The Effects of Unemployment on Fertility*

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Abstract: We analyze the causal effect of unemployment on fertility. Neoclassical theory of fertility has ambiguous (both positive and negative) predictions regarding the effect of unemployment for women. Additionally, existing empirical research shows contradictory results and makes a weak case for exogeneity of unemployment to fertility behavior. We suggest that (unexpected) firm closures constitute an exogenous source of unemployment, and adopt this as an instrument to estimate husbands' and wives' fertility responses, using unique administrative panel data from Denmark which includes *all* Danish residents between 1982 and 2006. The data contains monthly information about employment, relationship status and a very detailed fertility history – including stillbirths and miscarriages – of individuals, as well as information about the firms that they work in. We estimate our models separately for men and women. Our results show that unemployment as a result of firm closure negatively affects both women's and men's total number of births, and positively affects women's timing of first birth. Men do not appear to delay timing of first birth due to unemployment.

Keywords: Unemployment, Firm closures, Fertility

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1. Introduction

Recent research has shown an increasing tendency for countries with lower rates of female employment to also experience lower rates of fertility (Adsera 2004; Adsera, 2005; Ahn & Mira 2002; Brewster & Rindfuss, 2000; Esping-Andersen, 1999; Engelhardt & Prskawetz, 2004; Esping-Andersen, 2009). This implies a reversal of the well-known negative correlation between these two aggregates (i.e. Total Fertility Rates (TFRs) and female labor force participation rates (FLFPRs)) across the OECD countries. A common explanation for the emerging positive correlation is the extended duration of high (female) unemployment in southern and central European countries, especially throughout the 1990s (e.g. Ahn & Mira, 2002; Adsera, 2004; Engelhardt & Prskawetz, 2004). This explanation is supported by the observation that the downward trends in fertility coincide with increasing unemployment rates among women, especially in these countries (e.g. Ahn & Mira 2002; Adsera 2005).

A smaller group of researchers went beyond the aggregate data to analyze how one's unemployment experience and fertility behavior are related at the individual level[1] (e.g. Kravdal 2002; Kohler and Kohler 2002; Tölke & Diewald 2003; Adsera 2005; Gonzalez & Jurado-Guerrero, 2006; Kreyenfeld 2009; Ozcan et al. 2010; Adsera 2011). However, the need for further analyses still persists for three major reasons.

First, the findings of this literature are far from being conclusive. Some studies find either no association between unemployment and women's fertility timing (e.g. Kreyenfeld 2009; Kravdal 2002; Rindfuss et al. 1988; Kohler & Kohler 2002), or a positive association for women with a lower level of education (Kreyenfeld 2009; Hoem 2000). Yet others detect a negative association between unemployment and transitions to motherhood (e.g. Hoem 2000; Adsera, 2005; Gonzalez & Jurado-Guerrero, 2006[2]). Moreover, there are fewer studies analyzing this relationship between fertility behavior and unemployment for men, and those report similarly contradictory findings (e.g., Tölke and Diewald, 2002; Kravdal, 2002; Ozcan et al., 2010)

Second, the hypotheses derived from neoclassical fertility theory have ambiguous predictions regarding the direction of the effect. Especially for women, the effect of unemployment on fertility

[1] There are also other studies that look at the impact of aggregate unemployment on individual conception decisions (e.g. Kravdal, 2002, Dehejia and Lleras-Muney 2004); however, the theoretical mechanisms linking aggregate unemployment and childbearing decisions are different than those governing the direct experience of unemployment and childbearing decisions, as we will discuss in the next section.

[2] Only for Italy, Spain and France.

timing can be either positive or negative. Furthermore, when the theory's assumptions about gendered division of labor for childrearing and market work are relaxed, this produces even more ambiguous predictions for men and women (e.g., Hotz et al. 1997; Kravdal 2002; Adsera 2004; Ozcan et al 2010 and Adsera 2011). Thus, we believe that there is a need for systematic testing of this theory's predictions.

Third, this literature often lacks a proper causal approach. Researchers typically use simple duration models to estimate fertility timing, whereby the dependent variable is assigned the value of one from around nine months to one year before the birthdate of the child. Lagging the dependent variable is a common practice aimed to avoid any potential reverse causation, in which fertility influences the likelihood of becoming unemployed (e.g. Adsera, 2005; Ozcan et al., 2010 and others). Although this procedure breaks the time order and thus helps to avoid reverse causation, it fails to fully eliminate the endogeneity problem: that both fertility outcomes and the likelihood of being unemployed may well be determined endogenously through a series of events and preferences interlinked along the life course (e.g., Angrist and Evans, 1998). For example, planning to become a parent might affect some individuals' work performance and attachment to the job, and consequently might increase their probability of becoming unemployed. Alternatively, unobserved characteristics may select some women into motherhood and at the same time serve to reduce their attractiveness in the labor market, making them more vulnerable to risk of unemployment. Thus, a careful assessment of the causal relationship between unemployment and fertility requires that we find an exogenous source of unemployment (i.e. not dependent upon the individuals' observed or unobserved characteristics).

In this paper, we use (unexpected) firm/plant closures in Denmark as an exogenous source of one's unemployment status. We then analyze the impact of unemployment as a result of such job displacement on the individual's fertility timing and completed fertility. In fact, three other recent studies also used job displacements to predict various fertility outcomes[3] (e.g. Del Bono, Weber & Winter-Ebmer 2012; Lindo 2010; Huttunen & Kellokumpu 2010). Our research builds upon these three studies, but departs from them in a number of ways:

First of all, those studies explored the relationship between job displacement and various fertility outcomes, but unlike our study, did not always exhibit a clear focus on "unemployment" per se. For

[3] A fourth paper taking a causal approach might be Ananat and Gibson-Davis (2010), although their study uses county-level data (i.e. county-level plant closures and birth rates) rather than individual-level data.

example, Lindo (2010) used husbands' job losses[4] as a negative shock to family income to estimate wives' fertility responses. In primarily focusing on the income-fertility relationship, he did not consider wives' unemployment. In contrast, Del Bono et al. (2012) looked only at wives' job losses, as opposed to those for both partners. Their study aimed to analyze the effect of all career interruptions due to job displacement (i.e. irrespective of unemployment experience) on women's fertility levels. Huttunen and Kellokumpu (2010) focused on job displacement for both partners during the recession in Finland in 1991. Yet, the emphasis in their research was on the non-economic channels through which fertility is affected, such as divorce and probability of employment (where unemployment is simply grouped with inactivity in the reference category).

The findings of these studies are also far from being conclusive, and call for more empirical research. For instance, Del Bono et al., (2012) found that women with a job-displacement experience on average have 5-10% lower fertility compared to those who never experienced job displacement. They argued that this negative effect is not because of unemployment. Huttunen and Kellokumpu (2010) found a negative effect only for educated women, where this effect was only on the timing of birth and not completed fertility; they also found that a husband's job loss reduces completed fertility more than a wife's job loss. Yet, Lindo (2010) argued that a husband's job loss generates a positive effect on fertility timing in the short run, and a negative effect on completed fertility in the long run.

In contrast to these studies, we exclusively focus on unemployment and its impact on both fertility timing and completed fertility of Danish residents. We use firm closures to instrument unemployment, and estimate our models separately for men and women. Again, unlike previous literature, we do not limit our sample to include only married couples; instead, we take into account all births, including those that are out of wedlock.

In doing so, we benefit from the best possible data: administrative (panel) data for *all* residents of Denmark between 1982 and 2006. This has the following advantages over earlier studies. First, it is monthly data, which allows us to measure the timing of conception and unemployment more precisely. Second, as opposed to those studies which used data ending in the mid-1990s or earlier, our data spans from 1982 to 2006, bringing the analysis more up-to-date. Third, it includes a rich set of information about the socio-economic situations of individuals and their partners, their work and

[4] His study considers job losses due to various factors, including "being fired," and states that restricting the sample to include only job losses that are strictly due to firm closures did not change the results.

relationship history, and their workplaces. Fourth, and perhaps most importantly, with this data we are able to overcome many measurement issues prevalent in the broader literature. For instance, due to data limitations, some studies derived fertility histories using information about the age of cohabiting children in a given year (e.g. Kreyenfeld 2009; Kravdal 2002; Gonzalez & Jurado 2006; Adsera 2005; Schmitt 2008). This strategy gives an incomplete picture of birth events by excluding children who left home, live with other relatives, or live with the other partner in broken marriages[5]. Other studies with available fertility histories are also problematic because they rely on a selected sample of "live" births. Furthermore, there is evidence that men tend to underreport early births in most retrospective surveys, but especially if these births are out of wedlock (see Joyner et al 2012). We believe that an ideal data set should provide information about all types of *conception decisions*[6], i.e. not only those that result in live births, but also those that result in abortions and stillbirths, since these events may also potentially correlate with unemployment-related stress. To our knowledge, no studies have considered these types of conceptions in their analyses. We aim to alleviate these problems by including stillbirths, and measuring the exact duration of pregnancy – which captures early deliveries – in the construction of our dependent variable.

The structure of the rest of the paper is as follows. In the next section, we outline the theoretical mechanisms through which unemployment may affect fertility outcomes, and provide a summary of the previous literature. After this theoretical background, we present our data and sample, discuss our instrument, and report the preliminary results. The paper ends with our conclusions.

2. Theoretical Background and Previous Literature

Individuals' unemployment experiences may affect their fertility outcomes; either directly by influencing their childbearing decisions or indirectly by changing partnership formation and dissolution processes which, in turn, affect fertility outcomes (e.g. Eliason, 2004; Huttunen and Kellokumpu, 2011). For reasons of space and scope, we ignore these indirect channels[7] and focus

[5] Gonzalez & Jurado (2006) and Adsera (2005) attempted, though imperfectly, to address this problem in their studies. Adsera sets the age of women to 40, and argues that the percentage of women who do not live with their children and are below the age of 40 is very small.

[6] These should ideally include unsuccessful attempts to conceive, as well. Moreover, although this is often ignored in the literature, adoption decisions may also be affected by unemployment. Lack of information on adoptions and step-parenthood may be consequential, particularly in comparative studies of transition to parenthood, as countries might vary in the prevalence of these events. For example, Ozcan et al. 2010 reports that the transitions to fatherhood via adoptions and step-fatherhood in East Germany are about twice as prevalent as those in West Germany.

[7] These channels may also be less relevant in the Danish context, since marital status and fertility behavior are less correlated and less normatively ordered in Denmark compared to many other industrialized societies (e.g. Esping-Andersen 2007)

only on the direct relationship between unemployment and childbearing decisions. The mechanisms that link unemployment directly to fertility decisions are derived from the neoclassical (economic) model of fertility developed mainly by Willis (1973) and Becker (1960 and 1981), and its extensions. In a synthesized way, many of the following arguments are based on the discussions regarding those extensions outlined in Hotz, Klerman and Willis (1997), Kravdal (2002), Adsera (2004 and 2011):

In a nutshell, the standard (static) microeconomic models of fertility build upon three major assumptions. First, children are similar to consumption goods, and parents derive utility from having and raising children, which in turn implies a positive relationship between income and demand for children. Second, children are nonetheless costly both in economic and social terms, and they necessitate time investments that are especially high during the months immediately following the birth. As a result, households face a trade-off between quality and quantity when it comes to having children under their existing budget constraints. Third, although this is less explicitly pronounced in the extant literature, these models assume that traditional gender roles are common and persistent even in advanced societies[8]. This assumption led researchers to consider only women's time investment in childbearing and rearing, especially for the first birth (e.g., Del Bono et al 2012). Because the neoclassical model does not take into account men's time investment, it predicts that unemployment might have different effects on the fertility outcomes of men and women. Overall, the prediction is negative for men, and is directly related to unemployment's negative effect on total family income and resources which is called *the income effect*. However, in addition to the income effect, the same model suggests a *substitution effect* for women. This substitution effect implies that unemployment may be positively associated with women's fertility decisions, because it reduces the cost of having children by conveniently providing additional time for childbearing and child care. According to this model, then, while unemployment is expected to influence fertility decisions of men negatively, for women the overall impact is ambiguous.

In this paper, we revisit and test these predictions, which constitute our first set of hypotheses, using a firm-closure instrument. Because the static model relies on the trade-off between quality and quantity of children, this model is better suited for understanding the relationship between *unemployment* and *completed (lifetime) fertility* (Hotz. et al 1997). In line with the predictions, while we expect that unemployment due to firm closures will have a clear negative effect on men's

[8] See critique of this assumption in Esping-Andersen (2009). Brodmann et. al. (2007) find that fathers' time and involvement in childcare is high in Denmark, and is one of the predictors of the second and higher order births.

completed fertility, its effect on women's completed fertility will not be as clear due to offsetting income and substitution effects.

In fact, this theoretical framework has provided the foundation for most empirical research on fertility decisions, not only with respect to unemployment but also other types of economic uncertainty such as job insecurity/instability due to short-term contracts (e.g. De la Rica, 2008; Bernardi et al., 2008), general economic and institutional uncertainty including that experienced in transition countries (e.g. Kohler and Kohler, 2002), and subjective and expected financial uncertainty (e.g. Krayenfeld, 2009; Bhaumik and Nugent, 2005)[9].

Recessions and economic crises also generate uncertainty, and their impact on fertility has long been studied; both to understand the pro-cyclical nature of fertility (e.g. Butz and Ward 1979, Adsera 2005, Schaller 2011), and recently, to take advantage of large-scale firm closures during recessions (e.g. Dehejia and Lleras-Muney 2004; Ananat-Oltmans and Gibson-Davis, 2010; Huttunen and Kellonkumpu, 2011). However, we believe that large fluctuations in unemployment rates (aggregate unemployment levels) during recessions might generate very different behavioral responses than the unemployment experienced under stable macroeconomic conditions. During recessions, individuals may postpone childbearing decisions even if they do not themselves experience unemployment or a wage cut, (i.e. no income or substitution effect). Of course, an increase in aggregate unemployment might generate an overall decline in wage rates, which might be interpreted as an indirect income effect. Still, the intensified feeling of long-term economic insecurity experienced during recessions, rather than current income loss, might be what governs fertility decisions (Adsera, 2011). In sum, it is harder to separate "the effect of unemployment" from "the effect of recession" in these studies.

While the static model of neoclassical fertility is better suited to studying completed fertility, dynamic (life-cycle) models may provide a framework that is more suitable to incorporating *timing of births* (Hotz et al 1997). However, this latter set of models likewise relies on a set of assumptions such as lack of uncertainty, existence of perfect capital markets, etc. Under these assumptions, the models suggest that households aim to maximize their utility (smoothing consumption of goods) by choosing timing of children and wives' allocation of time over the life cycle. The implication is that women will prefer to have their children early in the life cycle in order to enjoy them for longer

[9] Although many of these studies rely on a similar theoretical framework, it is arguable that the substitution and income effects operate in the same way for other types of economic and labor market uncertainty.

periods. These models also imply that transitory unemployment will not affect completed fertility but will positively affect the timing of births, because women will prefer to give birth when wages are low, implying a dominant substitution effect (Hotz et al 1997; Lindo, 2010). Moreover, sociological theories suggest that substitution effects can be stronger for first births because there is a general social norm against remaining childless (Kravdal 2002). However, given the possibility of uncertainty and imperfect capital markets, transitory unemployment may have both income and substitution effects. Contrary to these models; Adsera (2011) stresses that the substitution effect might only dominate if unemployment is perceived as truly *temporary*. Yet, if unemployment becomes persistent, then pregnancy might imply "a weaker commitment to labor market," especially "if it happens early in the life course where human capital accumulation is crucial" (Adsera 2011: p.6). As a result, childbearing at younger ages combined with longer periods of unemployment might turn into "an unemployment trap" (Adsera 2004:p.22). However, since it is often uncertain how temporary an unemployment spell will be, women may also prefer to postpone childbearing. To sum up, we conclude that these models, like the others, do not unambiguously provide predictions about the effect of women's unemployment on their timing of births.

Taking into account all of the considerations discussed above, we hypothesize that unemployment as a result of firm closures will result in a delay in the timing of first birth for men, while for women, it will either positively affect that timing – due to an especially strong substitution effect for first births – or no effect at all (an offsetting income and substitution effect).

It is important to note here that the theoretical models did not make a distinction between cohabitation and marriage. Typically, the predictions about fertility outcomes referred to births within the marriage; births out of marriage, including those within cohabitation, have been completely ignored in both theoretical models (e.g. Hotz 1997) and empirical analyses (e.g. Del Bono et al., 2012; Huttunnen and Kellokumpu, 2010). This is regrettable, because in most European countries – but especially in the Danish context – cohabitation has become increasingly common as an alternative as well as precursor to marriage. Approximately 14% of all children in 2007 – around the last wave of our observation window – were living with unmarried cohabiting parents (Iacovou and Skew, 2011). Moreover, cohabitation may imply a more egalitarian setting when it comes to sharing time spent on childcare and housework (Batalova and Cohen, 2002), and consequently, may have implications for both genders regarding their fertility decisions under conditions of unemployment (see Brodmann et al., 2007). Thus, unlike previous studies on firm closures and

fertility, our method takes into account all births within or outside the marriage using a life-course approach, which we explain in the next section.

3. Data and Method

3.1. Data

In Denmark, all residents have a unique personal number which identifies an individual in a great many transactions such as tax forms, visits to the doctor, interactions with the welfare system, schooling, work status, workplace, registration of residence, etc. Some variables are recorded on a daily basis, others on a weekly or monthly basis, and a few – e.g. yearly income – on a yearly basis. Each year, Statistics Denmark collects the information registered with this personal number and makes this data available for statistical and research purposes. The available data is then, a panel starting in 1982 and ending in 2006 which contains all Danish residents, and allows for a linkage of partners – married or cohabiting - with parents and children. From this data, we know exactly when people conceived children (i.e., we know a child's birthday as well as the length of the mother's pregnancy), and which months they were unemployed. In addition, the data allows us to include the conception of children who ended up as stillbirths,[10] which is especially useful for our analysis of the relationship between unemployment and the probability of conceiving a child.

For this analysis, we use a sample of all Danes born in 1966 whom we can follow in the registers from age 16 (in 1982) up until they turn 40 (in 2006); i.e., the years during which childbirths are most likely. This cohort has 87,333 individuals. However, due to computational capacity problems, we select only a random sample containing 80 percent of this cohort. This leaves us with 69,235 individuals. For the analysis on completed fertility, we follow these individuals on a monthly basis until they turn 40 (and right censor them at that year). This leaves us with 20,770,800 individual per-month observations. For the analysis of first births, we follow individuals until they conceive their first child and right censor them afterwards. We right censor at age 40 those who did not conceive before 40. These restrictions leave us with 13,195,080 individual per-month observations, where there are 192 months per individual on average.

3.2. Method

[10] Before 1997, a stillbirth was defined as the birth of a non-living child after the 27th week of the pregnancy. From 1997 onwards the definition changed: it is now the birth of a non-living child after the 20th week of the pregnancy.

We analyze the effect of unemployment on completed fertility and timing of conception using a standard discrete-time duration model (see Yamaguchi, 1991, chapter. 2). However, due to the potential endogenous relationship between unemployment and conception discussed earlier – namely, that unemployment may affect the decision to conceive a child, but having a child may also increase the probability of unemployment – we apply a two-step procedure (2SLS) in which we instrument unemployment. We present separate results for men and women due to the gendered nature of the neoclassical model's predictions, as explained in the previous section. Our models include industry and region dummies as fixed effects, in order to capture a potential differential exposure to unemployment for men and women as the result of plant closures in certain industries and regions in Denmark.

3.2.1 Exogenous variation: Firm closure

While it has proven tricky to find useful exogenous variation for unemployment, firm closure has recently been established as a valid instrument (see e.g. Heinesen & Browning, 2010; Browning, Møller & Heinesen, 2004; Eliason & Storrie, 2004). The instrument relies upon two assumptions: first, that most employees fail to foresee that their workplace is about to close down; and second, that unemployment occurring as a result of such firm closure is uncorrelated with employee characteristics. The anticipation problem is often cited as a standard critique of the firm closure instrument, even though there are good examples of Danish firms having closed in the space of one day in recent years (a recent prominent example is the IT Factory in December 2008[11]). However, it is important to keep in mind that the IV-model estimates a local average treatment effect (the LATE), which only concerns those affected by the instrument[12]. Thus, even if the smarter employees foresee the closure and respond to it before they become unemployed, while another group of employees would have become unemployed regardless of the closure, there will still be a large group of individuals who only experience unemployment because of the closure. This third group is the one that the IV-model estimates are concerned with.

[11] For a Danish reference on this, see http://da.wikipedia.org/wiki/IT_Factory

[12] The firm closure literature argues that those who become unemployed are a selected sample of workers whose jobs are displaced. The workers with more ability to foresee their company's closure might leave the firm before becoming unemployed, which is called "the early-leavers" problem.. A typical way of treating this early-leavers problem in the literature is to include workers who left the firm a year before the closure. However, as in the Del Bono et al (2012) study on Austria, this option is not possible in Denmark because the law obliges mothers to take several months of maternity leave around the first birth. Additionally, some workers may be attractive enough in the labor market and not experience unemployment after their firm is closed, even if they do not foresee the firm closure. We will provide some sensitivity analyses using this group.

Equations 1 and 2 show the IV-model.

$$unemployment_{it} = \alpha_{it} + \delta \; x_{it} + \theta instrument_{it} + r_i \quad [1]$$

$$fertility\ outcome_{it} = \alpha_2 + \delta_2 x_{it} + \beta \widetilde{unemployement}_{it} + u_i \quad [2]$$

In both equations, *it* is the individual *i* (*i=1,…,N*) at a specific point in time *t (t=1,…M)*.. Equation 1 is the first-stage equation, in which the endogenous variable ($unemployment_{it}$) is regressed on the vector of exogenous controls x_{it} and the instrument. The second stage uses the predicted rather than actual value of the endogenous variable to predict the outcome variable, completed fertility or first birth, along with the vector of controls, x_{it}. The standard errors in the second stage are adjusted to account for the fact that we use the predicted, rather than actual, value of the endogenous variable. Random error terms are r_i and u_i. If the instrument is valid, there is no correlation between the predicted value of the endogenous variable and the error term in the second-stage equation, and the model will produce consistent results.

We identify firm closures following the standard definition in the Danish firm closure literature. In the registers, we have yearly information on all Danish firms, which means that we know whether a firm (identified with a unique number) exists in November of each year. If a firm – or the firm number - disappears from the data from one year to the next, this means that the firm has closed down. The registers take into account the possibility that specific firms may cease to exist when new owners take over, the firm moves to a new address, or there is a change in the industry; such organizational changes do not equal firm closure. Consequently, the following changes are not recorded as firm closures: 1) the firm changes address, but has the same owner and works in the same industry; 2) the firm changes address, but has the same owner and same employees; 3) the firm changes owner, but has the same employees and same address; or, 4) the firm changes owner, but has the same employees and works in the same industry. Here, the registers define ”same employees” as the continued engagement of at least 30 percent of employees from one year to the next.

However, for our study we need to know more than just the year of the firm's closure; since we analyze the effect of unemployment on conception in any given month, we need to determine whether unemployment occurring in a specific month was the result of the firm closure. Without that information, we cannot specify the causal effect of unemployment on conception. Consequently, we utilize information about the monthly unemployment rate among employees of each firm (determined for the year preceding the year of closure), defining the month of closure as

one in which the unemployment rate increased by 50 percent or more compared to the preceding month.

Based on this methodology, firm closures occur 69,144 times in our sample.

3.3. Variables

Fertility Measures

Because we focus on both completed fertility and the timing of the first child, we have two outcome variables. Our first outcome variable measures the *number of conceived children* at a monthly level. Thus, for the month that an individual conceives his or her first child the indicator changes from 0 to 1, remaining at 1 until the month that the individual conceives his or her second child – at which point it changes to 2, etc. As shown in table 1, the completed fertility in our sample is 0.45 for men and 0.87 for women. This obviously reflects the fact that we observed the individuals for many months before they conceived their first child (during which the value of the variable is zero). From the data, we know that both our male and female samples have between 0 and 8 children. The total fertility rate is 1.26 for all men and 1.80 for all women, but 1.85 for men who actually have children and 2.17 for women who have children. Technically, our indicator of completed fertility is not entirely accurate, since some women – though very few – may still have birth after age 40, and more importantly, many men may have births after 40. Nevertheless, we use the term "completed fertility" as a convenient designation for total number of births reached at age 40.

Our second outcome variable is the timing of conception, which is a monthly indicator of the individual's *first-child conception* that may result in a live or stillborn baby. Obviously, this is not a perfect indicator of conception decisions as it does not take abortions into account, nor does it contain any information on true intention to conceive; both are factors potentially influenced by unemployment. However, this is still far more precise than most other measures used in the literature because, unlike other studies, we have information about the duration of pregnancy. In our sample, 52,466 individuals (75.78 percent) conceived their first child during our observation period, corresponding to an average monthly conception rate of 0.003 for men and 0.005 for women (see table 1).

Table 1 about here

Explanatory Variables and Controls

Our key explanatory variable is, of course, labor market status; i.e. whether the individual is unemployed in a given month or not. We create this indicator based on the registers' information about whether individuals are receiving unemployment benefits, thus not distinguishing between those unemployed who are insured and uninsured. 55,736 individuals (80.50 percent) experienced unemployment for shorter or longer periods during our observation period, and the total number of months of unemployment in our sample is 2,462,394 .[13]

We also control for a number of other factors that may affect the probability of conceiving a child such as age, cohabitation (whether cohabiting or not), marital status (whether married or not), previous unemployment, education (whether the individual is in school during any given month), and educational level.

We also control for partners' unemployment status, educational level, and whether the partner is in school during any given month. Controlling for a partner's employment status may matter, since there is growing evidence in Europe showing that unemployment occurs simultaneously in couples (Gregg and Wadsworth, 2001), and such dual-joblessness may be correlated with childbearing decisions (Harkonen, 2011)[14]. We also report our models omitting these partner characteristics (see section 4.3). Table 1 shows that in any given month, between 3 and 7 per cent of partners are unemployed, while between 4 and 6 percent of the partners are in school. Most partners have vocational training as their highest educational attainment.[15]

Most importantly, we include dummies for the industry of occupation and county of residence, since both elements may affect unemployment probability and fertility decisions. In other words, our estimates report within-industry and within-county effects. All these variables are time-varying at a monthly level[16].

[13] This may seem extensive; however, it reflects that our population entered the labor market in the 1980's, when youth unemployment was unprecedentedly high in Denmark. Also, it corresponds to an average monthly unemployment rate of 11.86 percent, which is quite reasonable for the time period and age group studied.

[14] Although Lindo (2010) uses the husband's job losses as an instrument for an exogenous shock to household income in order to estimate fertility, we believe that husbands' job losses may generate a standard "added worker" effect on wives (Stephens, 2002), and thus may affect women's fertility decisions via influencing their work behavior.

[15] Note that all information on partners is set to zero in months where there is not a partner.

[16] The industry dummies are coded as monthly indicators, but they only vary at a yearly level. This is due to how the information is recorded in the registers.

Age captures our duration dependence, and we recode this into three binary variables indicating whether the individual is younger than 25, between 25 and 27, or older than 27. We do so because we wish to have a piecewise constant duration dependence rather than, e.g., a linear specification. Our threshold choices are based on the observed fertility behavior in our sample (conception peaks in the mid-twenties). Table 1 shows that in the sample used for calculating completed fertility, 36 percent of the individual per-month observations occur when the individual is below 25 years of age, and 56 percent occur when the individual is older than 27 (for both men and women). In the sample used for the first birth models, 49 percent of the male individual per-month observations occur when the male is younger than 25, and 60 percent occur for females when they are younger than 25. 40 percent of the women and 31 percent of the men are above 27 years of age.

Table 1 also shows that our individuals have experienced between 6 and 11 percent unemployment prior to any given month (we define previous unemployment as the share of the months observed prior to month *t* in which the individual has experienced unemployment).

Furthermore, our individuals cohabit during a period lasting between 25 and 51 percent of the observed months, and are married for a period lasting between 6 and 27 percent of those months[17]. The individuals are in school for between 18 and 30 percent of observed months. Educational level is categorized into elementary school, high school, vocational training, intermediate training, college or above (i.e. holding a bachelors, masters or PhD degree. As mentioned earlier, most of the individuals have vocational training as their highest level of education.

Finally, we see that most observations are of people who live in counties belonging to the larger cities – Copenhagen and Århus – and a considerable number of observed individuals work in industries like production and trade.[18]

4. Results

While our main analyses are based on 2SLS models, we start out by presenting results from simple OLS models (with clustered standard errors) to provide a benchmark. Thus, Tables 2 and 3 below

[17] Note that the small share of married people reflects large variations in marital status across age – very few married before age 20, and more than half of the sample are married at age 40.

[18] We assign the last known industry for unemployed individuals.

show results from OLS models for completed fertility and the timing of first births, respectively. After briefly summarizing the reduced form findings, we move on to Tables 4 and 5, which show the result from our 2SLS model (first and second stages) for completed fertility and timing of first births, respectively. The first column of these tables reports the results for men, and the second column for women. The models reported in these tables include all of our control variables, including partners' characteristics. In the appendix (Table A1), we also report simpler models that exclude partners' characteristics; we discuss these in section 4.3.

4.1. Results from OLS models

Table 2 shows the non-causal relationships between our first outcome variable – completed fertility – and our full set of covariates. Both men and women who experience unemployment in any given month have lower completed fertility for that given month, compared to men and women who do not experience unemployment. The coefficients are not large, but still highly significant, suggesting that unemployment experience is associated with a lower total number of births.

All other covariates have expected signs. For example, being married or cohabiting raises completed fertility, while both men and women who are in school display lower completed fertility. However, while higher educational level increases completed fertility for men, it decreases it for women. The opposite is true when it comes to previous unemployment: it increases completed fertility for women, but no significant effect is found for men. With respect to partners' characteristics, we see that having an unemployed partner increases completed fertility for men, but decreases it for women. We also see that the partner's level of education matters more when it comes to men's completed fertility, with no similar effect for women. In contrast, the total number of births for both men and women decreases if one's partner is in school.

Table 2 about here

Table 3 below shows the results of the Linear Probability Models (LPM) for the relationship between timing (probability) of first birth and unemployment.

Table 3 about here

As shown, experiencing unemployment is associated with a lower probability of conceiving the first child for women, but a higher probability for men. This finding implies that there is no income effect for men – a bit surprising – but that there is a negative effect for women, indicating that

women may delay the first birth under the condition of unemployment. This model is similar to the standard non-causal models used in the previous literature.

The signs of the coefficients for the control variables in this model are also in the expected direction. For example, we see that being married or cohabiting and having a higher level of education raises the probability of conceiving a first child for both men and women. However, while being in school increases the probability of a conception for men, it decreases this probability for women. This is not unusual, since giving birth while in school might be more disruptive for women than men. In contrast, while previous unemployment lowers the probability of conceiving a child for men, it results in a higher probability for women. Moreover, being a man or woman younger than 25 and being a women older than 27 lowers the probability of conceiving a first child, while being older than 27 increases that probability for men.

Importantly, based on these models we cannot make any causal claims regarding the effect of unemployment on fertility behavior, because of the potential endogeneity discussed previously. Still, we wished to present the reduced form models before moving onto our IV analyses mainly to provide a benchmark, and to illustrate that we may even reach an opposite conclusion once we have taken into account the potential endogeneity between unemployment and fertility. Thus, we continue with the results from the 2SLS models, where we instrument unemployment using firm closures.

4.2. Results from 2SLS models

Table 4 reports the results of 2SLS estimates. The upper panel of table 4 reports the first-stage estimates, and the lower panel reports the second-stage results. From the upper panel, we learn that our exclusion restriction – firm closures – increases the probability of unemployment for both men and women, and that the effect is highly significant for both genders.

Table 4 about here

In addition, we see that while being married, in school, and younger than 25 or older than 27 reduce unemployment probabilities for both men and women, cohabitation and previous unemployment increases this probability. Surprisingly, those with elementary school as their highest educational level are least likely to experience unemployment. The upper panel of table 4 also shows that partners' unemployment is positively correlated with their own unemployment risk, while having a

partner who is in school reduces unemployment risk. Lastly, women whose partner has elementary school as his/her highest educational level are least likely to experience unemployment, while the opposite is true for men. These coefficients should be interpreted as correlations, as it is highly likely that characteristics of an individual's partner are indicators of that individual's own unobserved characteristics.

The lower panel of table 4 shows the coefficient of interest, which designates the causal effect of unemployment on completed fertility – in other words, the total number of births. As discussed in the theory section, the effect of unemployment on the probability of conceiving a child is likely to vary significantly by gender. For women, the theory predicts both a positive (e.g. substitution) effect and a negative (e.g. income) effect, whereas for men the theory predicts only a negative effect. We find that unemployment has a negative effect on the completed fertility of both men and women. Thus, men and women who experience unemployment during ages 16-40 have fewer children than other men and women. These findings correspond to the dominating income effect for both genders.

Additionally, implications of the dynamic models and the predictions of sociological models often indicate a stronger substitution effect for first births. Table 5 shows the 2SLS models (the first and second-stage regressions) on the timing of the first birth for men and women. We find that while the instrument has reasonable power (table 5), unemployment has no effect on the likelihood of conceiving a child for men, and a positive effect for women (significant at the 5% level)[19]. This result is, in fact, in line with the prediction that substitution effects may dominate income effects for women when it comes to the first birth. It is noteworthy that there is no clear income effect (although there is a negative sign) for men who become unemployed due to firm closures.

Table 5 about here

The lower panel of table 5 also shows the coefficients of the controls. We see that married and cohabiting individuals are more likely to experience a first birth. Individuals younger than 25 are less likely to experience first births. And, while being in school increases this probability for men, it decreases the probability for women. Previous unemployment is irrelevant for men, but reduces the probability of first birth for women. Unemployment of one's partner increases the probability of first birth. Meanwhile, level of education is of little importance for both men and women on this

[19] The coefficients in table 5 models should represent marginal effects expressed as hazard rates.

variable. However, having a partner who is in school reduces the probability of first birth for both men and women, and this probability also decreases as the partner's educational level increases.

4.3. Robustness Checks

To ensure the robustness of our findings, we have applied a number of checks. First, we tested whether the results are robust to the exclusion of partner characteristics, and found that this is the case. One may argue that adding characteristics of partners might add another level of endogeneity, although good arguments can be made to control for partners' employment status, as mentioned in section 3.3. Appendix Table A1 shows the results of the models without partner characteristics, revealing that our findings barely change when we exclude partner variables and run models only with individuals' own characteristics as controls.

Second, we have tried several models in which we applied up to three-month lags to our instrument and to the month of unemployment, mainly to take into account the potential time difference between the decision to conceive and the actual conception, as well as properly match the timing of unemployment to these events[20]. Table A2 and A3 shows a summary of these lagging strategies for the total number of conceptions and for the timing of first birth, respectively. Each table reports only the coefficient of interest from the six models, with various lags on the instrument and on unemployment. The sign of the coefficients remains virtually the same for "completed fertility" across all models, although sizes vary somewhat. The results also remain virtually the same for first births, except the specification where we lagged our instrument for the men's sample by three months. There, the sign of the coefficient changes though it is insignificant. For women, the significance disappears while the coefficient sizes and signs are consistent across specifications. Taken together, the results in table A2 and A3 lead us to conclude that our findings remain mostly immune to the inclusion of lags to our models.

The third and last robustness check we provide here speaks to the potential concern about including controls for individuals' previous unemployment. Although we instrument current unemployment experience, we simply control for previous experiences of unemployment by using an indicator showing the share of months spent under unemployment before time t. We control for previous

[20] Note that this strategy does not change the composition of the treated group. Instead, it simply allows us to take into account the potential time lag between the treatment and the outcome of unemployment due to firm closure. In other words, we do not expand the sample of the treated in these models to include individuals who conceived up to three months before the firm closes.

unemployment because such past experiences may lead to further detachment from the labor market when an individual's firm closes; moreover, individuals with a longer record of past unemployment may react very differently to an additional spell of unemployment induced by firm closure compared to those who experienced more uninterrupted careers. Yet, one may argue that this indicator might be endogenous to fertility decisions, thus, we report all the models while omitting this control variable in Table A4. As can be seen, our models are robust to the exclusion of previous unemployment, and the coefficient of unemployment remains very similar to the ones in tables 2 to 5 for all models.

5. Discussion and Conclusions

These results show that experiencing unemployment has a negative causal effect on the total number of conceptions, both for men and for women. In addition, when we look at the timing of first births, we see a positive causal effect that only applies to women. The findings about completed fertility are consistent with the interpretation based on the static-Beckerian model that the income effect of unemployment surpasses the substitution effect of unemployment for both men and women. As a result, both groups may end up having fewer conceptions due to unemployment by firm closures. Put differently, while unemployment may reduce the time cost of childbearing and childrearing, the negative shock to current income may be more important for women and men *in the long run*.

However, the picture changes when we look at the timing of first births. While we found a positive effect for women, indicating a dominating substitution effect, we did not find any clear negative income effect for men. The latter finding is a bit surprising, although there are plausible reasons why timing of births for men might not be affected negatively by unemployment experience in the Danish welfare-state context, given the fact that we do not distinguish insured from uninsured unemployment. The dominating substitution effect for women may also not come as a surprise, since they may experience more pressure not to remain childless – especially when it comes to the first birth – than any pressure to avoid having children resulting from loss of income. After all, in the Danish context, any negative income effect of unemployment might have been alleviated by the reduced cost of childrearing due to the strong welfare state support to families with children, which includes free high-quality childcare.

In fact, these findings are in line with some of the findings of previous studies. Del Bono et al (2012) found that job displacement decreases completed fertility by about 5-10% – although they argue that this is not because of unemployment, but because of career interruption – and Lindo (2010) found that job losses may decrease completed fertility, but does not delay the timing of births. These effects may possibly be driven by uncertainty about future employment (Ahn and Mira, 2002), or higher levels of opportunity cost both in monetary and non-monetary terms (Hotz et al. 1997). Although at this stage we cannot distinguish these two reasons, a combination of the opportunity cost of unemployment in non-monetary terms such as human capital, and the related uncertainty about future employment, might be operating in the Danish context. This interpretation appears to be supported by previous research claiming that Danish women do not suffer significant income loss due to childbirth once one controls for observed characteristics (Gupta and Smith, 2002).

It is important to reiterate that our results have proven robust to a number of alternative specifications. Furthermore, our data has provided the most precise measures of "fertility timing" and "number of conceptions" in the literature by incorporating previously ignored birth outcomes, such as stillbirths and pre-terms, using exact durations of pregnancy. Reducing measurement error for conception timing in our empirical analysis brings us a few steps closer to the theoretical models which are concerned with "conception decisions" under unemployment, rather than "live-birth outcomes." Our data also extends the analysis as close to the current date as possible. Providing up-to-date information has been important for us, because we have no reason to believe that the causal effect of unemployment on individuals' conception decisions in the 1980s and early 1990s should have stayed the same throughout the 2000s. Some of the differences between our findings and the findings of Huttunen and Kellokumpu (2011), among other factors, may be due to the fact that they rely on data for job losses that occurred in the 1990s. We believe that changes both in the economic and policy environment of Europe and in gender roles since the 1990s might have shaped the fertility responses of individuals to unemployment. However, here we should acknowledge that we bear the cost of having limited our sample to a 1966 cohort in order to observe a large fertility window of women, and to keep the sample relevant to the present day. An additional benefit gained from doing so is the possibility of observing all birth events and unemployment experiences throughout the life courses of individuals.

Our findings contribute to a broader literature describing the impact of labor market uncertainty on fertility behavior. Unemployment constitutes the most common – and increasingly more relevant –

type of labor market uncertainty, especially for European countries in the last decade. Although a few studies within that literature have looked at the relationship between unemployment and fertility at the individual level, these rarely adopted a causal approach. Our causal claims rely on an instrumental variable strategy that is supported by industry and county-level fixed effects. The validity of our instrument has been tested on other outcome variables from the previous literature; it is well-accepted and applied even in the Danish context. Yet, adopting a causal approach using a firm-closure instrument comes at a cost: our conclusions can only be generalized to those unemployed specifically due to firm closures. In other words, we keep the interpretation of our results within the limits of the local average treatment effect (LATE). However, one can address a number of interesting questions in the future by extending our analysis to various population subgroups; for instance, differentiating the effect of unemployment by education level, or testing the differences between those who are insured or uninsured against unemployment to look more closely at the role of unemployment insurance, etc. In that sense, our analyses here should be considered as an initial stepping stone in the direction of exploring such heterogenous treatment effects.

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Table 1: Summary Statistics of Main Explanatory Variables

	Completed fertility		First birth
	Men	**Women**	**Men**
Variable	Mean (std.)	Mean (std.)	Mean (std.)
Unemployment	0.10 (0.30)	0.14 (0.35)	0.11 (0.31)
Completed fertility	0.45 (0.80)	0.87 (1.07)	
First child			0.003 (0.06)
Excl. res.: firm closure	0.004 (0.06)	0.003 (0.06)	0.004 (0.06)
Married	0.20 (0.40)	0.27 (0.44)	0.06 (0.24)
Cohabiting	0.40 (0.49)	0.51 (0.50)	0.25 (0.44)
In education	0.18 (0.39)	0.19 (0.39)	0.24 (0.43)
Previous unemployment	0.08 (0.13)	0.11 (0.15)	0.07 (0.13)
Younger than 25 years	0.36 (0.48)	0.36 (0.48)	0.49 (0.50)
Older than 27 years	0.56 (0.50)	0.56 (0.50)	0.40 (0.49)
Level of education (ref: elementary school)			
High school	0.11 (0.31)	0.15 (0.36)	0.04 (0.21)
Vocational	0.35 (0.48)	0.30 (0.46)	0.09 (0.29)
Intermediate	0.04 (0.19)	0.03 (0.16)	0.01 (0.09)
College or above	0.11 (0.31)	0.15 (0.35)	0.03 (0.18)
Missing information	0.01 (0.09)	0.00 (0.06)	0.00 (0.06)
County (ref: Copenhagen)			
Frederiksborg	0.07 (0.25)	0.07 (0.25)	0.25 (0.43)
Roskilde	0.05 (0.21)	0.05 (0.21)	0.06 (0.24)
West Zealand	0.05 (0.23)	0.05 (0.22)	0.04 (0.20)
Storstrøm	0.04 (0.21)	0.04 (0.20)	0.05 (0.22)
Bornholm	0.01 (0.08)	0.01 (0.08)	0.04 (0.21)
Funen	0.09 (0.28)	0.08 (0.28)	0.01 (0.08)
Southern Jutland	0.05 (0.21)	0.04 (0.20)	0.09 (0.28)
Ribe	0.04 (0.20)	0.04 (0.20)	0.05 (0.21)
Vejle	0.07 (0.25)	0.06 (0.24)	0.06 (0.25)
Ringkjøbing	0.05 (0.22)	0.05 (0.21)	0.05 (0.22)
Århus	0.12 (0.32)	0.12 (0.33)	0.12 (0.33)
Viborg	0.04 (0.20)	0.04 (0.20)	0.04 (0.20)
Northern Jutland	0.09 (0.29)	0.09 (0.29)	0.09 (0.29)
Industry (ref: no industry)			
Extraction of raw mater.	0.04 (0.18)	0.01 (0.09)	0.04 (0.19)
Production	0.17 (0.38)	0.09 (0.29)	0.17 (0.37)
Construction	0.08 (0.27)	0.01 (0.10)	0.08 (0.27)
Trade	0.18 (0.39)	0.12 (0.33)	0.19 (0.39)
Hotel and restaurant	0.01 (0.11)	0.02 (0.15)	0.02 (0.12)
Knowledge	0.08 (0.27)	0.08 (0.28)	0.07 (0.26)
Public service	0.09 (0.29)	0.23 (0.42)	0.09 (0.29)
Art and craft	0.01 (0.11)	0.02 (0.13)	0.01 (0.12)
Service	0.10 (0.30)	0.14 (0.35)	0.13 (0.34)
Partner characteristics			
Unemployed	0.07 (0.24)	0.04 (0.20)	0.05 (0.21)
In education	0.05 (0.23)	0.04 (0.19)	0.06 (0.43)
Level of education (ref: elementary school)			
High school	0.05 (0.22)	0.04 (0.19)	0.04 (0.21)
Vocational	0.16 (0.37)	0.27 (0.43)	0.09 (0.29)
Intermediate	0.02 (0.13)	0.03 (0.16)	0.01 (0.09)
College or above	0.08 (0.27)	0.08 (0.27)	0.03 (0.18)
Missing information	0.00 (0.06)	0.01 (0.08)	0.00 (0.06)
N of Observations	**10,648, 800**	**10,122,000**	**7,711,034**

Table 2: OLS models on *Completed Fertility*

	Men	**Women**
Variable	**Coef. (std.)**	**Coef. (std.)**
Unemployment	-0.03 (0.00)***	-0.01 (0.00)*
Married	0.78 (0.01)***	0.75 (0.01)***
Cohabiting	0.13 (0.01)***	0.29 (0.01)***
In education	-0.02 (0.00)***	-0.10 (0.00)***
Previous unemployment	-0.01 (0.02)	1.28 (0.03)***
Younger than 25 years	0.07 (0.00)***	-0.11 (0.00)***
Older than 27 years	0.48 (0.00)***	0.59 (0.00)***
Level of education (ref: elementary school)		
High school	-0.02 (0.00)**	-0.17 (0.00)***
Vocational	0.01 (0.00)*	-0.04 (0.01)***
Intermediate	0.06 (0.01)***	-0.18 (0.01)***
College or above	0.03 (0.01)***	-0.13 (0.01)***
Missing information	0.04 (0.02)’	-0.03 (0.06)
Partner characteristics		
Unemployed	0.05 (0.01)***	-0.03 (0.01)***
In education	-0.20 (0.01)***	-0.20 (0.01)***
Level of education (ref: elementary school)		
High school	0.07 (0.01)***	-0.06 (0.02)***
Vocational	0.11 (0.01)***	0.01 (0.01)
Intermediate	0.13 (0.02)***	-0.00 (0.02)
College or above	0.26 (0.01)***	-0.02 (0.01)
Missing information	-0.16 (0.00)***	-0.12 (0.04)***
Intercept	-0.27 (0.01)*	0.08 (0.01)
F-test	1,8865.73***	2,985.76***

*** p<0.001; ** p<0.01; * p<0.05; † p<0.1 Models also include 13 region dummies and 9 industry dummies. Standard errors are clustered at the level of individual

Table 3: Linear Probability Models (LPM) on *the First Births*

	Men	**Women**
Variable	Coef. (std.)	Coef. (std.)
Unemployment	0.0004 (0.0001)***	-0.0032 (0.0001)***
Married	0.007 (0.000)***	0.0063 (0.0003)***
Cohabiting	0.008 (0.000)***	0.0093 (0.0002)***
In education	0.000 (0.000)***	-0.0017 (0.0001)***
Previous unemployment	-0.001 (0.000)***	0.0048 (0.0005)***
Younger than 25 years	-0.002 (0.000)***	-0.0024 (0.0001)***
Older than 27 years	0.002 (0.000)***	-0.0025 (0.0002)***
Level of education (ref: elementary school)		
High school	-0.0003 (0.000)***	-0.0011 (0.0001)***
Vocational	-0.0002 (0.000)***	0.0012 (0.0001)***
Intermediate	0.0002 (0.000)	0.0007 (0.0003)**
College or above	-0.0000 (0.000)	0.0022 (0.0002)***
Missing information	0.0002 (0.000)	0.0003 (0.0005)
Partner characteristics		
Unemployed	-0.0076 (0.0001)***	0.0012 (0.0003)***
In education	-0.0045 (0.0002)***	-0.0030 (0.0002)***
Level of education (ref: elementary school)		
High school	0.0012 (0.0002)***	-0.0001 (0.0003)
Vocational	0.0025 (0.0002)***	0.0017 (0.0003)***
Intermediate	0.0035 (0.0005)***	0.0018 (0.0005)**
College or above	0.0064 (0.0003)***	0.0036 (0.0004)***
Missing information	-0.0015 (0.0001)*	-0.0010 (0.0007)
Intercept	-0.0008 (0.0001)***	0.0037 (0.0002)
F-test	516.79***	414.58***

*** p<0.001; ** p<0.01; * p<0.05; † p<0.1. Models also include 13 region dummies and 9 industry dummies Standard errors are clustered at the individual level

Table 4. 2SLS Models on *Completed Fertility*.

First Stage, Outcome: The Likelihood of Unemployment

	Men	**Women**
Variable	**Coefficient (std.)**	**Coefficient (std.)**
Instrument		
Firm closure	0.037 (0.002)***	0.039 (0.003)***
Controls		
Married	-0.003 (0.001)***	-0.020 (0.001)***
Cohabiting	0.016 (0.001)***	0.047 (0.001)***
In education	-0.007 (0.001)***	-0.014 (0.001)***
Previous unemployment	1.072 (0.003)***	1.064 (0.003)***
Younger than 25 years	-0.016 (0.001)***	-0.016 (0.001)***
Older than 27 years	-0.111 (0.001)***	-0.138 (0.001)***
Level of education (ref: elementary school)		
High school	0.018 (0.001)***	0.019 (0.001)***
Vocational	0.029 (0.001)***	0.023 (0.001)***
Intermediate	0.011 (0.002)***	0.026 (0.001)***
College or above	0.023 (0.001)***	0.019 (0.002)***
Missing information	0.009 (0.005)†	-0.017 (0.001)*
Partner characteristics		
Unemployed	0.026 (0.001)***	0.085 (0.007)**
In education	-0.004 (0.001)**	-0.211 (0.007)***
Level of education (ref: elementary school)		
High school	-0.005 (0.002)**	0.063 (0.011)***
Vocational	-0.006 (0.001)***	0.103 (0.009)***
Intermediate	-0.000 (0.002)	0.126 (0.018)***
College or above	-0.005 (0.002)**	0.256 (0.011)***
Missing information	0.006 (0.006)	-0.152 (0.034)**
Intercept	0.174 (0.003)***	0.217 (0.003)***
F-test of excluded instruments	267.15***	188.14***
F-test of model/R^2	4,845.78***/0.2701	6.782.16***/0.2739

Second Stage, Outcome: Completed Fertility

	Men	**Women**
Variable	**Coef. (std.)**	**Coef. (std.)**
Endogenous regressor		
Unemployment	-1.446 (0.152)***	-1.158 (0.191)***
Controls		
Married	0.775 (0.007)***	0.726 (0.009)***
Cohabiting	0.155 (0.008)***	0.347 (0.013)***
In education	-0.030 (0.001)***	-0.118 (0.004)***
Previous unemployment	1.509 (0.167)***	2.500 (0.207)**
Younger than 25 years	0.043 (0.004)***	-0.130 (0.006)***
Older than 27 years	0.324 (0.017)***	0.434 (0.027)***
Level of education (ref: elementary school)		
High school	0.011 (0.005)†	-0.146 (0.008)***
Vocational	0.049 (0.007)***	-0.014 (0.010)
Intermediate	0.071 (0.012)***	-0.147 (0.018)***
College or above	0.062 (0.009)***	-0.103 (0.012)***
Missing information	0.057 (0.024)*	-0.052 (0.006)
Partner characteristics		
Unemployed	0.085 (0.007)***	0.038 (0.014)**
In education	-0.211 (0.006)***	-0.203 (0.009)***
Level of education (ref: elementary school)		
High school	0.063 (0.011)***	-0.069 (0.015)***
Vocational	0.103 (0.009)***	0.008 (0.010)
Intermediate	0.126 (0.018)***	0.007 (0.018)
College or above	0.256 (0.011)***	-0.008 (0.013)

Missing information	-0.152 (0.033)***	-0.112 (0.036)**
Intercept	-0.022 (0.0286)	0.332 (0.043)
F-test of model/R^2	1,751.69***/0.2483	2,812.61***/0.3817

Standard errors are clustered at the individual level. Both 1st and 2nd stage equations include region and industry dummies. First stage equation also includes partner characteristics. *** p<0.001; ** p<0.01; * p<0.05; † p<0.1.

Table 5. 2SLS Estimations on the *First Birth*.

First Stage, Outcome: The likelihood of unemployment

	Men	**Women**
Variable	**Coef. (std.)**	**Coef. (std.)**
Instrument		
Firm closure	0.034 (0.003)***	0.029 (0.003)***
Controls		
Married	-0.006 (0.002)***	-0.019 (0.002)***
Cohabiting	0.013 (0.002)***	0.021 (0.002)***
In education	-0.004 (0.001)***	-0.002 (0.001)†
Previous unemployment	1.266 (0.004)***	1.359 (0.006)***
Younger than 25 years	-0.003 (0.001)**	0.013 (0.002)***
Older than 27 years	-0.102 (0.001)***	-0.095 (0.002)***
Level of education (ref: elementary school)		
High school	0.023 (0.001)***	0.029 (0.001)***
Vocational	0.034 (0.001)***	0.032 (0.001)***
Intermediate	0.016 (0.002)***	0.038 (0.003)***
College or above	0.037 (0.002)***	0.034 (0.002)***
Missing information	0.014 (0.005)**	-0.006 (0.009)***
Partner characteristics		
Unemployed	0.036 (0.002)***	0.053 (0.003)***
In education	-0.003 (0.002)*	0.005 (0.002)*
Level of education (ref: elementary school)		
High school	-0.007 (0.002)**	-0.010 (0.003)**
Vocational	-0.011 (0.002)***	-0.010 (0.002)***
Intermediate	-0.004 (0.004)	-0.003 (0.004)
College or above	-0.003 (0.002)	0.004 (0.003)
Missing information	0.014 (0.008)†	0.012 (0.008)
Intercept	0.086 (0.002)***	0.081 (0.004)***
F-test of excluded instruments	159.03***	79.43***
F-test of model/R2	3,908.53***/0.2796	2,352.97***/0.2551

Second Stage, Outcome: first birth

	Men	**Women**
Variable	**Coef. (std.)**	**Coef. (std.)**
Endogenous regressor		
Unemployment	-0.004 (0.010)	0.041 (0.021)*
Controls		
Married	0.007 (0.000)***	0.007 (0.001)***
Cohabiting	0.008 (0.000)***	0.008 (0.001)***
In education	0.000 (0.000)***	-0.002 (0.000)***
Previous unemployment	0.003 (0.012)	-0.055 (0.028)*
Younger than 25 years	-0.002 (0.000)***	-0.003 (0.000)***
Older than 27 years	0.002 (0.001)†	0.002 (0.002)
Level of education (ref: elementary school)		
High school	-0.000 (0.000)	-0.002 (0.001)***
Vocational	-0.000 (0.000)	-0.000 (0.001)
Intermediate	0.000 (0.000)	-0.001 (0.001)
College or above	-0.000 (0.000)	0.001 (0.001)
Missing information	0.000 (0.000)	0.001 (0.002)
Partner characteristics		
Unemployed	-0.007 (0.000)***	-0.001 (0.001)
In education	-0.005 (0.000)***	-0.003 (0.000)***
Level of education (ref: elementary school)		
High school	0.001 (0.000)***	-0.000 (0.000)
Vocational	0.002 (0.000)***	0.002 (0.000)***
Intermediate	0.004 (0.001)***	0.002 (0.001)**

College or above	0.006 (0.000)***	0.003 (0.000)***
Missing information	-0.002 (0.001)*	-0.002 (0.001)*
Intercept	0.001 (0.001)	0.000 (0.002)
F-test of model/R2	527.43***/0.0094	398.70***/-0.0185

Standard errors are clustered at the individual level. Both 1st and 2nd stage equations include region and industry dummies. First stage equation also includes partner characteristics. *** p<0.001; ** p<0.01; * p<0.05; † p<0.1.

Appendix

Table A1: Excluding partner variables (F is the value of F-test of the excluded instrument)

	Men	Women
Completed fertility	-1.523 (F=266.55***)	-1.187*** (F=190.20***)
First birth	-0.006 (F=159.84***)	0.040† (F=80.33***)

***: p<0.001 **: p<0.01, *: p<0.05, †: p<0.10

Table A2: Completed fertility (F indicates value of F-test of the excluded instrument)

	Men	Women
Lagged instrument (1 month)	-1.683***(F=195.81***)	-1.035***(F=212.76***)
Lagged instrument (2 months)	-1.848***(F=163.27***)	-0.939***(F=228.50***)
Lagged instrument (3 months)	-1.851***(F=163.88***)	-0.893***(F=237.46***)
Lagged instrument and lagged unemployment (1 month)	-1.386***(F=278.23***)	-1.082***(F=199.09***)
Lagged instrument and lagged unemployment (2 months)	-1.353***(F=290.70***)	-1.008*** (F=210.82***)
Lagged instrument and lagged unemployment (3 months)	-1.340*** (F=305.67***)	-0.977*** (F=221.30***)

***: p<0.001, **: p<0.01, *: p<0.05, †: p<0.10

Table A3: First birth

	Men	Women
Lagged instrument (1 month)	-0.009 (F=111.61***)	0.010 (F=88.88***)
Lagged instrument (2 months)	-0.013 (F=91.76***)	0.029 (p=0.107) (F=88.88***)
Lagged instrument (3 months)	0.008 (F=94.17***)	0.029† (F=100.75***)
Lagged instrument and lagged unemp (1 month)	-0.007 (F=163.95***)	0.011 (F=83.59***)
Lagged instrument and lagged unemp(2 months)	-0.009 (F=169.10***)	0.031 (p=0.108) (F=86.99***)
Lagged instrument and lagged unemp(3 months)	-0.006 (F=176.03***)	0.032 (p=0.101) (F=89.99***)

***: p<0.001, **: p<0.01, *: p<0.05, †: p<0.10

Table A4: Excluding previous unemployment

	Men	Women
Completed fertility		
OLS		
Unemployment	-0.03 (0.003)***	0.185 (0.005)***
IV		
Firm closure	0.056 (0.003)***	0.050 (0.003)***
F-test for instrument	483.76***	265.10***
Unemployment	-0.976 (0.095)***	-0.628 (0.143)***
Underid-test	460.21***	257.78***
First birth		
OLS		
Unemployment	0.0003 (0.0001)***	-0.002 (0.0001)***
IV		
Firm closure	0.051 (0.003)***	0.040 (0.004)***
F-test for instrument	295.77***	123.48***
Unemployment	-0.003 (0.006)	0.029 (0.015)*
Underid-test	284.95***	120.56***

***: p<0.001, **: p<0.01, *: p<0.05, †: p<0.10