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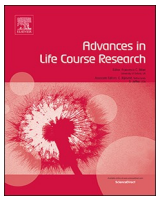

The impact of job uncertainty on first-birth postponement

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ABSTRACT

This paper aims to advance our understanding of entry into employment with uncertain conditions in Italy and its causal impact on the onset of the fertility process. We adopt the potential outcome approach to causal inference so as to quantify the net effect of having a first job with a temporary or a permanent contract on the propensity to have a first child within the first five years of employment. The analysis is based on retrospective data from the nationally representative 2009 Family and Social Subjects survey. Our results suggest that 7% of potential first-birth postponement among women and 5% of potential postponement among men is attributable to jobs with uncertain conditions. These individuals would have had a first child if they had had a permanent job. For women, potential postponement is elevated among those with higher education (reaching 16%), while for men potential postponement is especially visible among those with low and medium education. With this paper we quantify a non-negligible negative effect for early exposure to labour market uncertainties on potential first-birth postponement in Italy.

1. Introduction

The relationship between economic conditions and fertility is a topic of public interest. Rising economic uncertainty is a characteristic of the globalizing world, as a result of deregulation, internationalization, and delocalization (Blossfeld & Hofmeister, 2006; Blossfeld, Mills, & Bernardi, 2006). Economic uncertainty means a lack of clarity about future economic prospects (Bloom, 2014), which – in economic terms – means unknown probability distributions to possible outcomes (Beckert, 1996). In this paper, we view economic uncertainty as an individual risk factor, mainly related to spells of labour market uncertainty (e.g. unemployment, short-term contract jobs or a combination of these; Kreyenfeld, Andersson, & Pailhe, 2012; Mills & Blossfeld, 2013). Life-course circumstances characterized by precarious employment spells translate into a feeling of economic uncertainty for individuals because these jobs often bring with them economic penalties and uncertain futures (Scherer, 2009; Standing, 2011). In contemporary Europe, the spread of jobs with uncertain conditions is considered as a primary force behind the postponement of childbearing and the elimination of higher-parity births (Kreyenfeld et al., 2012; Mills & Blossfeld, 2013; Philipov, 2002). The social, economic, and demographic implications of persistently low fertility rates are largely known: the population age structure is impaired, something which puts the whole welfare system under pressure and affects the rules governing inter-generational transfers.

A number of macro-level studies have shown that adverse economic conditions, often measured by national unemployment rates, are associated with a decline in total fertility (Adsera, 2004, 2011; Goldstein, Kreyenfeld, Jasilioniene, & Orsal, 2013; Matysiak, Sobotka, & Vignoli, 2017; Sobotka, Skirbekk, & Philipov, 2011). There is the idea that macro-level economic downturns translate into micro-level perceptions of economic uncertainty, which may discourage people from having children. Kohler, Billari, and Ortega (2002), who pioneered the literature on economic uncertainty and low fertility in Europe, argued that couples in the lowest-low fertility countries have limited their childbearing due to economic uncertainty. Evidence at the micro level gives, instead, conflicting messages, ranging from positive to negative (Adsera, 2004; Barbieri, Bozzon, Scherer, Grotti, & Lugo, 2015; Edin & Kefalas, 2005; Hofmann, Kreyenfeld, & Uhlendorff, 2017; Kreyenfeld, 2010, 2015; Kreyenfeld et al., 2012; Özcan, Mayer, & Luedicke, 2010; Pailhé & Solaz, 2012; Sobotka et al., 2011; Vignoli, Drefahl, & De Santis, 2012).

There are various sources for these heterogeneous findings. First, most previous research focused on unemployment as an indicator of employment uncertainty (see Kreyenfeld, 2015; Matysiak & Vignoli, 2008 for a review), disregarding other factors, such as precarious work contracts (Kurz, Steinhage, & Golsch, 2005; Liefbroer, 2005; Noguera, Castro Martin, & Bonmati, 2005). Second, group-specific analyses and explanations have often been neglected, but the implicit underlying assumption that people are all equally vulnerable to employment uncertainty is both logically and empirically tenuous (Kreyenfeld, 2010). For instance, we might reasonably expect that the effect of employment

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uncertainty on fertility varies according to educational qualifications, though, this is still an under-investigated question. Third, previous research has concentrated on the *statistical significance* and the *direction* of the effect of employment uncertainty on fertility, largely disregarding the *magnitude* of the effect in question (with exceptions: Del Bono, Weber, & Winter-Ebmer, 2012; Del Bono, Weber, & Winter-Ebmer, 2015; Hofmann et al., 2017; Raymo & Shibata, 2017).

The aim of the present work is to advance our understanding of entry into employment with uncertain conditions in Italy and its *causal* impact on the onset of the fertility process. An individual's life course should not be considered as an arbitrary chain of events. Rather, as experiences follow upon one another, people are increasingly directed into given trajectories, and some options becomes less likely than others (Dannefer, 2003; Keizer, Dykstra, & Jansen, 2008; Mynarska, Matysiak, Rybińska, Tocchioni, & Vignoli, 2015). Hence, the entry into first employment represents a crucial life course step, as early career exposure to temporary employment may have long-term negative consequences for employment prospects (Barbieri & Scherer, 2009) and private life (Scherer, 2009). Labour market positions and transitions at a given point in time depend on previous circumstances, and may lead to path dependency, which has been shown to affect fertility intentions (Busetta, Mendola, & Vignoli, 2019) and fertility behaviour (Ciganda, 2015; Özcan et al., 2010; Pailhé & Solaz, 2012). Given this state-of-affairs, postponing parenthood during the first job may, in turn, affect completed fertility because of the limited time interval left for second or higher order births. Delaying entry into parenthood may, in some cases, also lead to involuntary childlessness.

In Italy flexible and temporary contractual forms have become, by European standards, particularly common, over the last decades. These contracts offer very limited guarantees for workers and are offered almost exclusively to the young, whose traditionally high unemployment has not, in the meantime, declined significantly (Barbieri, 2011). The link between employment uncertainty and fertility choices should be conceptualized as a succession of transitions in one's life-course (Kravdal, 2002; Kreyenfeld & Andersson, 2014). Here, we focus on a specific segment of the transition to adulthood of Italians – namely, the entry into employment and the progression to first birth. The first employment experience represents, naturally, a life-changing event in Italy's latest-late transition to adulthood (Billari & Rosina, 2004). Young adults in Italy tend to remain in the parental home, where they receive considerable psychological and material solidarity from parents, until they find a stable and secure job and are thus "prepared" to establish their own family. This "delay syndrome" – using an expression favoured by Livi Bacci (2001) – is now exacerbated by labour market changes, in which the first job is less likely to be based on an open-ended contract.

From the statistical point of view, we adopt the potential outcome approach to causal inference (Balbo & Arpino, 2016; Imbens & Rubin, 2015; Rubin, 1974). This approach differs from the classical methods usually exploited for the analysis of longitudinal and retrospective data, where the focus is on the parameters of an associational model. In our study, we define the causal effect of entry into employment with uncertain conditions on first-birth conceptions as follows: the difference between the observed proportion of first-birth conceptions of young adults with a temporary job contract vs. the unobserved proportion of first-birth conceptions of young adults with a temporary job if they had a permanent job contract. The unobserved proportion is estimated using first-birth conceptions of matched young adults with a permanent job contract, that is, young adults with a permanent job contract with similar background characteristics to young adults with a temporary job contract. We interpret the results in terms of "potential first-birth postponement" (or, more briefly, "potential postponement"), namely missing first-birth conceptions with respect to expected first-birth conceptions were young adults with a temporary job contract to have a permanent job contract. We also use the term "potential postponement" to stress that we are unable to distinguish whether the estimated "missing births" within the first five years of employment are, then, translated into childlessness or whether they result in a postponement of childbearing (a temporary postponement, because childbearing has occurred after our observation period).

We specifically address the following questions: what would be the magnitude of potential postponement if young adults with a temporary job contract had, instead, a permanent job contract? Is the impact, on potential postponement, of entry into employment with uncertain conditions heterogeneous with respect to gender and educational qualifications? To answer these questions, we reanalyse data from the nationally representative 2009 "Family and Social Subjects" survey carried out by the Italian Institute of Statistics (ISTAT).

2. Background

2.1. Employment uncertainty and family formation

Since the 1980s, the labour markets of countries with industrialized economies have experienced strong deregulation/segmentation, leading to a substantial change in their overall functioning. The deregulation process and other aspects of globalization (such as privatization and liberalization) have generated an unprecedented level of structural uncertainty in contemporary societies (Mills & Blossfeld, 2005, 2013). New forms of "flexible" employment, in most cases jobs with limited duration, have become more common in Europe over the last decades. Several studies have demonstrated that these jobs have negative consequences for occupational prospects (Barbieri & Scherer, 2009), for poverty risk at childbirth (Barbieri & Bozzon, 2016), for health outcomes (Pirani, 2017; Pirani & Salvini, 2015), and in individuals' private lives (Scherer, 2009).

In the realm of fertility research, various studies have showed that youth unemployment, term-limited working contracts, and unstable employment postpone childbearing (Adsera, 2004; Adsera & Menendez, 2011; Barbieri et al., 2015; Blossfeld et al., 2006; Kreyenfeld & Andersson, 2014; Özcan et al., 2010; Pailhé & Solaz, 2012; Sinyavskaya & Billingsley, 2015; Vignoli et al., 2012). This is especially true among the childless, who put off their family-formation plans (Neels, Theunynck, & Wood, 2013). But there are exceptions: for instance, Edin and Kefalas (2005) argued that the poorest women in non-permanent employment in the United States may decide to have a child before marriage because motherhood increases their social status and makes the future safer. Kreyenfeld (2010) argued that employment uncertainty accelerates childbearing among poorly-educated German women. These findings demonstrate the importance of taking into account group-specific analyses and explanations, which have all too often been omitted in recent studies (e.g., Barbieri et al., 2015; Vignoli et al., 2012). This omission was the result of overly small samples, making it impossible for separate analyses by different social groups or for estimates of meaningful interactions.

The empirical literature examining fertility reactions to employment uncertainty has focused predominantly on women. The role of men's employment uncertainty has, with rare exceptions (e.g., Tölke & Diewald, 2003), been ignored or downplayed. Already in 1988, Oppenheimer advanced the so-called uncertainty hypothesis, suggesting that men's unstable careers especially – marked by low-status jobs, non-employment, and irregular and temporary employment – embody uncertainty, making men less attractive as potential partners for family formation. More generally, the deterioration of men's position in the labour market and the declining ability of men to serve as the family's single breadwinner are key factors in understanding the recent postponement of marriage and fertility (Oppenheimer, 1988, 2003). In contemporary societies, both partners are usually employed, and in this case the characteristics of both their jobs prove important. Biographical options and constraints as well as normative expectations are, though, still quite different for men and women, depending on the level of gender equality in a given country (Kreyenfeld & Konietzka, 2005). Uncertainties in employment careers might produce a negative income

effect that inhibits the demand for children, and this negative income effect is expected to be particularly detrimental where male market performance is more central. In Southern Europe, for instance, women are the main caregivers and men act primarily as household providers. Here it is the deterioration of men's employment prospects, which is particularly responsible for bringing about a natural crisis in the male breadwinner model, one that might inhibit fertility (Vignoli et al., 2012). In this study, we examine the impact of employment uncertainty on fertility by investigating the effects of uncertain forms of first jobs for both men and women.

How the link between employment uncertainty and fertility varies across educational levels remains uncertain. There might be two competing expectations. Following a classical micro-economic interpretation of the family, economic resources and earning potentials – proxied by educational attainment – may have both positive and negative effects on fertility decisions. This would depend on whether income or substitution effects prevail (Becker, 1981). Among men, income effects are generally much stronger than substitution effects – the higher men's educational qualifications, the higher their fertility. Among women, having a child in times of employment uncertainty may impose particularly high opportunity costs on those with higher education, who may, consequently, postpone childbearing (e.g., Adsera, 2004). This is especially true in societies where combining paid work and family life proves more difficult. During negative economic conjunctures, in fact, highly-educated women may become even more attached to the labour market and postpone childbearing decisions, to keep career options open. At the same time, women with lower educational attainments may not have much to lose by temporarily withdrawing from the labour market (e.g., Kreyenfeld, 2010). Conversely, highly-educated individuals or those from an elevated social class usually have greater economic resources and a higher social position. They may, therefore, be better equipped to face hardships or spells of employment uncertainty (e.g., Sobotka et al., 2011). Theoretically speaking, this mechanism should be equally relevant for both genders, but in societies where "male-breadwinner qualities" are more relevant for starting a family – such as in Southern Europe – lower-educated men are expected to be particularly vulnerable to employment uncertainty. We investigate whether higher education represents an inhibitor or a facilitator for childbearing when men and women face uncertainty in their first job.

2.2. Italy

Southern Europe is known for having high employment protection and (consequently) high unemployment and high temporary employment among the young (Adsera, 2011; Barbieri et al., 2015). In Italy, from 1990 to 2016, the share of temporary employment among dependent workers grew rapidly from 5% to 14%, whereas the EU-28 average moved slightly from 10% to 14% (OECD, 2017a; see also Fig. 1). Labour-market flexibilization began with the introduction of the so-called work-and-training contracts (1983–1984). This was followed by a weakening of the strict rules for fixed-term contracts (L.56/1987), which were subsequently made increasingly more attractive for firms (L.451/1994; L.608/1996). The major step in labour-market deregulation/segmentation was taken in 1997 ('Treu Law', L.196/1997), which introduced temporary contracts and extended the applicability of fixed-term contracts. In 2003, the 'Biagi Law' (L.30/2003) gave a further impulse to the spread of 'flexible' forms of employment, which led to jobs that were far less 'protective' than their past equivalents, when open-ended jobs had typically been the rule (Barbieri & Scherer, 2009; Bernardi & Nazio, 2005).

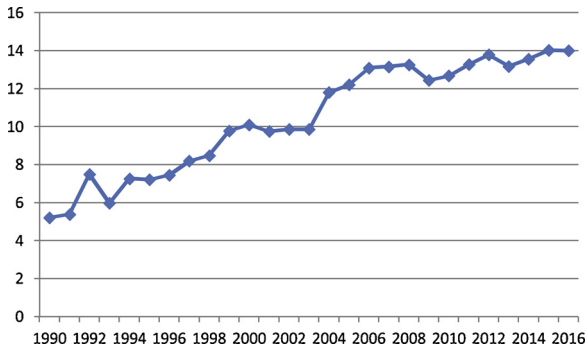

Fig. 1. Percentage of temporary employment over total dependent employees. Italy, 1990–2016.
Source: Own elaboration on data extracted from OECD.Stat.

In 2016 nearly fifteen million Italians had a permanent contract, whereas there were more than five million self-employed (Eurostat, 2017; OECD, 2017b). The largest share of precarious contracts was represented by fixed-term (i.e., temporary) arrangements, which was the case with about 2.5 million workers. According to most recent data, project-based jobs took in almost 400,000 workers (1.7% of total; Istat, 2014). Through the spread of precarious work contracts, the traditional division between 'insiders' and 'outsiders' in the Italian labour market has been reinforced (Ferrera, 2000). The former group typically includes older male workers with long-term contracts and solid guarantees in case of unemployment; the latter group comprises mostly young adults with precarious jobs, low pay, and very limited (or non-existent) safety nets in periods of unemployment.

Labour force participation for women aged 15 to 64 years is still relatively low by European standards, though it increased from about 30% in 1979 to 55% in 2016 (International Labor Organization, 2015; OECD, 2017b). Household living standards usually depend on the market performance of the man: even in dual-earner couples, women are still the main caregivers and men act primarily as household income providers (Aassve, Fuochi, Mencarini, & Mendola, 2015). Job precariousness is increasingly gendered. Over 50% of working women are employed in professions characterized by higher precariousness and inferior job conditions (e.g., keyboard-operating office clerks, customer and shop assistants, pre-primary or primary school teachers), with low prestige, lower wages, and little by way of responsibilities (Pirani & Salvini, 2015).

There are only a few studies that explore the association between adverse economic circumstances and fertility in an era of economic uncertainty in Italy (e.g., Barbieri et al., 2015; Busetta et al., 2019; Caltabiano, Comolli, & Rosina, 2017; Fiori, Graham, & Rinesi, 2018; Vignoli et al., 2012). This paper adds to these prior studies by focusing on the impact of temporary employment on the potential postponement of the first child at the time of a very specific, but crucial life course step – Italians entering employment for the first time.

3. Data

We analysed a sample of women and men selected from the Italian Multipurpose Household Survey on Family and Social Subjects (FSS), conducted by ISTAT in November 2009. This is a large scale, nationally-representative survey of approximately 24,000 households and 50,000 individuals, with a response rate over 80%. The FSS survey is particularly suitable for our purposes, because it provides retrospective information on fertility, work, partnership, and education histories, as well as information on several background characteristics. Unfortunately, employment history data do not allow us to distinguish between inactivity and unemployment over the life course. This distinction being crucial (e.g. a large share of non-working women might be inactive rather than unemployed), we are unable to identify unemployment as a source of employment uncertainty. In addition, data do not allow us to separate out voluntary and involuntary employment.

In order to investigate entry into a job with uncertain conditions during the first employment spell and its impact on potential first-birth postponement, we selected all men and women aged 18–49 at the

interview date.[1] They had to have been at least 18 and childless at the beginning of their first employment spell, which had to have lasted for at least one year.

They could have worked before 18, but each previous employment spell had to have lasted at most three months. Otherwise, they were excluded from the sample. If a career advancement or a change in occupational status was recorded within the first five years of employment – e.g., from a temporary work contract to a permanent one – the change ended the period of observation.

Overall, the sample consisted of 2,783 women and 3,178 men born between 1959 and 1991. Among women, 852 (30.6%) had temporary first employment, of whom 153 (5.5%) found themselves in the least protected employment conditions (i.e. project-based jobs); whereas 1,931 (69.4%) had a permanent first job. Among men, 770 (24.2%) had temporary first employment, of whom 96 (3.0%) had project-based jobs; 2,408 (75.8%) had a permanent first contract. Our analysis covers the period 1978-2008. The vast majority of men and women in our sample entered first employment with a permanent contract. It is also worth noting that job uncertainty was higher among women than among men.

4. Method

4.1. Causal inference framework

We are interested in estimating the effect of having a first temporary versus a permanent job contract on entering parenthood. We used retrospective (observational) data where individuals with temporary and permanent jobs might systematically differ in their background characteristics. We dealt with this issue by using propensity score matching methods under the assumption of selection on observables (Imbens, 2003; Rosenbaum & Rubin, 1983). We segmented the analysis by gender.

Our treatment variable was a binary indicator W for the type of employment, where $W_i = 1$ for individuals with a "temporary job" (treated individuals), and $W_i = 0$ for individuals with a "permanent job" (control individuals). Given that employment conditions may change over time – e.g. a person in temporary employment could then get a permanent position, thus changing his/her treatment status – we focused on a single spell of employment, namely the first.

Our outcome variable was the conception of the first child. Under the Stable Unit Treatment Value Assumption (SUTVA; Rubin, 1980), each individual i had two potential outcomes: s/he might conceive or not conceive a child if s/he had a permanent job, $Y_i(0)$, or s/he might conceive or not conceive a child if s/he had a temporary job, $Y_i(1)$. Conception refers to nine months prior to childbirth. The outcome of interest was annually measured each year from the beginning of the first employment spell, up to five years or till the end of the first employment spell, whichever occurred first. We fixed a five-year time span because the employment spell lasted five years on average both for treated women and treated men (while it lasted, on average, eight to nine years for control units). Note that those who ended their first employment experience in fewer than five years were not excluded in the estimation of the outcome of interest.

The causal estimand we aimed for is the Average Treatment effect for the Treated (ATT; Imbens & Rubin, 2015):

$$ATT = E[Y_i(1) - Y_i(0) \mid W_i = 1] = Pr[Y_i(1) = 1 \mid W_i = 1] - Pr[Y_i(0) = 1 \mid W_i = 1]$$

where the second equality follows from the binary nature of the outcome.

In our context, the ATT measures the average difference between the proportion of first-child conceptions under temporary versus permanent jobs among those who had a temporary job (the treated group; Imbens & Rubin, 2015).

Temporary and permanent employment may include different employment statuses: here, we run three separate analyses, with three different reference populations.

(1) First, we focus on the effects of having a temporary job (that is, a fixed-term or a project-based job) versus having a permanent job. Fixed-term and project-based jobs both identify precarious forms of employment; with the latter being the least protected form of employment.
(2) Second, we focus on the effects of having a fixed-term versus a permanent job.
(3) Third, we focus on the effects of having a project-based versus a permanent job.

Since each person was only observed in either the treatment or control group, only one of the two potential outcomes was observed for each individual i: $Y_i = W_i Y_i(1) + (1 - W_i) Y_i(0)$. Therefore, in order to draw inferences on the causal effect of interest, we need to estimate the missing outcomes. To this end, we introduced some assumptions on the assignment mechanism. Let $\boldsymbol{Z}_i$ denote a vector of observed covariates for unit i. We made the assumption that the assignment mechanism was strongly ignorable (Rosenbaum & Rubin, 1983), which holds if: (a) the treatment assignment is independent of the potential outcomes and conditional on the observed covariates (unconfoundedness): $W_i \perp (Y_i(0), Y_i(1)) | \boldsymbol{Z}_i$; and ($b$) if every unit has a positive probability of being assigned to treatment level 0, that is, of having a permanent job, and of being assigned to treatment level 1, that is, of having a temporary job (overlap): $0 < Pr(W_i = 1 | \boldsymbol{Z}_i = z) < 1 \ \forall \ i$. Unconfoundedness requires that there are no unobserved confounders of the treatment-outcome relationship, and overlap implies that, in large samples, there are treated and control individuals for all values of the covariates.

Unconfoundedness is a strong and untestable assumption, which is violated whether there exist unobserved variables that affect both the outcome and the likelihood of receiving treatment. In our study, unconfoundedness might be violated due to the presence of latent (unobservable) variables, such as fertility intentions, family orientation and career ambitions, which might be reasonably related to both the employment status and to the decision to conceive a child. Nevertheless, despite these potential confounders, we view the unconfoundedness assumption as a useful starting point. We have information on a large set of background variables, some of which can also be viewed as a proxy for important latent confounders. Moreover, we have carefully investigated which of background variables are most likely to confound any comparison between treated and control units (see the next sub-section for details). Therefore, we believe that the assumption that most relevant variables are observed may be a reasonable approximation. Alternative approaches, which do not rely on unconfoundedness, such as Instrumental-Variables methods (e.g., Angrist & Krueger, 2001; Imbens & Wooldridge, 2009) can be considered, but they rely on alternative strong and untestable assumptions. In any event, our estimates of first-birth potential postponement are "conservative" in the sense that if any bias is present, this points toward an underestimation in the negative impact of jobs with uncertain conditions on potential postponement. For instance, family-oriented women may respond to unfavourable employment prospects by choosing the "alternative career" of motherhood.

There exist various methods for drawing inference on average treatment effects under strong ignorability (see, e.g., Imbens, 2004; Imbens & Wooldridge, 2009). Here we use matching methods based on the propensity score (see, e.g., Imbens & Rubin, 2015; Stuart, 2010 for details on propensity score methods).

The analysis involves two steps. In the first step (*design phase*), the focus was on selecting a sub-sample of units where the distribution of

[1] In Italy, births before the age of 18 are rare (in our dataset they are less than 3% of overall first births) and highly selected.

the observed covariates was well-balanced between treated and control groups. Because we are interested in drawing inference on the ATT, the population of interest consists of the treated units. Therefore, in the design phase we used matching to find, for each treated person, one matched control person with similar background characteristics. Although there is a strong debate on the use of propensity score matching methods (e.g., King & Nielsen, 2019), we conducted the design phase in a rigorous fashion, by carefully checking that propensity score matching was successful in reducing imbalance in the observed covariates (see Section 4.2 for details). In the second step (*analysis phase*), matching was used to reduce bias in the estimation of the treatment effect: we imputed the missing potential outcome for each treated unit i by using the outcome of her/his matched control and estimated the unit-level causal effects, $Y_i(1) - Y_i(0)$, as the difference between the observed outcome for that treated unit and her/his imputed outcome: $Y_i - Y_i(0)$.

4.2. Design phase: propensity score matching

Our matching procedure is based on the propensity score, which is defined as the probability of having a temporary job, given the observed covariates (Rosenbaum & Rubin, 1983): $\Pr(W_i = 1|Z_i)$. The propensity score has two properties: it is a balancing score, that is the treatment is independent of the covariates given the propensity score; and if the treatment assignment is strongly ignorable given the covariates, then it is also strongly ignorable given the propensity score. These properties imply that matching based on the propensity score is sufficient to justify removing the bias associated with differences in the observed background variables.

We did not know the true propensity score, therefore we estimated it by specifying a logit model for the treatment indicator W_i on the background variables. Our dataset comprised a wealth of socio-demographic time-varying and time-constant variables, including relevant confounders of the relationship between types of employment and fertility decisions, that is, variables that are not affected by the treatment of interest – namely first employment contract type – and that could reasonably influence both the conception of the first child, as well as entry into the labour market and first employment type. See Tables A1-A3 in Appendix for the complete list of the confounders we used. In order to avoid the use of improper confounders, that is, variables that may have been affected by treatment, we used, as confounders, variables providing information on subjects before treatment assignment, that is, before the start of the first employment spell. Confounders relying on time-varying variables were defined by fixing the time-varying variables at specific points in time prior to the treatment assignment. Specifically, the exit from the parental home was fixed the year before the start of the first employment spell, given that we had only annual information on this covariate. Partnership status was measured three months and twelve months before the start of the first employment spell, to avoid anticipatory effects. Highest educational level was measured one, six and twelve months before the start of the first employment spell (results were stable to different time-point specifications). Finally, age (as a continuous variable), calendar period and the fact of whether the person was still in education were fixed one month before the beginning of the first employment spell.

Based on the set of observed covariates, we estimated the propensity score. The specification of the logit model for the propensity score was driven by the goal of obtaining estimates of the propensity score that balance the covariates between treated and control subsamples. We iteratively (re-)specified the propensity score model and checked covariance balance until we obtained estimates of the propensity score such that, within subsamples with similar values to the estimated propensity score, the distribution of covariates among the treated units was similar to the distribution of covariates among the control units. The final models for the propensity score included linear terms for all the observed covariates listed in Tables A1–A3, as well as a subset of second-order interactions of the basic set of linearly included covariates.

Given the estimated propensity score, we selected a sub-sample of matched control units such that the covariate distribution in the matched control group was similar to the covariate distribution in the treated sample. We first discarded control observations outside the common support range of the estimated propensity score, that is, all control units with a value for the estimated propensity score lower (higher) than the smallest (largest) value for the estimated propensity score among the treated. We also dropped some treated units with a value for the estimated propensity score greater than the largest value for the estimated propensity score among the control units. It is worth noting that when estimating the ATT it is in general beneficial to discard control units outside the range of treated individuals, but discarding treated individuals outside the range of control units may change the group to which the results apply (Crump, Hotz, Imbens, & Mitnik, 2009). Nevertheless, in our study only a few treated units were discarded, as we decided that including them in the analysis may have led to less credible and less accurate results. Then we constructed the matched sample using the one-to-one nearest neighbour matching algorithm without replacement with an exact match on age and education (e.g., Abadie & Imbens, 2002).

The choice of using the one-to-one nearest neighbour matching algorithm without replacement was based on theoretical considerations and careful empirical evaluations. We opted for matching without replacement because, in our application study, the sample size was sufficiently numerous to satisfactorily match each treated person with a different control person. Results were robust, also, with respect to the order in which treated individuals were matched. Matching without replacement allowed us to avoid inferential complications due to dependent matched controls. Selecting the number of matching involves a trade-off between bias and variance (Rubin & Thomas, 1996; Stuart, 2010). Our results were robust with respect to the choice of the number of matches, so we preferred to use one-to-one matching.

Fig. 2 illustrates the balance of covariates between treated and control groups in terms of the propensity score, before and after matching. Each sub-graph shows the box-plot of the propensity score estimates for the control group and the treated group, before (left panel) and after (right panel) matching. In all cases, the matching procedure seems to work well; after matching, the boxplots for treated individuals and matched controls are very similar. Tables A1-A3 (in online supplementary material) show the distributions of the covariates before and after matching, further highlighting the goodness of the matching procedure.

4.3. Analysis phase: ATT estimation

Given the sample of treated and matched-control individuals, for each treated individual i we imputed her/his missing potential outcome, $Y_i(0)$, using the outcome of her/his matched-control individual Y_i^C. Then, we estimated the Average Treatment effect for the Treated (ATT):

$$\hat{ATT} = \frac{1}{N_t} \sum_{i:W_i=1} (Y_i^{obs} - Y_i^C) = \frac{1}{N_t} \sum_{i:W_i=1} Y_i^{obs} - \frac{1}{N_c} \sum_{i:W_i=0} Y_i^{obs}$$

where $N_t = \sum_{i=1}^{N} W_i$ is the number of treated individuals and $N_c = \sum_{i=1}^{N} (1 - W_i)$ is the number of matched control subjects. Note that in our study Nc = Nt. The standard error of this estimator is made using the Neyman estimator: $\sqrt{\frac{S_t^2}{N_t} + \frac{S_c^2}{N_c}}$, where S_t^2 and S_c^2 are the variances of Yi(1) and Yi(0), respectively, which are estimated using the observed sample variances of Yi in the two treatment groups. This estimator of the variance does not rely on assumptions of homoskedasticity.

Fig. 3 exemplifies the overall matching and estimation procedure. For each treated person (i.e. a person with a temporary work contract) belonging to age group j and with educational level k, the matching

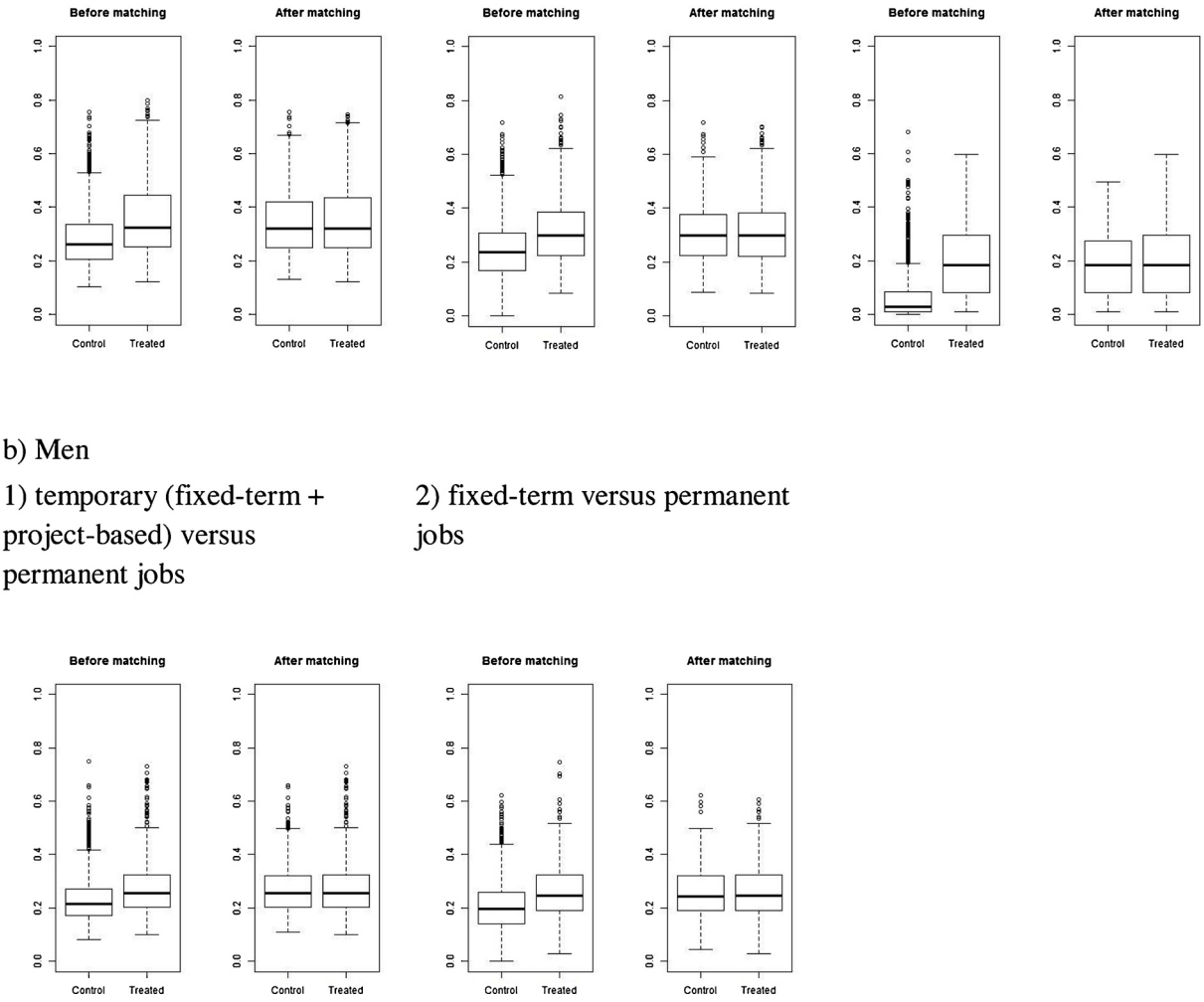

Fig. 2. Boxplots of the propensity score in the treatment and control groups before and after the matching procedure, for the different comparisons. By gender.
Note: For men, we did not perform the third comparison, because project-based male workers were too few for an analysis.

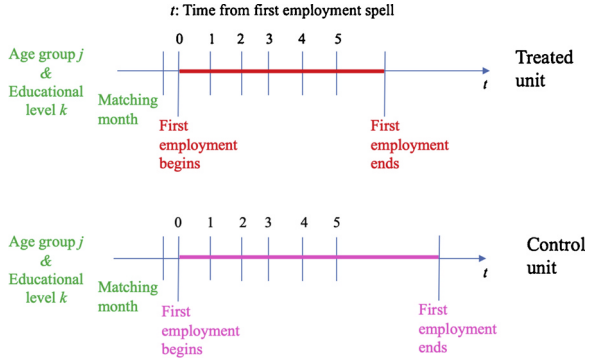

Fig. 3. Time lines for the matching and estimation procedure.

algorithm looks for a control person (i.e. a person with a permanent job contract) belonging to the same age group and with the same educational level who has the most similar propensity score to the treated person. Then, the missing potential outcome for the treated person (i.e. the potential first-child conception under permanent job) is estimated using the observed outcome for the matched control person (i.e. s/he has effectively conceived or not conceived her first child) each year up to five years from the beginning of the first employment spell.

5. Results

We investigated potential postponement of first-birth conceptions due to temporary employment in the five years following entry into first employment. The percentage of potential postponement increases monotonically over time: whereas during the first three years of employment no ATT estimate is statistically significant, after four (or five) years the differences in first-birth conceptions become significant (see Table 1). Our findings suggest that a non-negligible potential postponement of first-birth conceptions is attributable to temporary employment: 7% of women and 5% of men who had a first temporary job would have had their first child within five years of the beginning of the first employment spell if they had had, instead, a permanent job. This percentage increases comparing fixed-term versus permanent jobs, reaching, respectively, 9% and 6% of first-birth potential postponement for women and men. For women, the effect of having a project-based

Table 1
Average Treatment effect for the Treated (ATT) on first-birth conception from propensity score matching, by type of comparison. Percentage values. Women and men.

WOMEN	Temporary vs permanent			Fixed-term vs permanent			Project-based vs permanent		
n treated	845			694			153		
Years	ATT	*Confidence interval*	Estimated % first births for the treated (control)	ATT	*Confidence interval*	Estimated % first births for the treated (control)	ATT	*Confidence interval*	Estimated % first births for the treated (control)
1	−1.3	*[−2.9; 0.3]*	2.2 (3.6)	−0.6	*[−2.3; 1.1]*	2.4 (3.0)	−1.3	*[−4.4; 1.8]*	1.3 (2.6)
2	−1.8	*[−4.1; 0.6]*	5.6 (7.3)	−0.9	*[−3.4; 1.7]*	5.9 (6.8)	−2.0	*[−7.1; 3.2]*	4.6 (6.5)
3	−2.8	*[−5.7; 0.1]*	8.9 (11.7)	−2.9	*[−6.1; 0.4]*	9.2 (12.1)	−5.9	*[−12.8; 1.0]*	7.8 (13.7)
4	−4.9	*[−8.1; −1.6]*	10.9 (15.7)	−5.9	*[−9.6; −2.3]*	11.1 (17.0)	−5.9	*[−13.5; 1.7]*	10.5 (16.3)
5	−7.5	*[−10.9; −4.0]*	11.9 (19.3)	−9.2	*[−13.1; −5.3]*	12.1 (21.3)	−9.8	*[−18.0; −1.7]*	11.1 (20.9)

MEN	Temporary vs permanent			Fixed-term vs permanent		
n treated	796			670		
Years	ATT	*Confidence interval*	Estimated % first births for the treated (control)	ATT	*Confidence interval*	Estimated % first births for the treated (control)
1	−0.3	*[−1.7; 1.2]*	2.1 (2.3)	0.3	*[−1.2; 1.8]*	2.2 (1.9)
2	−1.0	*[−3.0; 1.0]*	3.6 (4.7)	−1.5	*[−3.7; 0.7]*	3.7 (5.2)
3	−1.6	*[−4.0; 0.8]*	5.3 (6.9)	−2.7	*[−5.4; 0.0]*	5.5 (8.2)
4	−3.3	*[−6.0; −0.5]*	6.9 (10.1)	−3.9	*[−6.9; −0.9]*	6.6 (10.4)
5	−4.7	*[−7.7; −1.7]*	7.9 (12.6)	−5.7	*[−9.0; −2.4]*	7.8 (13.4)

versus permanent job is even stronger: nearly 10% of women with a project-based job would have had the first child if they had had a permanent job. Clearly, also the proportion of potential first-birth conceptions increases monotonically over time, and the number is higher for women than for men.

Of course, a child-birth potential postponement within the first five years of employment might turn into either "real" postponement or renunciation. To shed some light on the fertility process we complemented our analysis with a few descriptive figures. In our sample, at the interview date, we verified that the percentage of childless people among temporary workers in the first employment spell was higher than among permanent workers: 7% for women and 5% for men. Women and men with a temporary job contract and at least two children were, respectively, 2% and 5% less than permanent workers. Hence, our findings seem to be confirmed, by expanding the time-window of observation, both in magnitude and in direction. Clearly, these rudimentary additional figures do not disentangle postponement and renunciation, because fertility histories for younger generations are censored at the time of the interview. Nonetheless, the fertility process seems to be affected by the diverse fertility careers undertaken by men and women according to the precariousness of their first job contract.

We also assessed the heterogeneity of the effects of having a first temporary versus permanent job by educational level[2] . For this heterogeneity analysis, we replicated the design and analysis phase for each subgroup, estimating separately the propensity score for each category of this covariate: i.e. for individuals with tertiary education, for those with upper-secondary education and for those with, at most, lower-secondary education.

We estimated the highest proportion of potential postponement of first-birth conceptions among treated women with tertiary education (see Table 2): nearly 16% of them did not have a first child within five years of the beginning of their first employment spell because of the precariousness of their job. Conversely, just 2% of women in the lowest educational bracket would have had a first child if they had had a permanent job; this estimate lacks, note, statistical precision. In the three comparisons, the magnitude of potential postponement relies heavily on the proportion of first-birth conceptions among women in permanent employment, which varies from 15.8% for the lowest educated to 27.0% for the tertiary educated. For men, the highest proportion of potential postponement is estimated for those with a primary or lower-secondary education, which are also those with the highest proportion of first-birth potential conceptions: 13.3% among temporary workers and 20.3% among permanent workers. 7% of them did not have a first child within five years of the beginning of the first employment spell because they had a temporary rather than a permanent job. For men with upper-secondary education, the size of potential postponement is notable and evident within three years of the beginning of the employment spell. On the other hand, the potential postponement for men with the highest educational qualifications has limited statistical precision.

It might be worthwhile making an aside here. Being a worker with a permanent or a temporary job affects other life course domains too, such as partnership status. Thus, in our analytical design the type of work contract might affect first-birth conception both directly and indirectly, i.e. through partnership formation. An example: in our sample 21% of men with a permanent work contract had a partner at the end of the observation period (i.e. five years after the beginning of the employment spell, or at the end of the employment spell, if it occurred earlier); on the other hand, only 12% of men with a temporary work contract had a partner. As for women, 32% of those with a permanent work contract had a partner at the end of the observation period versus 23% of women with a temporary work contract. Unfortunately, we were not able to restrict the analysis to the sample of individuals who remain together for the first five years of employment. This was because, of course, of the small sample size.

6. Conclusions

Stable and predictable career prospects were a rule for the immediate post-war generations in Italy, but this has long since ceased to be the case. In this article, we investigated the consequences of temporary and uncertain forms of employment on potential first-birth postponement. Contrary to most previous research for Italy and elsewhere, we quantified potential first-birth postponement due to job uncertainty. We found that 7% of potential first-birth postponement among women and 5% among men is attributable to early job uncertainty: these individuals would have had a first child if they had had a first permanent job within the first five years of their employment

[2] We focused on the educational level one month before entering into employment.

Table 2
Average Treatment effect for the Treated (ATT) on first-birth conception from propensity score matching, by highest educational level. Percentage values. Women and men.

WOMEN	Primary/Lower-secondary education			Upper-secondary education			Tertiary education		
n treated	171			542			126		
Years	ATT	*Confidence interval*	Estimated % first births for the treated (control)	ATT	*Confidence interval*	Estimated % first births for the treated (control)	ATT	*Confidence interval*	Estimated % first births for the treated (control)
1	−0.6	*[−4.3; 3.2]*	2.9 (3.5)	−1.3	*[−3.3; 0.8]*	2.4 (3.7)	−1.6	*[−4.7; 1.5]*	0.8 (2.4)
2	0.0	*[−5.6; 5.6]*	7.6 (7.6)	−1.9	*[−4.7; 1.0]*	5.2 (7.0)	0.8	*[−4.3; 5.8]*	4.8 (4.0)
3	1.2	*[−5.5; 7.8]*	11.7 (10.5)	−3.1	*[−6.7; 0.4]*	8.3 (11.4)	−4.7	*[−12.3; 2.7]*	7.9 (12.7)
4	1.2	*[−6.1; 8.4]*	14.0 (12.9)	−5.2	*[−9.1; −1.2]*	10.1 (15.3)	−12.7	*[−21.6; −3.8]*	9.5 (22.2)
5	−1.8	*[−9.3; 5.8]*	14.0 (15.8)	−7.0	*[−11.2; −2.8]*	11.3 (18.3)	−15.9	*[−25.4; −6.4]*	11.1 (27.0)
MEN	Primary/Lower-secondary education			Upper-secondary education			Tertiary education		
n treated	256			411			94		
Years	ATT	*Confidence interval*	Estimated % first births for the treated (control)	ATT	*Confidence interval*	Estimated % first births for the treated (control)	ATT	*Confidence interval*	Estimated % first births for the treated (control)
1	−2.3	*[−6.1; 1.5]*	3.9 (6.3)	−1.0	*[−2.6; 0.7]*	1.0 (1.9)	1.1	*[−2.5; 4.6]*	2.1 (1.1)
2	−1.6	*[−6.2; 3.1]*	7.0 (8.6)	−1.7	*[−4.0; 0.6]*	1.9 (3.6)	−3.2	*[−8.6; 2.2]*	2.1 (5.3)
3	−5.1	*[−10.8; 0.6]*	9.8 (14.8)	−2.9	*[−5.8; −0.1]*	3.2 (6.1)	−5.3	*[−12.0; 1.4]*	3.2 (8.5)
4	−6.3	*[−12.4; −0.1]*	11.7 (18.0)	−4.1	*[−7.4; −0.9]*	3.9 (8.0)	−6.4	*[−15.2; 2.4]*	7.4 (13.8)
5	−7.0	*[−13.5; −0.6]*	13.3 (20.3)	−5.4	*[−8.9; −1.8]*	4.6 (10.0)	−6.4	*[−15.5; 2.8]*	8.5 (14.8)

career. Employment contracts and career prospects differ not only according to material and immaterial gratification, but also according to the amount of predictability and security jobs provide for the workforce. This, in turn, has potent effects on fertility outcomes. Precarious and insecure working arrangements imply negative consequences for both occupational prospects and for individuals' private lives. These effects are especially severe for project-based workers; namely, those with the lowest employment protection. The diffusion of jobs with uncertain conditions seems to represent a substantial force driving the likelihood of parenthood, at least it does in Italy.

We also investigated the heterogeneity of the effects of job uncertainty on first-birth potential conceptions with respect to educational qualifications. Group-specific analyses are only rarely performed in the literature on employment uncertainty and fertility (e.g., Kreyenfeld, 2015), often because sample sizes are too small. For women, our results are in line with the old-fashioned, but still relevant, micro-economic interpretation of family life. Highly-educated women have as much as 16% potential first-birth postponement, suggesting higher opportunity costs (or, in sociological terms, "role incompatibilities") among those holding jobs with uncertain conditions. More highly-educated women may prefer a temporary contract to have the chance to progress in their career over a much sought after profession, and catch up on their initial fertility loss, when their contract becomes permanent. Having the first child later in life because of uncertainty in a first job might, of course, leave little time for second (or higher) order births or lead to childlessness among tertiary-educated women. Among men, the higher levels of potential first-birth postponement may be found among those with the lowest educational qualifications. For these men, establishing a stable, secure, and more or less successful career is likely to be a normative expectation (Tölke & Diewald, 2003) and a precondition for family life with adequate living standards (Matysiak & Vignoli, 2013). The gendered impact of job uncertainty among higher-level professions suggests that "breadwinner-qualities" still play a decisive role in establishing a family in Italy.

Our study has several limitations, which offer opportunities for future research. First, it is difficult to evaluate whether potential first-birth postponements were mostly driven by the temporary postponement of childbearing or rather by a fall in the underlying level (quantum) of fertility that would also depress completed family sizes for men and for women. A rough descriptive analysis has shown how first-birth potential postponement leads to a fall in fertility and an increase in childlessness. The natural evolution of our approach would be to develop a life course extension of the causal inference framework adopted here. This approach would allow us to account for each employment spell and job change over the life course, and the transition to first as well as to higher-order births. Second, we showed that employment type influences the propensity to have a first child during the first employment spell, but we, however, ignored contract duration. Nevertheless, limiting our analyses to workers with contracts that are at least one year long, and focusing on the first five years of employment, we suggest that the potential postponement in first-birth conceptions because of jobs with uncertain conditions may not depend merely on employment duration. Third, we could not account for a few socio-economic characteristics, for instance household income, and some potential unobserved confounders, such as fertility intentions, family orientation and career ambition. These would require longitudinal data that are unavailable for Italy. Nonetheless, if any bias is present, it will have been responsible for an underestimation of the negative impact of entry into employment with uncertain conditions on first-birth conceptions. After all, women with high family orientation or low career ambition might have opted out of precarious employment and chosen family formation. Fourth, distinguishing between voluntary and involuntary employment conditions is crucial for a better understanding of the consequences of temporary and uncertain forms of employment on parenthood. In fact, for some occupations – depending, in part, on the prestige of a given job – short-term contracts, or dispatch work, are the norm and are not perceived as heightening uncertainty (Vignoli, Mencarini, & Alderotti, 2018). Unfortunately, life-course data of this kind do not exist for Italy. Fifth, we could not estimate potential changes in the proportion of first-birth conceptions within couples. Note that we used a retrospective survey that does not include information on ex-partners; here a couple analysis could only be performed for intact couples – i.e. those who had not experienced relationship disruption. Restricting the analysis to intact couples would mean working with a very small, selected sample. The challenge for future research will be to account for the employment characteristics of both members of the couple through panel data, but, unfortunately, so far this information is not available for Italy. Finally, in our analysis the partnership status is considered as a matching variable. Hence, we do not distinguish between the ways in which temporary employment

influences fertility indirectly through union formation and directly within unions. For instance, because temporary employment reflects a partnership sorting mechanism, men with precarious jobs are more likely not to be in a union (Vignoli, Tocchioni, & Salvini, 2016). A simultaneous consideration of patterns of union formation and parenthood in relation to employment uncertainty would be an interesting topic for future research.

In any event, our results contribute to the contemporary research on economic uncertainty and fertility by quantifying a non-negligible negative effects of early exposure to labour market uncertainties on potential fertility postponement in Italy. From a life-course perspective, it is imperative to recognise the importance of critical, or sensitive, periods that can have enduring effects because positions and transitions today depend on previous circumstances leading to patterns of path dependency (Barbieri & Scherer, 2009; Dannefer, 2003). Our findings emphasise the importance of considering entry into first employment, and its uncertain conditions, as a life-changing event in terms of fertility differentials. This paper will not be the last on the topic, as the spread of labour-market uncertainty will likely continue to be a key driver of fertility dynamics in the years to come.

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