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Employment uncertainty and reproductive decisions in Norway: A register-based study based on plant closures

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Abstract

We assess how employment uncertainty due to experiencing plant closure relates to childbearing among women and men in Norway. We use plant (workplace) closure as an indicator of employment uncertainty to infer a causal effect of experiencing employment uncertainty on fertility outcomes. We use population-level register data for 1999-2014 and event history analysis with logit models of first and second births separately. Our results show that for men, first-birth probabilities remained almost the same within three years of experiencing plant closure, while for women, first- and second-birth probabilities decreased a year before the plant closure, possibly due to anticipation effects, but first-birth probabilities increased by three percentage points in the year of the closure, possibly due to declining opportunity costs. Similarly, for women experiencing plant closure, second-birth probabilities increased by two percentage points in the year of closure compared to the year before closure. The fertility response to experiencing plant closure remained the same for men before (1999-2008) and after the economic crisis (2009-2014). For women, first-birth probabilities increased 1.2 percentage points within three years of the closure, though this increase declined slightly to 0.8 percentage points after the recession period. We conclude that in a setting with high social security levels, experiencing plant closure does not affect men's fertility outcomes (first or second birth), while it increases women's probabilities of having children within three years of the closure. We find no significant differences in the number of children at age 49 between those who did and did not experience plant closure. Therefore, we conclude that plant closure had a slightly positive tempo effect on women's fertility in the years around the closure, but did not have a significant quantum effect on women's fertility. This could be because the scarring (negative long-term) effects of experiencing plant closure on fertility dissipated after a few years due to Norway's generous welfare benefits, and because fertility readjusted after the shock. Thus, workers experiencing plant closure in Norway might have seen it as an opportunity to realise their childbearing ideals over the shorter term and at younger ages.

Keywords: Employment Uncertainty, Gender Equality, Fertility, Life Course, Norway,

1. Introduction

In the Nordic countries, fertility used to follow a “common Nordic fertility regime” characterised by the highest fertility rates in Europe (Andersson et al., 2009). Norway’s Total fertility rate (TFR) fluctuated between 1.7 and 1.9 from the late 1970s until 2007. After the Great Recession in 2008, Norway’s TFR reached a high of 1.98 in 2009, but has been constantly declining since 2010 (Statistics Norway (2024): Population Statistics). Similar declining fertility trends were also observed in other Nordic countries in 2010. These trends have yet to be explained, as factors such as postponement of reproduction (Hellstrand et al., 2021), health factors (Syse et al., 2020), or educational differences (Comoli et al., 2021) cannot fully account for them.

It is unclear whether the fertility decline in Norway following 2009 was at least partly driven by economic uncertainty in general and employment uncertainty in particular~~;~~ see Chapter 5, Hart & Kravdal (2020). This factor has not yet been investigated in the Norwegian context for fertility decline. Economic uncertainty is generally defined as having uncertainty regarding future economic prospects in their surroundings (Beckert, 1996; Bloom, 2014; Vignoli et al., 2020a; Vignoli et al., 2020b). Employment uncertainty occurs when individuals perceive that their employment stability is not guaranteed (Buh, 2023). Employment uncertainty is strongly linked to economic uncertainty, which may lead to hiring stalls. Increasing income inequality might also elicit feelings of insecurity, particularly among young Norwegians. The period after 2008 was also characterized by very high housing prices, which made it difficult for young people to establish themselves in the labour market and to purchase a house (Skirbekk, 2022). Indeed, there is evidence that after the 2008-09 financial crisis, Norwegians became more concerned with having stable employment and increasingly saw it as a prerequisite for starting a family (OECD, 2023). Thus, previous research suggests that employment (un)certainty is particularly relevant for fertility. However, during the financial crisis, the Norwegian economy suffered less than other Nordic countries, with unemployment remaining relatively low and the GDP declining only 1.6% in 2009 (Dølvik & Oldervoll, 2019). Moreover, in Norway, incomes are high, and the welfare state is strong, which should have reduced insecurity caused by unstable labour market conditions (Nguyen, 2017). The net impact of uncertainty on fertility remains unclear.

This study investigates whether experiencing employment uncertainty through the experience of plant closure affects fertility in Norway. We use exposure to plant closure as an indicator of employment uncertainty, exploiting plant closures as quasi-exogenous shocks. Our study uses individually-linked Norwegian administrative registers from 1999 to 2014 and focuses only on individuals aged 15-50 who were employed in the private sector. We use discrete-time event history analysis as our main regression approach to model first and second birth transitions. We also study the number of children individuals had at the end of their reproductive period to assess whether plant closures had quantum effects on fertility. Splitting the data into pre-recession (1999-2008) and recession/post-recession (2009-2014) periods, we assess whether employment uncertainty had a stronger effect on fertility outcomes post-recession. We also look at gender differences in fertility responses to employment uncertainty in all our analyses, as previous studies examining the unemployment-fertility relationship reported mixed results. (Kristensen & Lappegård, 2022) found a negative unemployment-fertility relationship for men and women in Norway in 1994 -2014, while Kravdal (2002) observed a positive unemployment-first birth relationship for women and a negative unemployment-fertility relationship for men in Norway in 1992-1998.

Employment uncertainty is a concept that reflects individuals' expectations that their economic prospects are stable (Comolli and Vignoli.,2021); and this employment uncertainty, combined with income prospects, influences individuals' childbearing ideals, fertility behaviours, and family formation patterns (Kreyenfeld et al., 2012). The literature has used several subjective and objective measures for employment uncertainty. In this paper, we argue that experiencing plant closure is a good measure of individual-level employment uncertainty for two reasons. First, it is arguably exogenous, in contrast to other objective measures of employment uncertainty. Here, exogeneity means that plant closures are beyond individuals' control, as they do not choose whether their plant does or does not close (Brand, 2015). Second, people's experiences of plant closure capture both objective and subjective aspects of employment uncertainty. Workers experiencing plant closure often become unemployed (Bender et al., 2002). Moreover, even if individuals do not become unemployed and move directly to the next job, getting displaced might increase their perceptions of uncertainty regarding their future employment prospects and their chances of experiencing temporary employment and subsequent job losses (Stevens, 1997).

Norway is an interesting context for two main reasons. First, Norway is one of the world's wealthiest nations, with high-income levels and a strong welfare state, which may alleviate potential insecurity caused by unstable labour market conditions. Norway's economy suffered much less than those of other richer countries during the Great Recession. Second, Norwegian society has recently been characterised by high levels of gender equality in household responsibilities and labour market outcomes, which may have reduced gender differences in fertility responses to employment uncertainty in recent years. The gender gap in labour force participation also fell sharply between 1991 and 2011, declining to five percentage points in 2011 (OECD, 2012). These recent increases in female labour force participation and income levels may have strengthened women's bargaining power regarding their childbearing decisions. Thus, we can expect minimal to no gender differences in fertility responses to employment uncertainty.

Our paper contributes to the employment uncertainty-fertility literature in three major ways. First, we use the high-quality register data from Norway to provide insights into the effects of employment uncertainty on fertility due to the exogenous employment shock of plant closure. Such research is missing in the Norwegian context, as previous studies focused only on unemployment. Second, we are the first to look at the salience of the 2008-09 financial crisis for increased levels of employment uncertainty among Norwegians. Third, we examine the long-term effects of employment uncertainty through plant closures on fertility (quantum) by comparing the cohort fertility (total number of children born by the end of the reproductive period for a particular cohort) of the treatment group with that of the control group not experiencing plant closure.

2. Background

2.1 Theoretical perspectives

2.1.1 Economic uncertainty and fertility

Economic uncertainty is becoming a strong predictor of fertility decline and delayed family formation in Europe (Kreyenfeld et al., 2012). Matysiak et al., 2020 showed that after the 2008 recession, fertility rates declined more in the European regions with higher levels of unemployment and deteriorating labour market conditions than in regions affected less by the recession. However, even Norway, the least affected by the recession, experienced a drop in the TFR from 1.98 in 2009 to 1.6 in 2018 (Hellstrand et al., 2021). Economic uncertainty also leads to poor macro-economic conditions and higher unemployment rates, and thus creates doubt among jobholders regarding the stability of their jobs, which, in turn, increases employment uncertainty.

The existing literature on economic uncertainty and fertility mostly examined this relationship using macro-level economic indicators, such as recessions and high unemployment rates, and their impact on fertility. The results were largely similar, showing that fertility is procyclical in developed countries, i.e., a negative relationship exists between high unemployment at the national level and fertility (Adsera, 2005; Sobotka et al., 2011). However, Norway escaped the economic slowdown and high unemployment other countries experienced during the Great Recession, as its impact on the Norwegian economy was minimal, and was largely restricted to a decline in oil prices (Dølvik & Oldervoll, 2019).

2.1.2 Employment uncertainty and fertility

According to Buh (2023), "Employment uncertainty is when an individual feels that their employment stability is not guaranteed or is perceived as not guaranteed". There are several subjective and objective measures of employment uncertainty. The subjective measures capture the feelings of uncertainty more directly than the objective measures using individual surveys, including questions about perceived employment security levels. However, employment uncertainty is often measured objectively at the micro level by examining the prevalence of fixed-term contracts, temporary employment, volatile self-employment, or involuntary job loss, as this information is readily available from the survey data.

Employment uncertainty can impact fertility directly and indirectly through family formation. Its direct impact stems from the fact that some people will commit to having children only when they are sure about their future income or job security, as people may see their future as less secure during recessions or economic slowdowns. Thus, couples might delay their childbearing plans during a recession and wait for the economy to stabilise before having children (Bloom, 2014; Bachmann & Bayer, 2013). This decision about the timing of marriage or childbearing and long-term effects regarding the number of children in the face of employment uncertainty is based on the human agency principle of life course perspective

(Elder, 1998); which states that individuals construct their own life courses through their choices within their historical and socio-economic circumstances. Indirectly, employment uncertainty can delay marriage plans, since marriage is a long-term commitment and requires stable employment and resources. For Italy, Vignoli et al. (2016) showed using objective measures of employment uncertainty, i.e., being in fixed-term or temporary employment, that it significantly decreases the probability of being in a union. Such union formation delays result in the postponement of childbearing plans.

How employment uncertainty shapes union formation and childbearing could differ by gender, as men and women may react differently. The male breadwinner hypothesis states that males are considered less attractive partners if their employment is uncertain, as this can creates doubt about their ability to provide for a family (Kalmijn, 2011). According to the uncertainty reduction framework by Friedman et al. (1994), women, by contrast, might respond to employment uncertainty by entering a union or starting a family to stabilise their uncertain circumstances. However, given the highly gender-equal work and family context in contemporary Norway, women in Norway might respond to employment uncertainty by looking for stable employment, rather than by starting a family.

2.1.3 Employment, fertility, and gender attitudes

The unemployment-fertility relationship varies depending on the gender of the person who lost their job. These differences are rooted in Becker's family economics model (1960), which states that a man's job loss affects fertility only through an income effect, while a woman's job loss can affect fertility through both income and substitution effects. The substitution effect increases women's fertility as being unemployed reduces the opportunity costs of having and raising children, providing a convenient time for childbearing. Thus, the neoclassical model predicts that the overall effect of women's employment/income status on their childbearing decisions is ambiguous, and also depends on other factors at the individual or household level (e.g., her share of income) and the contextual level (e.g., gender norms regarding female work and economic support after childbearing). However, male employment/income status affects fertility only through income, as men are not expected to take time off work to care for their children at home (Heckman & Walker, 1990). Thus, while the neoclassical model predicts that male unemployment negatively affects fertility decisions, women in contemporary Norway might be having fewer children as their labour force participation has increased. Women's jobs are becoming increasingly essential for them, increasing the opportunity costs of childbearing.

The dynamic fertility model (Hotz et al., 1997) predicts that women prefer having children earlier in life to spend more time with their children. It also predicts a stronger substitution effect than income effect for women, meaning that when a woman's income declines due to unemployment, she is more likely to have children (Hotz et al., 1997; Lindo, 2010). This is especially true for the first birth, as the influence of the substitution effect on women's first-birth probabilities can be even greater due to a strong social norm against childlessness. However, this relationship between income loss and fertility among women seems to have reversed in contemporary low-fertility contexts, as recent evidence from Italy suggests that female employment is positively associated with fertility at the individual level (Alderotti, 2022).

2.1.4 Exogenous shocks to employment and fertility

Numerous studies have gone beyond simple unemployment-fertility associations to investigate the causal effects of individual-level job displacements due to firm closures on fertility outcomes in Austria (Del Bono et al., 2012) (Lindo, 2010), the US (Hofmann et al., 2017), Germany (Huttunen & Kellokumpu, 2016), Finland (Andersen & Ozcan, 2021), and Denmark. Bratsberg et al. (2021) examined the effect of experiencing firm bankruptcy on male fertility as an exogenous shock to men's employment in Norway. They found that men experiencing firm bankruptcy are less likely to experience childbirth and more likely to stay childless. They also checked the robustness of their results using establishment closures, and the main results on unemployment and earnings stayed the same.

2.1.5 Plant closure as an indicator of employment uncertainty and income loss

The experience of plant closure is analogous to objective measures of employment uncertainty, such as having a fixed-term contract or temporary employment. This is because experiencing plant closure is akin to having temporary employment, as the affected workers know they will have to find a job elsewhere immediately after the closure, even if they have a few years to do so. The workers also face subjective employment uncertainty when experiencing plant closure, as job loss due to plant closure increases their uncertainty regarding their future employment conditions (Stevens, 1997). A study for Germany by Wunder and Zeydanli (2021) looked at the anticipation effects of experiencing plant closure on workers' objective and subjective employment uncertainty outcomes. They found increases in anticipation effects in workers before they experienced plant closure in terms of their subjective outcomes, such as their feelings of job insecurity, and their objective outcomes, including the probability of job loss. We argue that due to its exogeneity, the experience of plant closure sets the narrative for workers' expectations for future employment, as they may feel uncertainty about the stability of future economic conditions. This uncertainty can, in turn, reduce workers' desired fertility. The narrative framework for employment uncertainty and fertility proposed by Vignoli et al. (2020a; 2020b) explains this fertility behaviour as individuals acting according to their future narratives despite their uncertainty.

2.1.6 Effect of employment uncertainty on completed fertility by welfare context

The number of children an individual has in the face of employment uncertainty is governed by their own life course choices within their historical, socio-economic welfare context and labour market policies. A recent study by Alderotti (2024) looking at completed fertility following employment instability in Italy found significant differences in the number of children born to two age groups who experienced different levels of labour market instability. The results suggest that fertility recovery has been insufficient for the group who experienced labour market deregulation and precarious employment. By contrast, Pailhé & Solaz (2012) found that employment uncertainty does not significantly affect lifetime fertility in France, as the French welfare state offers extensive support to families facing unemployment in the form of generous unemployment benefits. These findings may explain why economic uncertainty affects fertility less in France than elsewhere. We expect to observe a similar pattern in Norway, as the country's welfare system is one of the most generous in the world, with extensive welfare, parental, and unemployment benefits.

2.2 Norwegian context

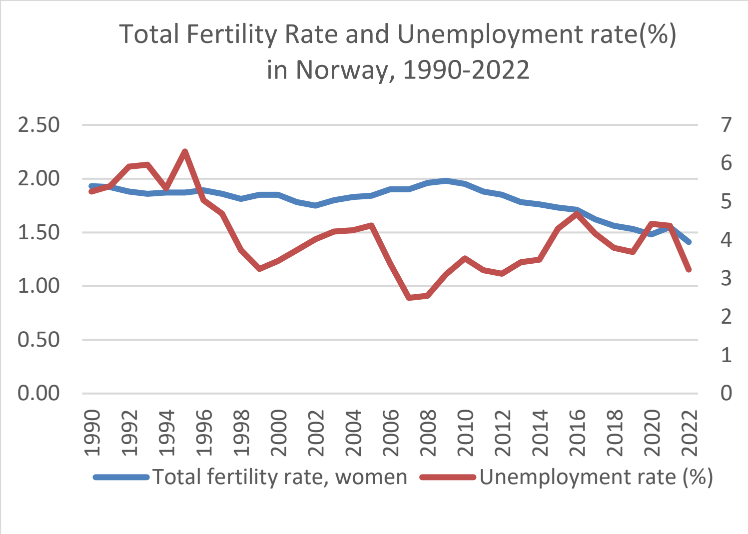
2.2.1 The institutional context in Norway

Norway is a welfare state with generous and universal transfers and tightly knit social safety nets (Esping-Andersen, 1990) that provide high levels of social security to individuals and universal access to services regardless of wealth and occupation. Most men and women in Norway work full-time, and the gender gap in employment rates is relatively small. In 2011, 73.3% of Norwegian women aged 15-64 were employed, compared to 77.3 % of Norwegian men and the OECD average female employment rate of 57.3%. Family policies are designed to support high female employment rates.

A country's socio-welfare policies also play an essential role in buffering the influence of job insecurity on trust (Nguyen, 2017). The Norwegian welfare context appears to have a protective effect on individuals' perceptions of employment uncertainty by providing generous unemployment and welfare benefits. Unemployment benefits are equal to annual compensation of 62.4% of prior income, with a fixed ceiling. The length of time workers can receive unemployment benefits depends on the pensionable income they earned in the previous 12 months (Norwegian Social Insurance Scheme, 2021).

Norway also grants the right to paid parental leave, and the amount parents receive is based on their working status prior to the birth of their child. Parents can take almost one year of paid leave with almost total wage compensation up to a fixed ceiling (The Norwegian Social Insurance Scheme, 2021). Parental benefits are calculated in the same way as sickness benefits. To receive the benefits, parents must have been employed and have received a pensionable income for at least six out of the 10 months before the leave period. Unemployment benefits can also act as the pensionable income required for parental benefits, and unemployed individuals have the right to take parental leave, though their parental benefits might be smaller (Lappegård et al., 2022). This system provides strong incentives for parents to be employed before having a child, and might deter individuals who are uncertain about their employment from having children.

Figure A: Total fertility rate and unemployment rate (%) in Norway 1990-2022



Source: World Bank statistics

2.2.2 Trends in fertility, education, and employment uncertainty in Norway

The fertility rate in Norway was among the highest in Europe during the period covered in this study (1999-2014). Norway's TFR fluctuated between 1.7 and 1.9 in the late 1970s. After the Great Recession in 2008, Norway's TFR reached a high of 1.98, but has been constantly declining since 2010 (Statistics Norway 2024). Unemployment has also been relatively low in Norway over the last 20 years (ranging from 3.2% in 1999 to 3.6% in 2014 for individuals aged 15–74) (Statistics Norway, 2020). See **Figure A**. Moreover, in recent years, women have been spending more time in paid employment while men have been spending more time on household work and childcare (Kitterod & Ronsen, 2003).

Individual-level perceptions of economic insecurity may have increased after the financial crisis of 2008-09, and might have influenced fertility patterns. Even though the Norwegian economy rebounded quickly, Norwegians' perceptions of their economic situation changed after the crisis (OECD, 2023). Oppenheimer (1994, 1997) observed that economic crises and precarious employment prospects may create doubts in people's minds about their ability to provide for their family. This uncertainty effect differs from the income effect. Norwegians also reported placing greater value on having a stable job during the 2010s. Thus, we expect to find that the employment-uncertainty-fertility relationship grew stronger (more negative) over our study period because of the additional value placed on stable employment as a prerequisite for starting a family in Norway.

2.2.3 Previous literature on Norway

Studies on the relationship between unemployment and fertility in Norway were conducted by Kravdal (2002) for the 1992-1998 period and by Kristensen (2022) for the 1994-2014 period. These studies found a gender divide in the relationship between unemployment and fertility. Here, we examine this relationship separately for men and women, as the income and substitution effects affecting this relationship might be similar to those affecting the relationship between unemployment and fertility. Moreover, these studies did not examine the employment uncertainty-fertility relationship in the present era of heightened uncertainty.

One descriptive report by Hart & Kravdal (2020), see Chapter 5, which examined the factors contributing to the fertility decline in Norway, suggested that this decline is not directly related to people's employment status, but is instead attributable to a general feeling of economic uncertainty. Despite the intuition that employment uncertainty is an important determinant of fertility in contemporary Norway, the previous studies on Norway only looked at the effect of being unemployed on fertility by using receiving unemployment benefits as the proxy for unemployment. This approach has two limitations: first, it focuses on the effect of employment status on fertility, which is less relevant in contemporary Norway; and, second, the treatment assignment of being unemployed and receiving unemployment benefits is not random, as it depends on a person's work performance, their aspirations to find another job, and whether they voluntarily resigned due to their fertility preferences or health behaviours. Our study addresses these limitations by assessing the effects of an exogenous "treatment shock" (plant closure) on individual-level employment uncertainty. A plant closure is plausibly exogenous for individuals in dependent employment, as closures are related to macro-economic conditions, and individuals likely have little control over whether the closure happens. Thus, in our study, we examine the relationship between plant closure-induced employment uncertainty and fertility.

2.4 Research aims

Our main study aim is to assess the impact of employment uncertainty on fertility in Norway, addressing issues of endogeneity and considering the broader economic context by tackling our research questions for men and women separately. We formulate the following hypotheses to address our four main research questions based on the existing findings from the literature on employment uncertainty and fertility, theories on gender, and recent developments in gender-egalitarianism in Norway.

Hypothesis 1: Plant closures had minimal effects on fertility responses in Norway due to the country's high-income levels and the strong welfare state, which are expected to alleviate the insecurity caused by unstable labour market conditions.

Hypothesis 2: There was no or only a small gender gap in fertility responses to plant closures for first and second births due to the gender-egalitarian attitudes towards work and childbearing in Norway.

Hypothesis 3: In Norway, the individuals experiencing plant closure in 1999-2008 were less likely to delay their childbearing plans than those experiencing plant closure in 2009-2014.

Hypothesis 4: The number of children at age 49 was the same for individuals regardless of whether they experienced plant closure, as closures had only period effects on fertility due to Norway's generous welfare state and unemployment benefits.

3. Data and Methods

3.1 Data and sample selection

This study uses longitudinal register data from Norway, combining individual-level data from different administrative registers containing the total Norwegian Population. All registers in Norway have an anonymized personal identification number, which allows us to link information from different registers. Our study period covers 1999–2014 and includes detailed information on all children's birth dates, educational attainment, marital status and economic activities such as working hours and income. Our analysis is limited to 2014 as the employment register data after 2014 started to report employment information monthly rather than annually. The coding of occupation, industry, sector, and income definitions also changed from 2015 onwards, making harmonisation between the two periods difficult.

We focus on individuals in their reproductive and working years. Thus, we restrict ourselves to the population aged 15-50, i.e., individuals born between 1949 and 1999. We further restrict the sample to person-years lived in Norway during this period by using information from the residential status register, which indicates whether, in a given year, individuals were or were not registered as residents of the country. This excludes all individuals who unregistered, emigrated, or died in that given year. In total, we are left with 27.53 million person-years from 2.90 million individuals.

For our main analyses, we also restrict the sample to individuals experiencing plant closure in the private sector (as defined below), and compare the likelihood of having a child before and after the plant closure. A total of 239,937 people experienced plant closure and are observed for 3.07 million person-years.

Information on employment and plant closure comes from the employer-employee register for 1999-2014, and combines data on employment and unemployment from the Norwegian Labour and Welfare Administration (NAV) and earnings and income from the Norwegian Tax Authorities. Some forms of employment are not in the employment register, such as short-term employment, jobs performed by freelancers or contractors, paid care work, and unpaid employment. We use employment years based on the start and stop date of the job, including the exact date, month, and year, to add these missing employment person-years.

3.2 Treatment variable: Plant closures

Economic analysis defines a firm as a company that may own one or multiple establishments (plants) (Sadeghi et al., 2016). An establishment (plant) is defined as a single physical unit of a firm, such as a store, factory, or office, where one predominant activity occurs (Sadeghi et al., 2016). Plant closure represents a broader definition of workplace closure than firm closure. We divide workers into those who were exposed or nonexposed to plant closure if they were working in the plant in the year it closed down. We use the plant closure definition in year *t*: a plant is a closing plant in year *t* if it exists in the employment register in year t but is no longer there in year *t +1* or any of the years after *t +1* (Kellokumpu, 2015). For example, a plant that closed down in 2014 will appear in the registers in 2014 but not in the employment registers in 2015. To ensure that these are real closures, we classify those exiting plants for which more than two-thirds of the workforce was working in a single new plant in the following year not as real closures, but rather as reorganisations. This approach aligns with prior studies, such as Rege et al. (2007) and Huttunen et al. (2011). We only consider plants that employed at least five people in the year before closure to reduce the possibility of a self-employed or family business closure being considered a plant closure, as in these cases it is less clear whether the plant closure is an exogenous shock. Based on this definition of plant closure, we create a closure binary variable that indicates whether an individual did or did not experience plant (establishment) closure in a given year.

We use exposure to plant closure as an indicator of employment uncertainty. Experiencing plant closure is a good measure of individual-level employment uncertainty as it captures both objective and subjective aspects of employment uncertainty. First, workers experiencing plant closure often become unemployed (Bender et al., 2002). Second, these workers also face subjective employment uncertainty, as getting displaced due to plant closure increases their uncertainty regarding their future employment, and ultimately increases their chances of experiencing temporary employment and subsequent job losses (Stevens, 1997).

Plant closures are also arguably exogenous, in contrast to other objective measures of employment uncertainty. Here, exogeneity means that plant closures are beyond individuals' control, as workers do not choose whether their plant closes. For this reason, plant closure has been used extensively in the literature as an instrument for unemployment and other labour market outcomes (Brand, 2015). However, using plant closure as an instrument for unemployment, in which plant closure serves as an intent to treat design for job loss/unemployment, may be partially endogenous, as workers might have left in the year just before the closure or started new employment right after the closure depending on their education, capabilities, and perhaps even motivation to find a new job. Therefore, we propose defining plant closure as an exogenous shock for employment uncertainty by directly controlling for plant closures in our model, given that all workers who were exposed to the shock of the plant closure faced employment uncertainty in the following years.

However, firm (plant) closures may also be partially endogenous, as workers' chances of experiencing plant closure depend on their education, capabilities, and perhaps even motivation. For this reason, we also control for a person's education and labour market characteristics, as even though our measure of employment uncertainty is exogenous (to a person's behaviour), non-random selection of individuals into occupations with a higher risk of plant closure means that there is a selection bias when simply comparing individuals who did and did not experience plant closure. For instance, individuals who work for companies that later experience bankruptcy may be negatively selected, as they might have chosen to work there because they had fewer options or were unable to properly assess the company's prospects due to their low levels of education and work experience.

The mechanism through which employment uncertainty proxied by plant closures acts on fertility is income loss/uncertainty following closure. We can measure the effect of employment uncertainty alone by controlling for workers' net income in the year of closure, as that removes the income uncertainty. After controlling for net income, the effects on fertility are only due to employment uncertainty, as the effects are solely attributable to individuals acting according to their perceptions or narratives of the future, and not in response to their current employment/financial situation.

3.3 Outcome variables: Birth indicators

As key outcomes we generate binary birth indicators (first birth and second birth), which reflect whether a given individual had a conception leading to a birth in the observed years, i.e., 1999-2014, using population register data and subtracting nine months from the child's birth date. This gives us the exact month and year of birth and conception. However, since our analysis is at an annual level, we only use the year of conception in our models. This is done to ensure that the plant closure happened before an individual decided to conceive a child. This is a common practice to avoid reverse causation; for instance, individuals who want to have a child might actively decide to leave their current job before giving birth or even conceiving, and thus become unemployed or leave the labour market. Moreover, in our analysis, we consider the first parity only in the case of multiple births. For example, if a childless couple gives birth to twins, we only consider the first birth, as different dynamics apply to the second birth.

We also generate a time-varying variable for the number of children of each person in our sample. This variable tells us the exact number of children a person has in the observed year. For our quantum analysis, we use this time-varying variable at the end of reproductive periods (e.g., ages 34-49 for the 1965 cohort and ages 29-44 for the 1970 cohort). We drop individuals with more than nine children as they constitute a particular group, and account for less than 0.1% of the data. Our analysis does not consider children born abroad, as the person-years in which a person is not registered are excluded. Additionally, we only have the dates of birth of children, and do not have information on pregnancies that were aborted or ended in a stillbirth.

3.4 Covariates

In our event study model, we control for the sex of the working person and interact it with our treatment variable, i.e., time to plant closure, to compute the trajectories of birth probability by time to plant closure for each gender.

As Dommermuth & Lappegård, 2017 observed, there are differences in the fertility, income, and education levels of immigrant women in Norway from those of native women. We include a dummy variable in all our models separating those born in Norway from those born abroad. We also control for the individual's current age by adding a squared term for age as our covariate. Adding the square of the age variable allows us to model the effect of age more accurately, which has a non-linear relationship with fertility. Educational attainment includes three groups based on the Norwegian standard for defining education (NUS) categories: primary or no education coded as one, secondary education coded as two, and tertiary education coded as three. We also control for the period effects by controlling for the year as a categorical variable to capture the possible impact of changing fertility rates over time.

3.5 Methods

In our analysis of first-birth probabilities following plant closures, childless females and males are followed from age 15 until the year they conceived their first child. They are also censored from our analysis sample if they were over 50, died, emigrated permanently, or reached the end of our study period in 2014. Similarly, we have built our model for analysing the second childbirth by conditioning on the timing of the second birth conception or censoring for men or women with one child, and applying the same censoring conditions as for the first birth.

We use binary logistic regression in all our analyses under the framework of event history analysis (Yamaguchi, 2005). This study investigates the impact of employment uncertainty on an individual's probability of childbirth within three years of the plant closure. We use observations from t-3 to t+3 for the event study analysis of individuals experiencing plant closure, i.e., a specific time window for people experiencing plant closure, where t is the year of plant closure. This restriction enables a within-group comparison of people exposed to plant closure. We then predict the first- and second-birth probabilities models separately by time to plant closure.

We assess the impact of plant closure on fertility in the context of Norway's unemployment and business cycles by distinguishing between periods, with one model covering the whole period (1999-2014) and one model separating the years before (1999-2008) and after the Great Recession (2009-2014). For our pre- and post-recession period analysis, we calculate the average marginal effect separately for people who experienced plant closure between 1999-2008 and 2009-2014. The average marginal effect measures, on average, how much the probability of birth has changed from three years before the closure to three years after the closure for the two periods separately. We then compare these estimates of the two periods to ascertain whether the effect changed post-recession.

To assess whether plant closure had only a timing effect on fertility, we estimate the mean number of children for both the treatment and the control group by simply comparing the mean number of children at ages 34-49 for the 1965 cohort and at ages 29-44 for the 1970 cohort. The treatment group includes people who had ever experienced plant closure, while the control group consists of people who had never experienced plant closure.

3.6 Potential mechanisms

We also examine potential mechanisms of the relationship between experiencing employment uncertainty through plant closures and fertility. First, we investigate whether plant closure was accompanied by a decline in annual work income in the years following the plant closure for those who found employment in the private sector in **Figure A3**. Since

Norway has generous unemployment and parental benefits, it is reasonable to focus on an individual's net income rather than just on their annual earnings from work. Thus, we also look at whether experiencing plant closure was accompanied by a net income loss during the year of closure and in the following years in **Figure A4**. We then test the relationship between plant closure and first-birth probabilities for people experiencing plant closure, after additionally including net income as a covariate in **Figures A5 & A6** to see whether the loss in annual net income mediated this plant closure-fertility relationship. Finally, to assess the extent of unemployment following plant closures, we also estimate the proportion of people who were re-employed in the private sector in the years after the closure in **Figure A2**.

4. Results

The descriptive results are available in Table S1 and Figure S1 in the supplementary materials. We use the time to event (plant closure) as our main predictor variable in the binary logit model and predicted margins for first and second childbirths (**Figures 1 and 2)**. Plant closure did not affect first- and second-birth probabilities for males within three years of the closure, as shown in **Figures 1 and 2,** respectively. In contrast, for females, first- and second-birth probabilities increased significantly in the year of plant closure. The most substantial increase in first-birth probabilities for females, of three percentage points, happened in the year of plant closure. For the next three years, first-birth probabilities remained consistently higher, at around two percentage points, for women than for men (**Figure 1)**. Similarly, the most significant gains in second-birth probabilities for women, by around two percentage points, were in the year of plant closure. In later years, second-birth probabilities for women decreased, in line with those for men (**Figure 2)**.

Figure 3 shows the relationship between plant closure and first-birth probabilities during different periods, i.e., 1999-2014, 1999-2008, and 2009-2014. We see no significant changes in the effects of plant closure between the later and the earlier period for men (first-birth probabilities increased 0.2 percentage points after plant closures). We also see no changes in the effects of plant closure across periods on second-birth probabilities for men, as the relationship stayed almost zero.

Figure 4 shows that women experienced slightly stronger positive effects in pre-recession periods (first-birth probabilities increased 1.2 percentage points after plant closures), which decreased slightly after the recession period (to 0.8 percentage points). However, plant closures had slightly positive effects on women's second-birth probabilities in both periods (increasing 0.6 percentage points). Overall, we found little evidence that the impact of plant closures on fertility changed after the Great Recession.

Finally, we examine whether these short-term fluctuations in the childbearing plans of people experiencing plant closure affected the total number of children they had at the end of their reproductive years. **Figure 5** calculates the mean number of children for men in the treatment and control groups separately. We find that men in both groups ended up having around 1.8 children by age 49 (1.82 in the control group and 1.81 in the treatment group), which is close to the official estimate of 1.84 children for men of the 1965 cohort at age 50 (see Table 2, SSB Norway). This means that experiencing plant closure had no long-term effects on men's fertility. Similarly, we find that women in the treatment group ended up having the same number of children (2.025) by age 49 as women in the control group (2.024). This figure is slightly lower than the official estimate (2.06) for the 1965 cohort (see Table 2, SSB Norway). The slight difference could have arisen because we only consider private sector plants in our analysis. People working in the private sector have lower fertility because of its greater uncertainty. Similarly, Lappegård et al., (2022) found that fertility is lower in the service sector. Our robustness checks for the number of children at age 44 for women of the 1970 cohort show almost the same results (1.94 children in the treatment group and 1.98 children in the control group). Thus, for Norwegian women, experiencing plant closure may have been viewed as an opportunity to realise their childbearing ideals, rather than as a source of employment uncertainty. We also see minor differences for men at age 44 (1.73 for the treatment group and 1.71 for the control group).

We estimate the proportion of people who became unemployed in the years after the plant closure. **Figure A2** shows that around 62% of males and 57% of females were re-employed in the private sector in the following year. We also examine whether workers who found employment in the private sector after the plant closure experienced a decline in work income (**Figure A3)**. We find persistent wage differences between males and females who experienced plant closure. We also observe a decline in annual work income in the year of the plant closure for both men and women, which could be a mechanism for delaying childbearing plans for three years after the plant closure for men. This figure also shows that in the years after the plant closure, annual work income recovered for workers who found employment in the private sector. While women earned less than men, their unemployment had a smaller effect on household income. As the income effect was weaker for women than for men, women might have used the plant closure as an opportunity to have children.

Since Norway has generous unemployment and parental benefits, it is reasonable to focus on an individual's net income rather than just their annual earnings from work. This is because even if a person becomes unemployed following a plant closure or decides to have a child around the time of the plant closure, they can still qualify for unemployment/parental benefits, and this net income from tax registers includes these benefits. **Figure A4** demonstrates the results of regressions where the outcome variable is annual net income. We observe no change in the year of closure, which could be due to the person receiving work income for part of the year and later getting benefits for the rest of the year. However, we see a decline for both men and women in the years after the plant closure, followed by a recovery for men but not for women within five years.

The potential loss in income in the years after the closure could be a mechanism for an individual to change their fertility plans. Thus, we ran our same main analysis for the first- and second-birth probabilities by time to plant closure, but added net income as a covariate to remove the income effect from our models. **Figures A5** and **A6** present the results from these models, and show that the results remain almost unchanged for the first- and second-birth probabilities. This could mean that all changes we observed in our model controlling for net income are due to employment uncertainty.

5. Discussion

5.1 Main findings

This article investigates the relationship between experiencing employment uncertainty due to a plant closure and childbearing. Our results show that within three years of the plant closure, first-birth probabilities were almost the same for men, while for women, first- and second-birth probabilities decreased a year before the plant closure, possibly due to anticipation effects, but first-birth probabilities increased by three percentage points in the year of closure, possibly due to declining opportunity costs. Similarly, for women experiencing plant closure, second-birth probabilities increased by two percentage points from the year before to the year of closure. We see a decline in women's second-birth probabilities in subsequent years, in line with those of men. These results contradict our first hypothesis that employment uncertainty would have no effects on fertility. Our second hypothesis, that there would be no gender differences in fertility responses to plant closures, must also be rejected.

These zero effects on men's fertility outcomes following plant closures might be explained by the finding that 62% of men found jobs in the private sector the year after the closure. For the remaining men who did not find employment in the following years, the generosity of social safety programmes, such as unemployment and parental benefits, may have buffered their fertility intentions against employment uncertainty; hence, we find no effects for men. However, a previous study found a negative association between unemployment and men's first-birth risks in Norway between 1994 and 2014 (Kristensen et al., 2022). Similar studies following the relationship between unemployment and fertility (e.g., Kreyenfeld, 2016; Solaz et al., 2020; Kristensen et al., 2022) argued that men experiencing unemployment might delay their childbearing plans until their economic situation is less uncertain. These studies looked at a selected group of men who experienced unemployment, while our study design captures employment uncertainty due to plant closures, and not due to unemployment per se. In our study, plant closures often did not lead to unemployment, as workers started searching for employment beforehand, and most found jobs around the time of the closure. Thus, unlike previous studies, we are not solely focused on unemployed men, which might be driving the negative effects. As our results apply to a broader male population facing employment uncertainty, and not just unemployed individuals, we find no effects.

We observe a positive impact of experiencing employment uncertainty due to plant closure on the first-birth risks of women in the three years after plant closures. This may be because half of the women stayed employed in the private sector after the closure. We also show in **Figure A3** that women earned less than men, and thus contributed a smaller share of the household income. As women's unemployment had a lesser effect on household income, the income effect was weaker for women than for men. Previous research for Norway by Kravdal (2002) using data from 1992 to 1998 suggested that first-birth rates were slightly higher for unemployed women than for employed women. However, Kristensen et al. 2022 found a negative association between female unemployment and first-birth probabilities in Norway between 1994 and 2014. These studies used receiving unemployment benefits as the indicator for unemployment, which means their treatment was becoming unemployed and applying for unemployment benefits. This may be partially endogenous, as people who lost their jobs and were receiving unemployment benefits could constitute a selective sample depending on their education, capabilities, and perhaps even motivation to find a new job. By contrast, our study design captures employment uncertainty due to experiencing plant closure, and not unemployment per se, as 50% of women found jobs in the year after the plant closure. As our results apply to a broader female population facing employment uncertainty, and not just to unemployed females who might be driving these negative effects, we find positive effects.

We also find no apparent change in the plant closure-fertility relationship for the first or second birth among men, even in the later years of our analysis (2009-2014). We observe that for men, the effect stayed almost zero over both periods. Similarly, we find no change in the plant closure-fertility relationship among women, as even though there were slightly stronger positive effects in pre-recession periods (first-birth probabilities increased 1.2 percentage points after the plant closure), which decreased slightly after the recession period (2009-2014) (to 0.8 percentage points), their confidence intervals overlap. The plant closure-fertility relationship for second-birth probabilities among women also remained unchanged in post-recession periods. This contradicts our third hypothesis, as we expected to find that the plant closure-fertility relationship grew stronger (more negative) over time after the 2008-09 financial crisis. However, as the financial crisis had little effect on Norwegian labour markets, see no significant changes in the relationship over time. We expected to observe that with the strengthening position of women in the Norwegian labour market, cooperative fathers, favourable social norms, and supportive family policies may have increased women's bargaining power regarding their childbearing decisions in the later years of our analysis. Hence, our third hypothesis, that the effect of employment uncertainty on fertility would be more negative in the post-recession period, is rejected.

Finally, we find support for our fourth hypothesis, which states that the number of children at age 49 would not differ between people who did and did not experience plant closure. We have tested this on the 1965 cohort for men and women separately, and find that they had almost the same number of children by the end of their reproductive lives by comparing the mean number of children in both groups over age. At age 49, men in both groups had 1.8 children on average, while women in both groups also had almost the same number of children (2.02). When we look at these results combined with those from the event study analysis, we see that they show no tempo or quantum effect for men. However, women who experienced closure preponed their childbearing plans compared to women who did not. Thus, for Norwegian women, experiencing plant closure may have been seen as an opportunity to realise their childbearing ideals, rather than as a source of unemployment uncertainty. These results align with findings from (Pailhé & Solaz, 2012), which show that employment uncertainty does not significantly affect lifetime fertility in France, as the French welfare state offers extensive support to families facing unemployment, which may explain why economic uncertainty affects fertility less in France than elsewhere.

5.2 Methodological considerations

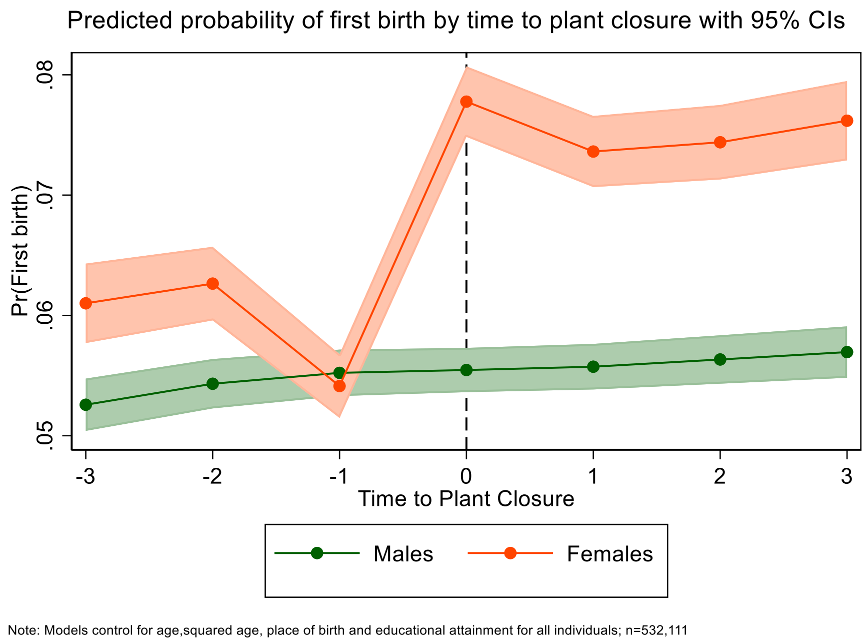
Our study has several limitations. First, we use people working in the plant until the year it closed down as our treatment group, which could be an issue, as workers may have adjusted their fertility behaviour in anticipation of the plant closure before it happened. This might bias our plant closure treatment effect on fertility towards zero. Moreover, there might be a selection of workers who chose to stay in the plant until the year of closure, as individuals with better education and more labour market experience may have left a few years beforehand. Alternative strategies have been used in the literature, including sampling workers one or two years before the closure. This is a trade-off, as choosing the earlier year improves the exogeneity of workers being attached to the particular firm. However, choosing workers one or two years before the closure as a treatment might lead to heterogeneity in exposure to employment uncertainty, as some of the workers would have left the plant before its closure.

Additionally, we could estimate the quantum (long-term) effects of plant closures by comparing cohort fertility (total number of children born by the end of the reproductive period) for the 1965 and 1970 cohorts only because our data do not go beyond 2014. Thus, it is possible that experiencing plant closure has had a quantum effect on later cohorts, as they are more sensitive to employment uncertainty and have different fertility norms, ages at first stable partnership, ages at first birth, childcare costs, and housing expenses, which could have influenced their fertility decisions.

We also do not control for partner characteristics in this study as the information on cohabiting partners is available only from 2005 onwards. Partner characteristics could impact our results, as whether the partner is employed may affect an individual's decision to have children when experiencing plant closure. Further studies examining the employment uncertainty/unemployment-fertility relationship should be done from a couple's perspective to see whether the partner's labour market characteristics influence the probability of having a child following an individual's unemployment. Studies on the unemployment-fertility relationship from a couple's perspective are scarce. However, a few studies, such as Huttunen & Kellokumpu (2016) for Finland and a recent study by Di Nallo et al. 2023, analysed the effects of job loss on the fertility of couples in the UK and Germany.

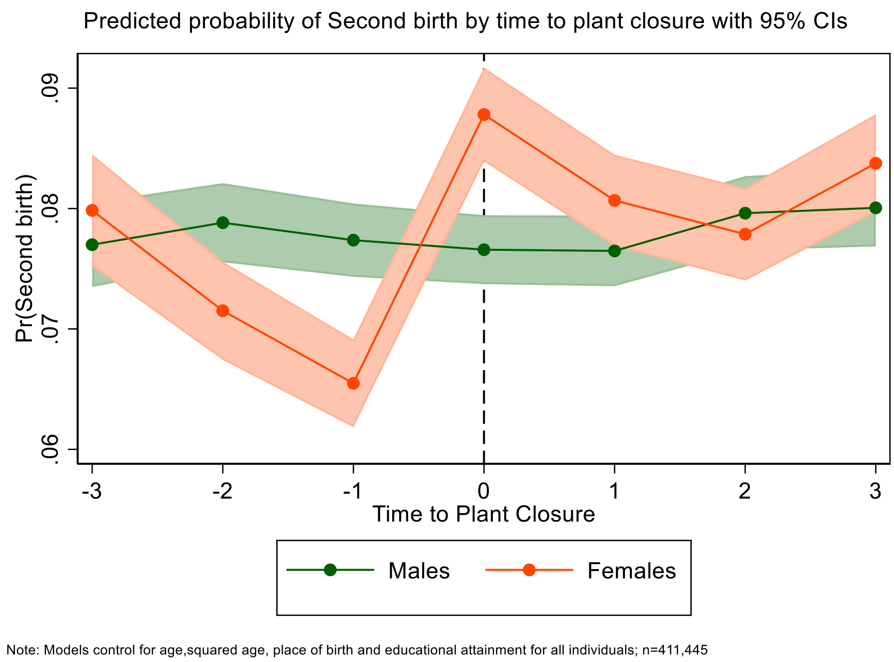
Figures

Fig 1: Predicted first-birth probabilities by time to plant closure using a binary logistic model



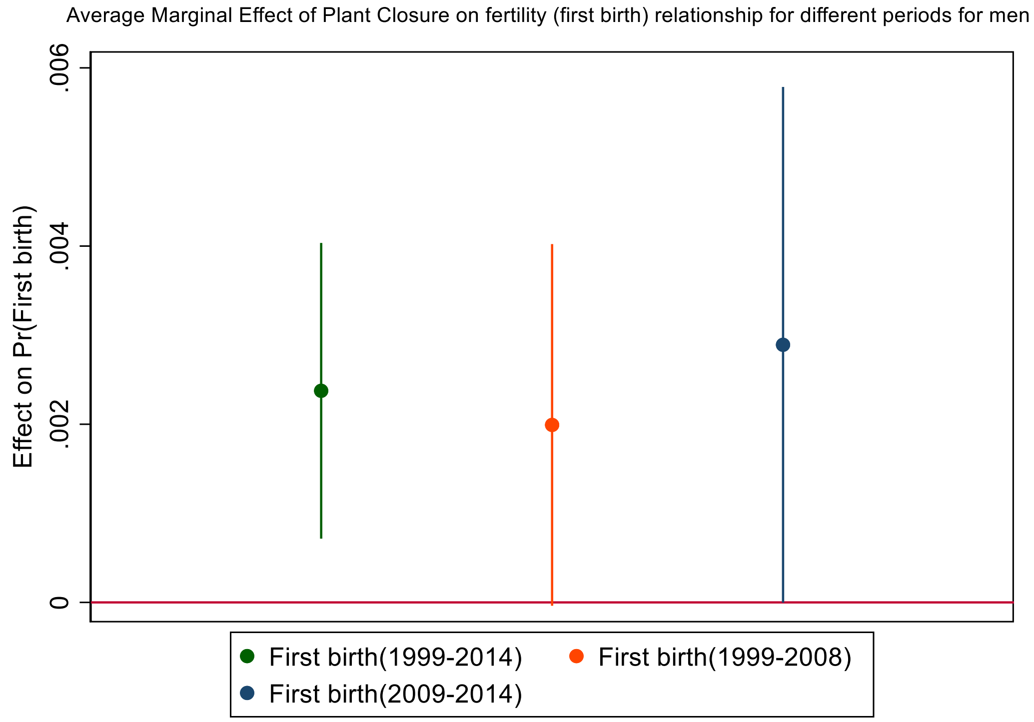
Note: Predicted first-birth probabilities by time to plant closure using a binary logit model. Full regression results in Table A.1.

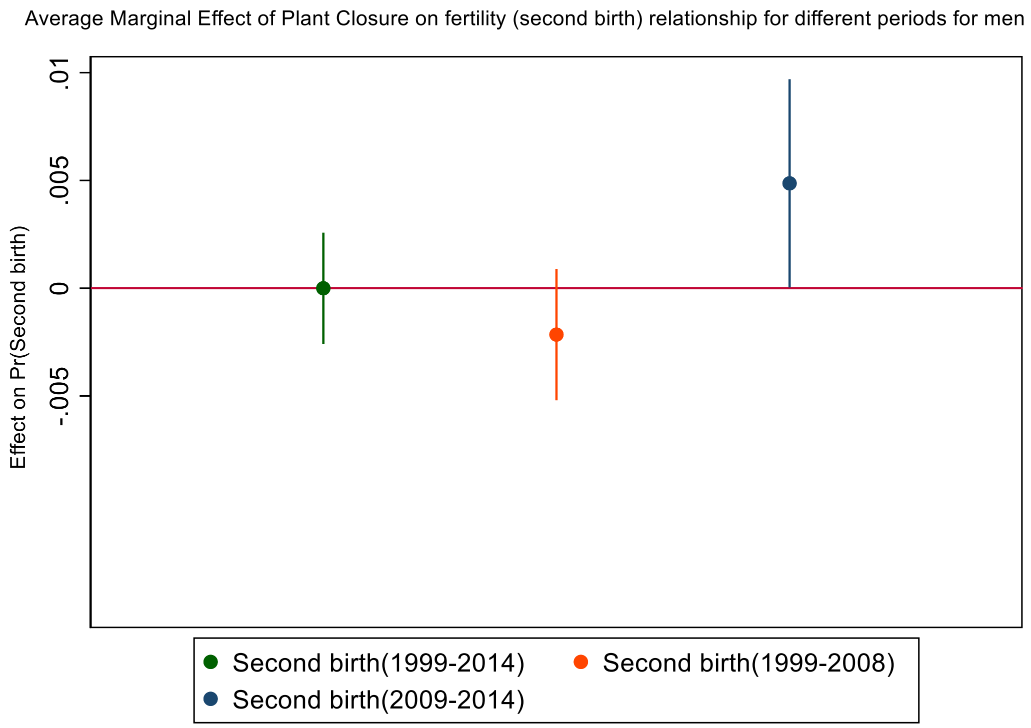
Fig 2: Predicted second-birth probabilities by time to plant closure using a binary logistic model



Note: Predicted second-birth probabilities by time to plant closure using a binary logit model. Full regression results in Table A.2.

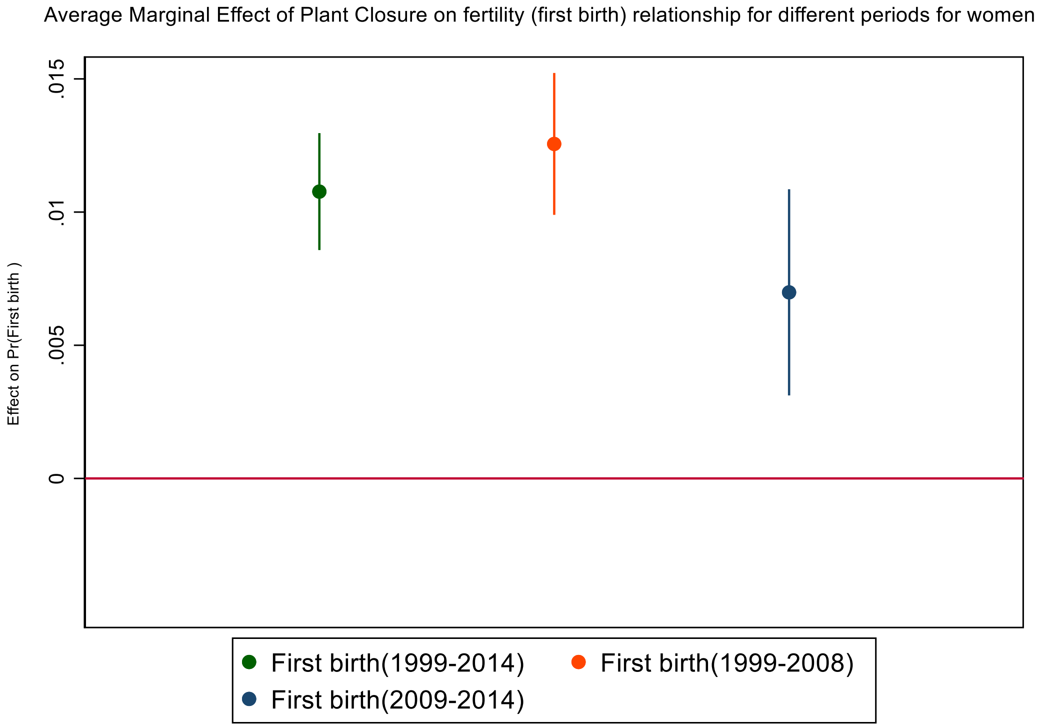
Fig 3: Plant closure-fertility relationship for different periods for men: first birth (top) and second birth (bottom)

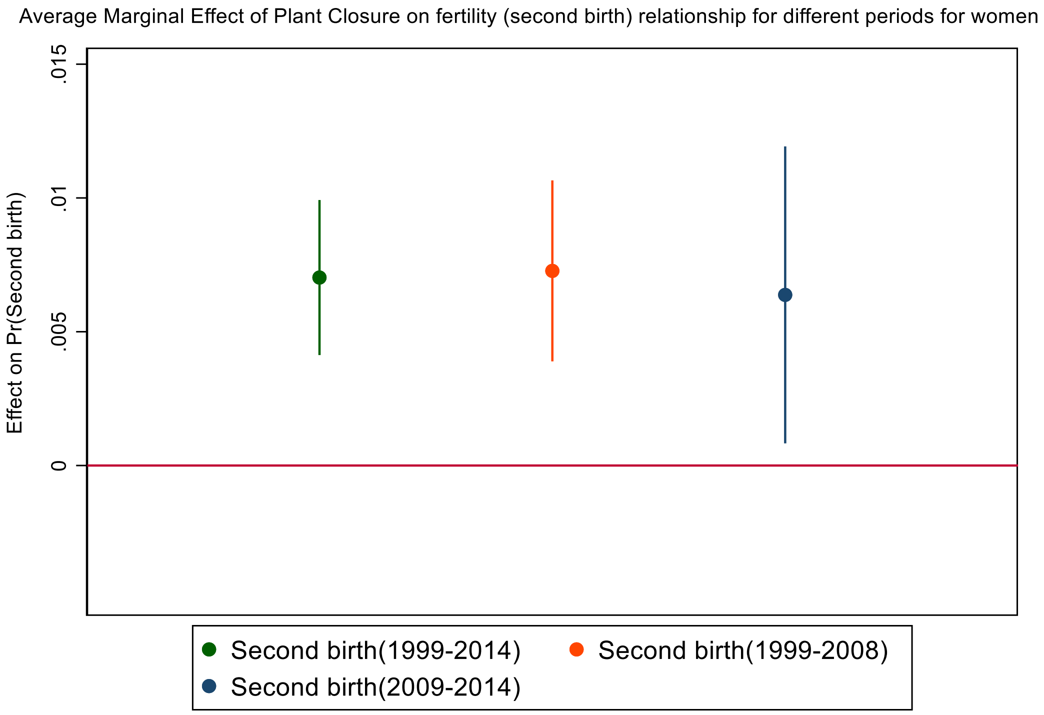




Note: Marginal effects of plant closures following the binary logit model run separately for men and women for different periods.

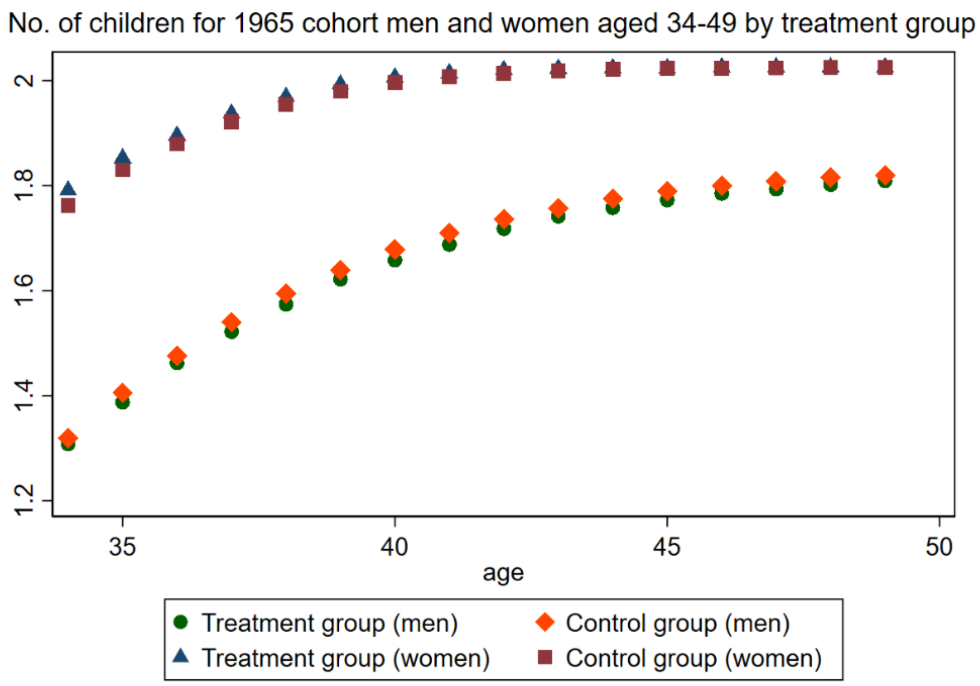
Fig 4: Plant closure-fertility relationship for different periods for women: first birth (top) and second birth (bottom)

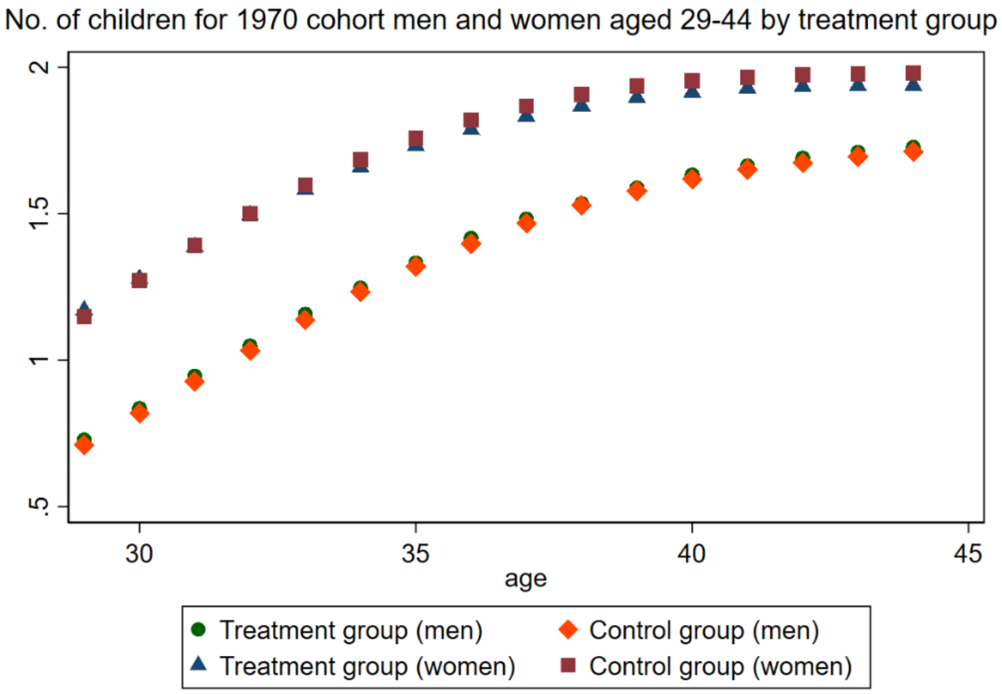




Note: Marginal effects of plant closures following the binary logit model run separately for men and women for different periods.

Fig 5: Total number of children for the 1965 cohort (top) and the 1970 cohort (bottom) by treatment group status





Note: Mean numbers of children are estimated by age for the treatment and the control group.

APPENDICES

Fig.A1: Number of individuals experiencing plant closure by year

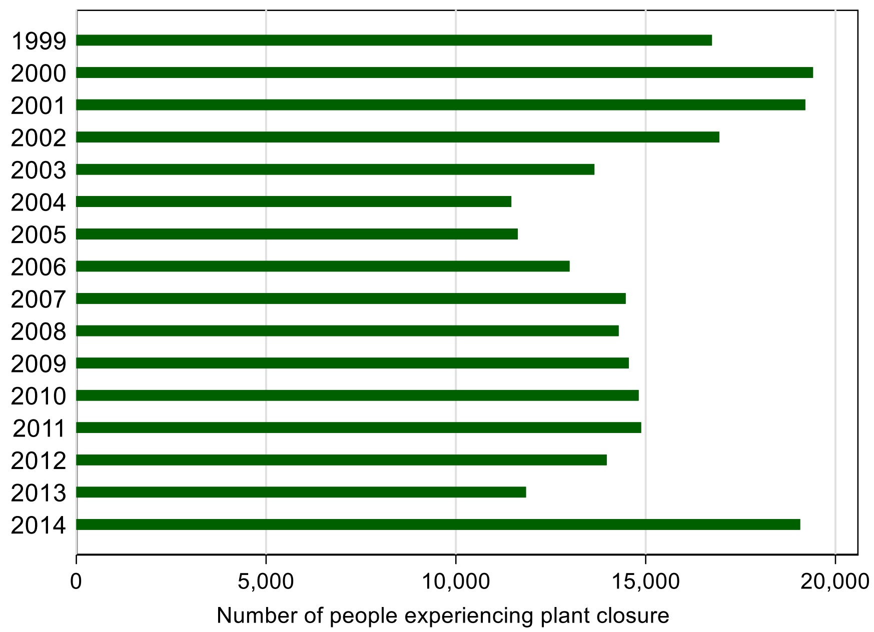
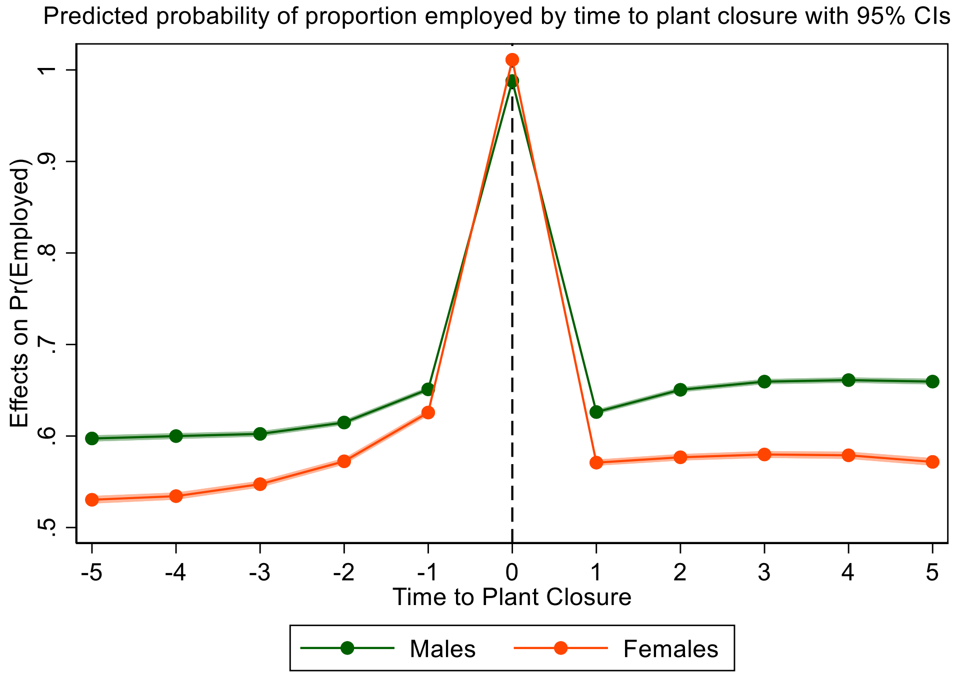
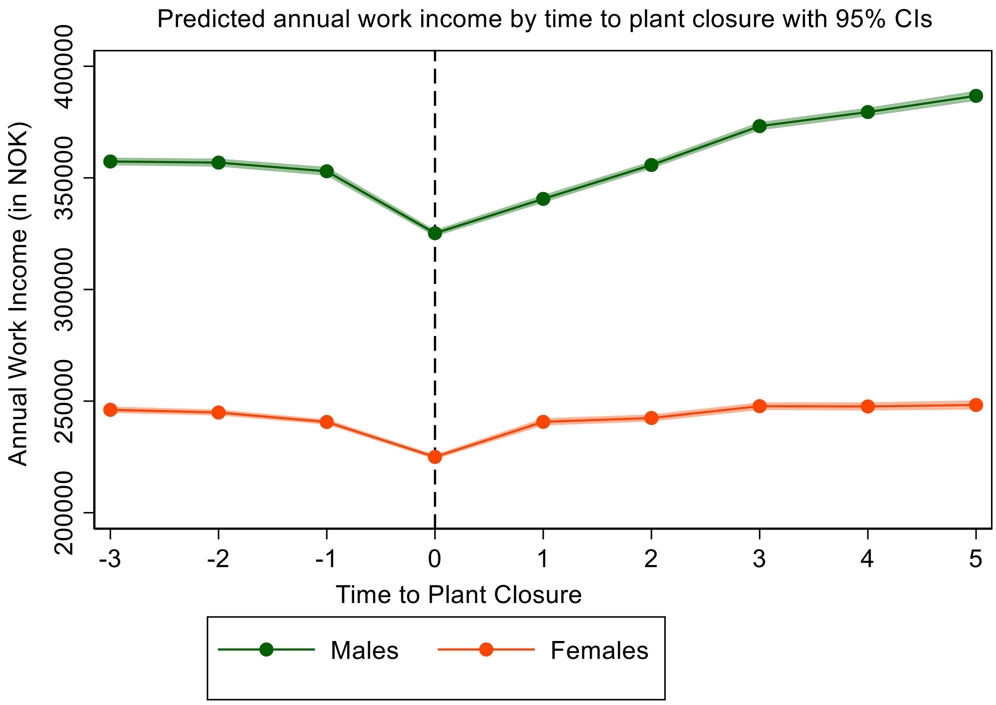


Fig A2: Proportion of people employed before and after plant closures



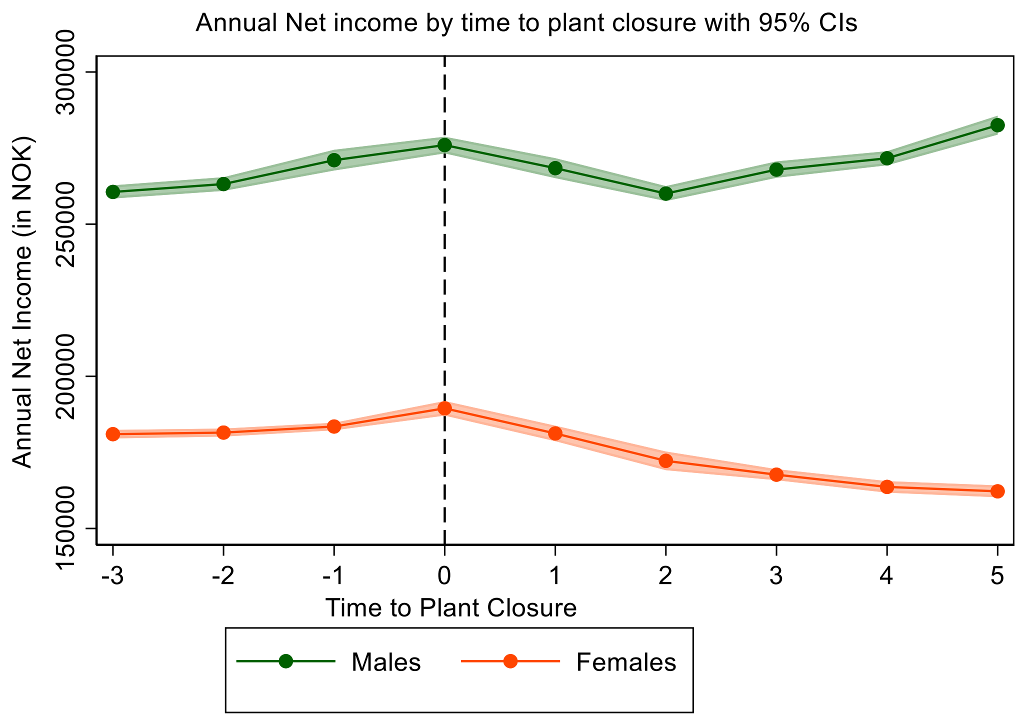
Note: Proportion of people employed before and after plant closures using a binary logit model for men and women.

Fig A3: Plant closure-work income trajectory for people experiencing plant closure



Note: Predicted work income following plant closures using a linear probability model.

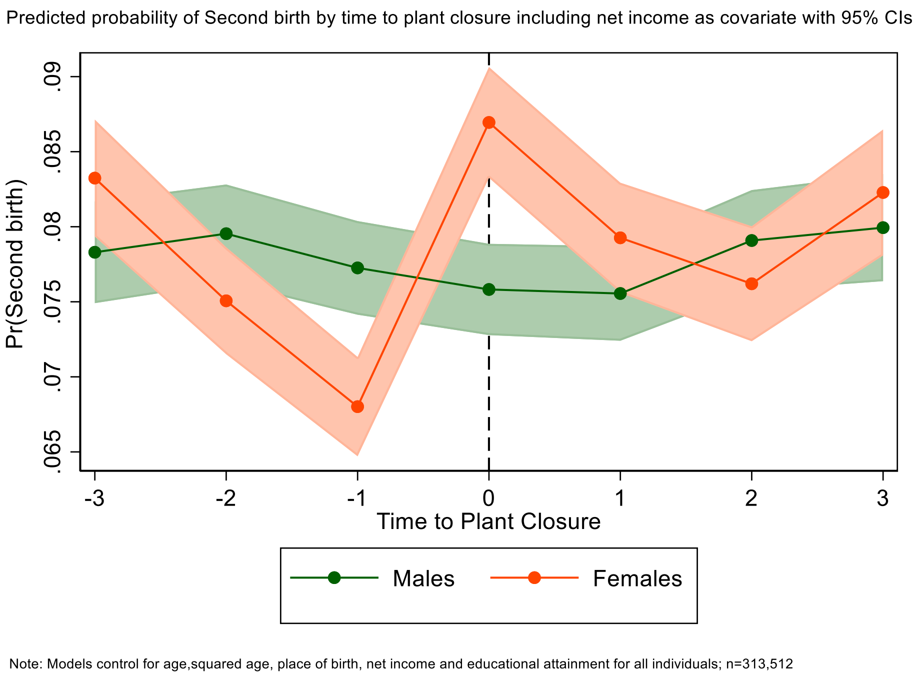
Fig A4: Plant closure-net income trajectory for people experiencing plant closure



Note: Predicted net income following plant closure using a linear probability model.

Fig A5: Plant closure-first-birth probabilities for people experiencing plant closure, after additionally including net income as a covariate

Fig A6: Plant closure-second-birth probabilities for people experiencing plant closure, after additionally including net income as a covariate



Note: Predicted first- and second-birth probabilities by time to plant closure using a linear probability model.

Table A.1: Regression results for the first birth by time to plant closure using a binary logistic model

Variables	Coefficients	95% CI	Robust SE
First birth			
Time to closure (TTC) (-3) (Ref)			
TTC (-2)	0.035	-0.025 - 0.096	(0.031)
TTC (-1)	0.053*	-0.005 - 0.112	(0.030)
TTC (0)	0.058**	0.000 - 0.116	(0.029)
TTC (1)	0.063**	0.005 - 0.122	(0.030)
TTC (2)	0.075**	0.015 - 0.135	(0.030)
TTC (3)	0.087***	0.026 - 0.148	(0.031)
Male (Ref)			
Female	0.162***	0.088 - 0.236	(0.038)
TTC (-3) #Male (Ref)			
TTC (-3) #Female (Ref)			
TTC (-2) # Male (Ref)	0.000	0.000 - 0.000	(0.000)
TTC (-2) # Female	-0.006	-0.106 - 0.093	(0.051)
TTC (-1) # Male	0.000	0.000 - 0.000	(0.000)
TTC (-1) # Female	-0.184***	-0.282 - -0.086	(0.050)
TTC (0) # Male	0.000	0.000 - 0.000	(0.000)
TTC (0) # Female	0.212***	0.120 - 0.304	(0.047)
TTC (1) # Male	0.000	0.000 - 0.000	(0.000)
TTC (1) # Female	0.145***	0.051 - 0.239	(0.048)
TTC (2) # Male	0.000	0.000 - 0.000	(0.000)
TTC (2) # Female	0.145***	0.050 - 0.240	(0.049)
TTC (3) # Male	0.000	0.000 - 0.000	(0.000)
TTC (3) # Female	0.160***	0.063 - 0.257	(0.049)
Age	0.885***	0.867 - 0.903	(0.009)
Age squared	-0.014***	-0.015 - -0.014	(0.000)
year =1999 (Ref)			
year = 2000	-0.024	-0.092 - 0.045	(0.035)
year = 2001	-0.017	-0.085 - 0.050	(0.034)
year = 2002	0.013	-0.053 - 0.079	(0.034)
year = 2003	0.066*	-0.000 - 0.133	(0.034)
year = 2004	0.107***	0.039 - 0.174	(0.035)
year = 2005	0.169***	0.101 - 0.238	(0.035)

year = 2006	0.194***	0.125 - 0.263	(0.035)
year = 2007	0.295***	0.227 - 0.364	(0.035)
year = 2008	0.320***	0.252 - 0.388	(0.035)
year = 2009	0.336***	0.268 - 0.403	(0.035)
year = 2010	0.243***	0.174 - 0.312	(0.035)
year = 2011	0.211***	0.142 - 0.280	(0.035)
year = 2012	0.090**	0.017 - 0.163	(0.037)
year = 2013	0.049	-0.027 - 0.125	(0.039)
year = 2014	-0.026	-0.107 - 0.054	(0.041)
Foreign-born (Ref)			
Norwegian-born	-0.102***	-0.136 - -0.069	(0.017)
Primary education (Ref)			
Secondary education	-0.050***	-0.079 - -0.021	(0.015)
Tertiary education	-0.003	-0.035 - 0.030	(0.017)
Constant	-15.753***	-16.022 - -15.483	(0.138)
Observations	532,111		

Robust standard errors in parentheses (*** p<0.01, ** p<0.05, * p<0.1)

Table A.2 Regression results for the second birth by time to plant closure using a binary logistic model

Variables	**Coefficients**	**95% CI**	**Robust SE**
Second birth			
Time to closure (TTC) (-3) (Ref)			
TTC (-2)	0.027	-0.043 - 0.096	(0.035)
TTC (-1)	0.006	-0.062 - 0.073	(0.035)
TTC (0)	-0.006	-0.072 - 0.060	(0.034)
TTC (1)	-0.008	-0.075 - 0.060	(0.034)
TTC (2)	0.038	-0.030 - 0.106	(0.035)
TTC (3)	0.044	-0.025 - 0.113	(0.035)
Male (Ref)			
Female	0.041	-0.042 - 0.124	(0.042)
TTC (-3) #Male	0.000	0.000 - 0.000	(0.000)
TTC (-3) #Female	0.000	0.000 - 0.000	(0.000)
TTC (-2) # Male	0.000	0.000 - 0.000	(0.000)
TTC (-2) # Female	-0.151**	-0.265 - -0.036	(0.059)
TTC (-1) # Male	0.000	0.000 - 0.000	(0.000)
TTC (-1) # Female	-0.228***	-0.340 - -0.115	(0.057)
TTC (0) # Male	0.000	0.000 - 0.000	(0.000)
TTC (0) # Female	0.115**	0.009 - 0.221	(0.054)
TTC (1) # Male	0.000	0.000 - 0.000	(0.000)
TTC (1) # Female	0.019	-0.088 - 0.127	(0.055)
TTC (2) # Male	0.000	0.000 - 0.000	(0.000)
TTC (2) # Female	-0.066	-0.175 - 0.043	(0.056)
TTC (3) # Male	0.000	0.000 - 0.000	(0.000)
TTC (3) # Female	0.010	-0.099 - 0.120	(0.056)
Age	1.050***	1.026 - 1.073	(0.012)
Age squared	-0.016***	-0.017 - -0.016	(0.000)
year =1999 (Ref)			
year = 2000	-0.086**	-0.164 - -0.007	(0.040)
year = 2001	-0.125***	-0.202 - -0.048	(0.039)
year = 2002	-0.165***	-0.241 - -0.089	(0.039)
year = 2003	-0.159***	-0.236 - -0.083	(0.039)
year = 2004	-0.209***	-0.287 - -0.131	(0.040)
year = 2005	-0.163***	-0.241 - -0.085	(0.040)
year = 2006	-0.173***	-0.252 - -0.094	(0.040)
year = 2007	-0.218***	-0.297 - -0.139	(0.040)
year = 2008	-0.217***	-0.296 - -0.139	(0.040)
year = 2009	-0.235***	-0.314 - -0.157	(0.040)
year = 2010	-0.163***	-0.242 - -0.085	(0.040)
year = 2011	-0.224***	-0.303 - -0.144	(0.041)
year = 2012	-0.119***	-0.201 - -0.037	(0.042)
year = 2013	-0.142***	-0.231 - -0.053	(0.045)
year = 2014	0.039	-0.055 - 0.132	(0.048)
Foreign-born (Ref)			
Norwegian-born	-0.121***	-0.158 - -0.083	(0.019)
Primary education (Ref)			
Secondary education	0.055***	0.021 - 0.088	(0.017)
Tertiary education	0.162***	0.125 - 0.199	(0.019)
Constant	-18.518***	-18.899 - -18.137	(0.194)
Observations	313,714		

Robust standard errors in parentheses (*** p<0.01, ** p<0.05, * p<0.1)

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Supplementary

Table S1 shows descriptive statistics of people who have never experienced plant closure versus people who have ever experienced plant closure. We notice that people who experienced plant closure are 1.5 years older than those who had never experienced it, which explains why the proportion of childlessness is lower in this group than in the control group. Moreover, there is a higher proportion of men in the treatment group than in the control group, as men are often working in more precarious sectors such as manufacturing.

Figure S1 shows the distribution of our employed sample by the industry of their employment. We can see that our sample's employment is distributed among all the industries. This makes our sample representative of the employed population in these sectors, including people in the service, retail, business, and manufacturing sectors. The bottom figure also reveals the distribution of people experiencing plant closure by the industry in which they are employed. We can see that plant closures are distributed among all the industries, which makes our treatment (plant closure) more representative, contrary to the belief that plant closures occur primarily in the manufacturing sector.

Tables & Figures

Table S1: Descriptive statistics of people who never experienced plant closure versus people who ever experienced plant closure

Individual characteristics	Never experienced plant closure		Ever experienced plant closure		Difference between the two groups	
	mean	**sd**	**mean**	**sd**	**b**	**t**
Age	31.975	10.262	33.183	9.537	-1.208***	(-207.276)
Number of children						
Childless	0.295	0.456	0.239	0.427	0.056***	(214.895)
One child	0.157	0.364	0.170	0.376	-0.013***	(-57.414)
Two children	0.329	0.470	0.359	0.480	-0.030***	(-103.353)
Three children	0.165	0.371	0.173	0.378	-0.008***	(-34.570)
Relationship status	0.311	0.463	0.322	0.467	-0.011***	(-37.212)
Married	0.311	0.463	0.322	0.467	-0.011***	(-37.212)
Country of origin						
Born outside Norway	0.120	0.325	0.122	0.327	-0.001***	(-6.864)
Born in Norway	0.870	0.336	0.868	0.338	0.002***	(9.308)
Gender						
Male	0.558	0.497	0.610	0.488	-0.052***	(-177.301)
Female	0.442	0.497	0.390	0.488	0.052***	(177.301)
Net income (NOK)	219774.637	799736.781	239976.869	511468.764	-20202.232***	(-60.413)
Educational attainment						
Primary education	0.333	0.471	0.313	0.464	0.020***	(71.177)
Secondary education	0.413	0.492	0.456	0.498	-0.043***	(-142.063)
Tertiary education	0.238	0.426	0.214	0.410	0.023***	(92.707)
Observations	24459422		3066324		27525746	

Fig.S1: Distribution (%) of people by industry and people experiencing plant closure by industry in our sample