relation to the dummy *Above 2/3 cutoffs* for passing 2 out of 3 productivity thresholds. Controlling for the distance from the three different cut-offs, having met at least two of them strongly determines the probability of obtaining the NSQ. More precisely, individuals who met at least two of the three productivity thresholds have a higher probability of promotion of about 12 to 16 percentage points (the first-stage F-statistics is 88.08 in our most demanding specification in column 6).[11]

Table 8: The Effect of Promotion On Child Birth. 2SLS results

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Two Stage Least Square Estimates						
Promotion to Associate Professor	0.047	0.034	0.032	0.031	0.032	0.009
	(0.045)	(0.042)	(0.042)	(0.043)	(0.050)	(0.052)
Panel B: First Stage Estimation Results						
Above 2/3 cutoffs	0.145***	0.158***	0.157***	0.152***	0.144***	0.122***
	(0.013)	(0.014)	(0.014)	(0.014)	(0.014)	(0.013)
First-stage F statistic	120.50	122.54	120.96	114.05	114.05	88.08
Field dummies	Yes	Yes	Yes	Yes	Yes	Yes
University dummies	No	No	No	No	Yes	Yes
Year dummies	No	No	No	No	No	Yes
Observations	19260	19260	19260	19260	19260	19260
Clusters (Individuals)	3949	3949	3949	3949	3949	3949

Notes: Estimates from 2SLS regressions are reported in each column. In the Second Stage the dependent variable is *Child Birth*. In the First Stage the dependent variable is *Promotion*. Sample includes all female assistant professors (RU) in Italian Universities as for 2012 who are aged up to 46. Standard errors clustered by individual are reported in parentheses. $^{*}p< 0.10$, $^{**}p< 0.05$, $^{***}p< 0.01$.

In panel A of Table 8 we report results from the Two-Stage Least Squares estimation approach. In column 1 we include field dummies and the distance from the three different cut-offs but do not control for individual covariates and find that promotion leads to an increase in the probability of having a child of about 4.7 percentage points. Adding age (column 2), age squared (column 3), experience (column 4), and

[11] In Table A4 in the Appendix we report reduced form estimates. Also in this case results are in line with those discussed above. As expected the magnitude of the effects is smaller.

university fixed effects (column 5) reduces the effect to 3 percentage points. When adding year fixed effects (column 6) the magnitude of the estimated coefficient further reduces to 0.9 percentage points. Importantly, this latter coefficient is very similar to that in column 2 of Table 7 (1 percentage point) for women who got promoted under the new regime that considers the NSQ as a pre-requisite, though it is not statistically significant at conventional levels, likely because of the reduced sample size (19260 versus 80514 observations). This seems to suggest that our individual fixed effects estimates are unlikely biased by unobservable factors that change over time and that affect both career advancements and fertility, thus increasing our confidence in the findings discussed above.

6. Concluding Remarks

It is well documented that the shortfall of women in top academic positions is at least partially due to a family-work conflict since these jobs entail high effort and time which are incompatible with family related necessities. This conflict seems to induce many women to either sacrifice family or career.

While many papers have documented negative effects of fertility on a woman's career, we took a different approach by looking at the impact of improved career prospects on the decision to have a child. To this purpose, we use administrative data on the universe of female Assistant Professors employed in Italian universities from 2001 to 2018 and estimate an individual fixed effects model to capture the effect of promotion to Associate Professor on fertility. Our results document that promotion to associate professor increases the probability of having a child by 0.6 percentage points, which translates into an increase by 12.5% of the mean.

The effect of promotion on fertility could be determined by a higher income available (the promotion determines an increase of about 35% of the disposable income): this is in line with the findings of Modena, Rondinelli and Sabatini (2013) that show that 40-50% of Italian couples were discouraged to have (more) children because of an insufficient income.

An alternative explanation for the positive effect of promotion we find in the present analysis could be the following: during the phase of assistant professorship, women postpone fertility – since having children is very time consuming – and devote their time and energy to scientific research in order to increase their scientific productivity and raise their probability of promotion. Once they are promoted, they have the possibility to have (more) children minimizing negative effects on their careers.

The estimated effect of promotion on fertility is robust to many robustness checks, including a specification that allows either age or years of experience to enter non-linearly in order to flexibly control for the fact that both promotion and maternity could be related to age or seniority, respectively. In addition, we document that the effect mainly occurs immediately after promotion and gradually vanishes with the number of years from promotion. Also, we find that the impact of promotion is higher for women aged below the median of 41, for those who work in a university which is located in the North of Italy, and for those in who work in Engineering and in the Social Sciences. Furthermore, we find that the impact is stronger under the new university regulation that, starting from 2012, considers the NSQ as a pre-requisite for career advancements. In particular, we show that promotion to associate professor under the new regime increases the likelihood of having a child by 1 percentage point.

Our empirical analysis shows positive effects of promotion also when using a Fuzzy Regression Discontinuity Design in which we exploit the eligibility requirements in terms of research productivity introduced since 2012 in the system regulating career advancement in Italian academia. In this econometric framework the degree of credibility of our identification strategy is increased since we are able to compare the fertility behavior of very similar women: those who just pass the NSQ productivity thresholds and those who just miss them. We find that women who got promoted to Associate Professor have a 0.9 percentage point higher probability of having a child, though the effect is imprecisely estimated due to the reduced sample size. This effect is very similar in magnitude to the one obtained when looking at promotion since 2012 using individual fixed effects regression analysis, suggesting that our main results are unlikely driven by omitted variable bias.

Our findings suggest that policies aimed at improving women career prospects are important not only to increase productivity and enhance equal opportunities but also to help increasing fertility. This could be very important for all OECD countries currently plagued by very low fertility rates.

References

Adsera, A. (2004). Changing fertility rates in developed countries: The impact of labour market institutions, *Journal of Population Economics*, 17(1): 1-27.

Adsera, A. (2005). Vanishing children: From high unemployment to low fertility in developed countries, *American Economic Review, Papers and Proceedings* 95(2): 189-193.

Adsera, A. (2010). Where are the babies? Labor market conditions and fertility in Europe, *European Journal of Population*, 27(1): 1-32.

Adsera, A., Menendez, A. (2011). Fertility changes in Latin America in the context of economic uncertainty. *Population Studies*, 65(1): 37-56.

Ahn, N., Mira, P. (2001). Job bust, baby bust? Evidence from Spain, *Journal of Population Economics*, 14: 505-521.

Ahn, N., Mira, P. (2002). A note on the changing relationship between fertility and female employment rates in developed countries. *Journal of Population Economics*, 15: 667-682.

Bagues, M., Sylos-Labini, M., Zinovyeva, N. (2017). Does the Gender Composition of Scientific Committee Matter? *American Economic Review*, 107(4): 1207-1238.

Beaujouan, E., Berghammer, C. (2019). The Gap between Lifetime Fertility Intentions and Completed Fertility in Europe and the United States: A Cohort Approach. *Population Research and Policy Review*, 38(4): 507-535.

Becker, G. (1981). *A treatise on the family. Cambridge*, MA, USA: Harvard University Press.

Bertrand, M. (2018). Coase Lecture–The Glass Ceiling. *Economica*, 85(338), 205-231.

Blackaby, D., Booth, A., Frank, J. (2005). Outside Offers and the Gender Pay Gap: Empirical Evidence from the UK Academic Labour Market, *The Economic Journal*, 115(501): F81-F107.

Bratti M., Del Bono E., Vuri, D. (2005). New mothers'labour force participation in Italy: The role of job characteristics, LABOUR, 19 (1): 79-121.

Chiuri, M. (2000). Quality of child care and household labour supply in Italy, *Labour*, 14: 97-118.

Cigno, A. (1991). Economics of the family. Oxford University Press, Oxford.

Comer, D., Stites-Doe, S. (2006). Antecedents and consequences of faculty women's academic-parental role balancing. *Journal of Family and Economic Issues*, 27, 495–512.

Currie, J., Schwandt, H. (2014). Short- and long-term effects of unemployment on fertility, *Proceedings of the National Academy of Sciences*, 111(41): 14734-14739.

De la Rica, S., Iza, A. (2005). Career planning in Spain: Do fixed-term contracts delay marriage and parenthood? *Review of the Economics of the Household*, 3:49-73.

De Paola, M., Nisticò, R., Scoppa, V. (2020). Fertility Decisions and Employment Protection: Evidence from the Italian Jobs Act Reform. IZA Discussion Paper No. 12991.

De Paola, M., Ponzo, M., Scoppa, V. (2017). Gender Differences in the Propensity to Apply for Promotion: Evidence from the Italian Scientific Qualification. *Oxford Economic Papers*, 69(4): 986-1009.

De Paola, M., Scoppa, V. (2015). Gender Discrimination and Evaluators' Gender: Evidence from Italian Academia. *Economica*, 82 (325): 162-188.

Del Boca, D. (2002). The effects of child care and part time on the participation and fertility decisions of married women. *Journal of Population Economics*, 15(3): 549–573.

Del Boca, D., Locatelli, M., Vuri, D. (2005). Child care choices of Italian households. *Review of Economics of the Household*, 3: 453–477.

Del Boca, D., Pasqua, S., & Pronzato, C. (2009). Motherhood and market work decisions in institutional context: A European perspective. *Oxford Economic Papers*, 61(Suppl 1), i147–i171.

Del Boca, D., & Sauer, R. (2009). Life cycle employment and fertility across institutional environments. *European Economic Review*, 53(3): 274-292.

Del Bono, E., Weber, A., Winter-Ebmer, R. (2015). Fertility and Economic Instability: The Role of Unemployment and Job Displacement, *Journal of Population Economics*, 28(2): 463–478.

Del Bono, E., Weber, A., Winter-Ebmer, R. (2012). Clash of Career and Family: Fertility Decisions after Job Displacement, *Journal of the European Economic Association*, 10(4): 659–683.

Fahlén, S., Oláh, L. (2018). Economic uncertainty and first-birth intentions in Europe. Demographic Research, 39(28): 795-834.

Francesconi, M. (2002). A Joint Dynamic Model of Fertility and Work of Married Women, *Journal of Labor Economics*, 20: 336-380.

Friedlander D., Schellekens J., and Ben-Moshe E. (1991), The Transition from High to Low Marital Fertility: Cultural or Socioeconomic Determinants? *Economic Development and Cultural Change*, 39(12), 331-351.

Ginther, D. K., Kahn, S. (2004). Women in Economics: Moving Up or Falling Off the Academic Career Ladder? *Journal of Economic Perspectives*, 18(3): 193-214.

Goldstein, J., Kreyenfeld, M., Jasilioniene, A., Örsal D. D. K. (2013). Fertility Reactions to the Great Recession in Europe: Recent Evidence from Order-Specific Data, *Demographic Research,* 29: 85-104.

Hacker J., Roberts, E. (2017). The impact of kin availability, parental religiosity, and nativity on fertility differentials in the late 19th-century United States, *Demographic research*, 37(34), 1049–1080.

Hotz, V. J., Miller, R. A. (1988). An Empirical Analysis of Life Cycle Fertility and Female Labor Supply, *Econometrica*, 56: 91-11.

Huttunen, K., Kellokumpu, J. (2016). The effect of job displacement on couples' fertility decisions, *Journal of Labor Economics*, 34(2): 403-42.

Ichino, A., Sanz-de-Galdeano, A. (2005). Reconciling motherhood and work: Evidence from time use data in three countries. In D. S. Hamermesh& G. A. Pfann (Eds.), *The economics of time use* (pp. 263–288). Elsevier: Amsterdam.

Inanc, H. (2015). Unemployment and the timing of parenthood: implications of partnership status and partner’s employment, *Demographic Research*, 32(7): 219-250.

Jacobs, J., Winslow, S. E. (2004). Overworked faculty: Jobs, stresses, and family divides. *Annals of the American Academy of Political and Social Science*, 496, 104–129.

Jappelli, T., Nappi, C. A., Torrini, R. (2017). Gender Effects in Research Evaluation. *Research Policy*, 46: 911-924.

Kohler, H. (2000), Fertility decline as a coordination problem, *Journal of Development Economics*, 63(2), pp. 231-263.

Kreyenfeld, M., Andersson, G. (2014). Socioeconomic differences in the unemployment and fertility nexus: Evidence from Denmark and Germany, *Advances in Life Course Research*, 21: 59-73.

Lindo, J. (2010). Are children really inferior goods? Evidence from displacement-driven income shocks, *Journal of Human Resources*, 45(2): 301-27.

Marenzi, A., Pagani, L. (2008). The labor market participation of Sandwich Generation Italian women, *Journal of Family and Economic Issues*, 29(3): 427-444.

Mason, M., Goulden, M., Wolfinger, N. H. (2006). Babies matter: Pushing the gender equity revolution forward. In S. J. Bracken, J. K. Allen, & D. R. Dean (Eds.), The balancing act: Gendered perspectives in faculty roles and work lives (pp. 9 –29). Sterling, VA: Stylus.

McDonald, P. (2006). Low fertility and the state: The efficacy of policy. *Population and Development Review,* 32(3): 485-510.

McDowell, J. M., Singell, L. D., Ziliak, J. P. (1999). Cracks in the Glass Ceiling: Gender and Promotion in the Economics Profession. *American Economic Review*, 89(2): 392-396.

Meron, M., Widmer, I., Shapiro, D. (2002). Unemployment leads women to postpone the birth of their first child, *Population,* 57(2): 301-330.

Modena, F., Rondinelli, C., Sabatini, F.. (2013). Economic Insecurity and Fertility Intentions. The Case of Italy, *Review of Income and Wealth*, 60(1): 233-255.

Modena, R., Sabatini, F. (2012). I would if I could: Precarious employment and childbearing intentions in Italy. *Review of Economics of the Household*, 10(1): 77–97.

Moffitt, R. (1984). Profiles of Fertility, Labour Supply and Wages of Married Women: A Complete Life-Cycle Model, *Review of Economic Studies*, 51: 263-78.

Nieddu, M., Pandolfi, L. (2018). The Effectiveness of Promotion Incentives for Public Employees: Evidence From Italian Academia. CSEF Working Paper, 507.

O'Laughlin, E., Bischoff, L. G. (2004). Balancing parenthood and academia: Work/family stress as influenced by gender and tenure status. *Journal of Family Issues*, 26, 79–106.

Press, J. E., Townsley, E. (1998). Wives' and Husbands' Housework Reporting: Gender, Class, and Social Desirability. *Gender and Society*, 12(2), 188-218.

Prifti, E., Vuri, D. (2013). Employment protection and fertility: Evidence from the 1990 Italian reform. *Labour Economics*, 23: 77-88.

Ranjan, P. (1999). Fertility behavior under income uncertainty. *European Journal of Population*, 15(1): 25-43.

Rosenzweig, M., Wolpin K. I. (1980). Life-Cycle Labor Supply and Fertility: Casual Inferences From Household Models, *Journal of Political Economy*, 88: 328-348.

Santarelli, E. (2011). Economic resources and the first child in Italy: A focus on income and job stability, *Demographic Research*, 25(9): 311-336.

Shelton, B., John, D. (1996). The Division of Household Labor. *Annual Review of Sociology*, 22, 299-322.

Sobotka, T., Skirbekk, V., Philipov, D. (2011). Economic recession and fertility in the developed world, *Population and Development Review*, 37(2): 267–306.

Suitor, J., Mecom, D., Feld, I. S. (2001). Gender, household labor, and scholarly productivity among university professors. *Gender Issues*, 19, 50–67.

te Velde, E., Habbema, D., Leridon, H., Eijkemans, M. (2012). The effect of postponement of first motherhood on permanent involuntary childlessness and total fertility rate in six European countries since the 1970s. *Human Reproduction*, *27*(4), 1179–1183.

Vignoli, D., Drefahl, S., De Santis, G. (2012). Whose job instability affects the likelihood of becoming a parent in Italy? A tale of two partners, *DemographicResearch*, 26(2): 41-62.

Ward, K., Wolf-Wendel, L. (2004). Academic motherhood: Managing complex roles in research universities. *Review of Higher Education*, 27, 233–257.

Appendix

Table A1. Descriptive Statistics – Individual Fixed Effects Approach

	Mean	SD	Min	Max
Child birth	0.04	0.20	0	1
Promotion to Associate Professor	0.15	0.35	0	1
Age	40.17	4.15	24	46
Aged 24 to 30	0.02	0.12	0	1
Aged 31 to 35	0.14	0.34	0	1
Aged 36 to 40	0.33	0.47	0	1
Aged 41+	0.52	0.50	0	1
Experience (yrs.)	6.05	4.16	0	25
Years from promotion	0.56	1.70	0	16
North	0.46	0.50	0	1
Centre	0.22	0.41	0	1
South	0.32	0.47	0	1

Source: ANVUR. Sample: only women; aged<=46; Assistant Professor in 2001 or later (we exclude women who were already Associate and Full Professors in 2001). Total Observations (individual*year): 101,146; Individuals: 11,825.

Table A2. Descriptive Statistics – Fuzzy Regression Discontinuity Approach

	Mean	SD	Min	Max
Child birth	0.05	0.22	0	1
Promotion to Associate Professor	0.23	0.42	0	1
Qualified as Associate Professor	0.69	0.46	0	1
Above 2/3 cutoffs	0.87	0.34	0	1
Distance from cutoff (Indicator 1)	5.35	16.11	-51	503.08
Distance from cutoff (Indicator 2)	15.21	34.97	-69.71	959.16
Distance from cutoff (Indicator 3)	1.97	3.65	-12	39
Age	41.74	3.22	29	46
Aged 24 to 30	0.001	0.02	0	1
Aged 31 to 35	0.04	0.20	0	1
Aged 36 to 40	0.28	0.45	0	1
Aged 41+	0.67	0.47	0	1
Experience (yrs.)	7.95	3.52	0	24
North	0.53	1.14	0	6
Centre	0.49	0.50	0	1
South	0.20	0.40	0	1

Source: ANVUR. Sample: only women, aged<=46, Assistant Professor in 2012 followed in subsequent years (we exclude women who were already Associate and Full Professors in 2012). Total Observations (individual*year): 19,260; Individuals: 3, 949.

Table A3. The Effect of Promotion on Child Birth. Linear Probability Model (LPM)

	(1)	(2)	(3)	(4)	(5)
Promotion to Associate Prof.	0.008***	0.008***	0.003	0.003	-0.001
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Age	-0.003***	-0.000	-0.001	-0.005	-0.006**
	(0.000)	(0.003)	(0.003)	(0.003)	(0.003)
Age Sq.		-0.000	-0.000	-0.000	0.000
		(0.000)	(0.000)	(0.000)	(0.000)
Experience (yrs.)			0.002***	0.000*	0.000
			(0.000)	(0.000)	(0.000)
Field dummies	Yes	Yes	Yes	Yes	Yes
Year dummies	No	No	No	Yes	Yes
University*Year dummies	No	No	No	No	Yes
Observations	101146	101146	101146	101146	101146
Clusters (Individuals)	11825	11825	11825	11825	11825

Notes: Estimates from OLS regressions are reported in each column. The dependent variable is *Child Birth*. Sample includes all female hired as assistant professors (RU) in Italian Universities after 2001 who are aged up to 46 followed until 2018. Standard errors clustered by individual are reported in parentheses. *$p< 0.10$, **$p< 0.05$, ***$p< 0.01$.

Table A4. The Effect of Scientific Qualification on Child Birth. Reduced-Form Results

	(1)	(2)	(3)	(4)	(5)	(6)
Above 2/3 cutoffs	0.007	0.005	0.005	0.005	0.002	0.001
	(0.007)	(0.007)	(0.007)	(0.007)	(0.006)	(0.006)
Distance from cutoff (Indicator 1)	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Distance from cutoff (Indicator 2)	0.000	0.000*	0.000*	0.000*	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Distance from cutoff (Indicator 3)	0.001	0.000	0.000	0.000	-0.000	-0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Age		-0.003***	0.023*	0.020*	0.021*	0.018
		(0.001)	(0.012)	(0.012)	(0.011)	(0.011)
Age Sq.			-0.000**	-0.000**	-0.000**	-0.000**
			(0.000)	(0.000)	(0.000)	(0.000)
Experience (yrs.)				0.002***	0.002***	0.001**
				(0.001)	(0.001)	(0.001)
Field FEs	Yes	Yes	Yes	Yes	Yes	Yes
University FEs	No	No	No	No	Yes	Yes
Year FEs	No	No	No	No	No	Yes
Observations	19260	19260	19260	19260	19260	19260
Clusters (Individuals)	3949	3949	3949	3949	3949	3949

Notes: Estimates from reduced-form regressions are reported in each column. Sample includes all female assistant professors (RU) in Italian Universities as for 2016 who are aged up to 46. Dependent variable is a dummy indicating whether the individual has a child birth. Standard errors clustered by individual are reported in parentheses. *$p< 0.10$, **$p< 0.05$, ***$p< 0.01$