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Research Article

Unemployment and fertility: The relationship between individual and aggregated unemployment and fertility during 1994–2014 in Norway

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Abstract

BACKGROUND
Studies on the unemployment–fertility relationship show divergent and inconclusive findings.

OBJECTIVE
We aim to investigate the unemployment–fertility relationship by focusing on multiple dimensions of unemployment across 21 years.

METHODS
Using register data covering the Norwegian population in the period 1994–2014, we apply discrete-time event history analysis to estimate the relative risk of first and higher-order births for men and women by their employment situation and local unemployment levels.

RESULTS
There is a negative association between individual unemployment and the risk of birth for childless women, childless men, and fathers. For mothers, the association is positive. The negative association is present among childless men and childless women across the included time period of the study, whereas for mothers and fathers it disappeared over time. There is a negative association between municipal unemployment rates and higher-order births, but not first births. A positive association was found in the 1990s for childless men and childless women, but at the turn of the millennium the association became slightly negative. For mothers and fathers, the negative association remains over time but grows weaker and less clear. Our findings also show that individual unemployment matters more for people's fertility behavior than aggregated

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unemployment and that it matters more for childless individuals' childbearing decisions than for parents'.

CONTRIBUTION

By investigating the unemployment–fertility relationship using different unemployment measures and a gender perspective, this paper extends our understanding of contemporary fertility dynamics while also checking for potential changes in this relationship across time.

1. Introduction

Low fertility is a concern in modern societies. With many countries experiencing increasing economic uncertainty, more attention has been given to the unemployment–fertility relationship. So far, the findings have been divergent and inconclusive.

Among men, the unemployment–fertility relationship is mainly negative (Busetta, Mendola, and Vignoli 2019; Kravdal 2002; Neels, Theunynck, and Wood 2013; Pailhé and Solaz 2012), but some findings show a positive association (Inanc 2015). Among women, a positive unemployment–fertility relationship has frequently been observed (Adserà 2011; Busetta, Mendola, and Vignoli 2019; González and Jurado-Guerrero 2006; Schmitt 2012), in addition to more ambiguous results that are both nonsignificant and negative (Comolli et al. 2020; Gutiérrez-Domènech 2008; Kravdal 2002; Özcan, Mayer, and Luedicke 2010). These findings underline the necessity of a gender perspective when studying the relationship between unemployment and fertility because the employment situation of men and women may influence fertility decisions differently.

Three main sources of variation across empirical studies might lead to inconclusive or weak empirical evidence for the unemployment–fertility nexus: the measure of unemployment, the sample under study, and the period of the study. First, unemployment can be measured at either the aggregate or the individual level, but both measurements are rarely included in the same study. When using only one of the measures the effect of unemployment may be reflecting a combined effect of the two. When jointly considered, the effect will be separated and give a clearer insight into the importance of both individual unemployment status and the effect of exposure to general unemployment levels. A second complication in the analysis of unemployment and fertility is that the ramifications of unemployment might depend on individuals' current life-course stage or socioeconomic position. Small samples make it difficult to account for this, reducing the potential for studying fine-tuned group-specific differences in behavior (Kreyenfeld and Andersson 2014). Finally, varying results could emerge from studies investigating the unemployment–fertility relationship in different time periods. The influence of

unemployment on individual fertility is unlikely to be fixed and may change over time. However, investigating the relationship between both individual and aggregated unemployment and individual fertility over time is data-demanding and such studies are few and far between.

In seeking to cope with these issues and provide fresh insight into the relationship between unemployment and fertility, this study focuses on multiple dimensions of unemployment and makes use of administrative register data that covers the whole resident population of Norway in the period 1994 to 2014. More specifically, we investigate how both individual and aggregated unemployment impact the risk of birth.

In all our analyses we distinguish between men and women and between individuals with and without children. We investigate men and women separately, but we acknowledge that both partners' economic situation (including unemployment) influences the couple's fertility decisions. However, our data does not include information on the partners' economic situation.

A similar study on Norwegian data was carried out by Kravdal (2002), covering the period from 1992 to 1998. Our study differs from that study by covering a longer period and including a fixed-effect procedure that controls for unobserved characteristics of the municipalities that people live in, which may influence the unemployment–fertility relationship. In so doing, our study distinguishes two important dimensions of unemployment: individual unemployment, which refers to whether an individual is registered as unemployed or not, and aggregated unemployment, which refers to unemployment levels at the municipal level.

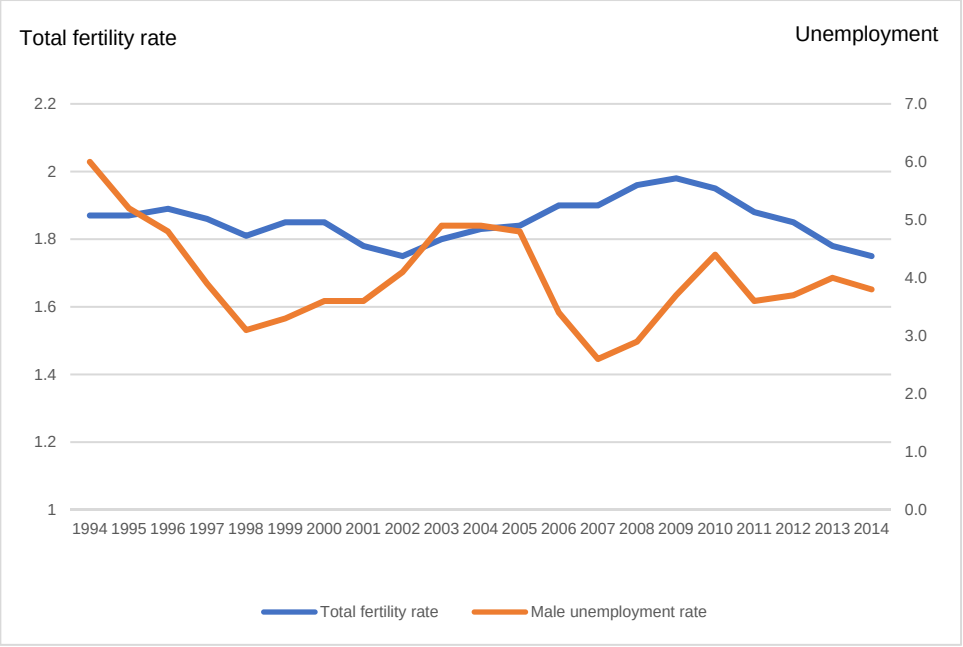
2. The Norwegian context

Fertility levels in Norway were among the highest in Europe during the period covered in this study. However, although the total fertility rate was relatively high and stable during the 1990s and 2000s, it decreased annually after 2010 (see Figure 1). When compared with other Western countries, national levels of unemployment in Norway over the last 30 years have been relatively low and stable, but with some variation (ranging from 5.4% in 1994 to 2.5% in 2007 and 3.6% in 2014 among individuals aged 15–74 years) (Statistics Norway 2020).

People are eligible for unemployment benefits if their income from work in the previous year or over the last 3 years was above a specified minimum, and their working hours were reduced by at least 40%. This means that people eligible for unemployment benefits may be either fully or partly unemployed. People are also eligible for benefits while temporarily dismissed by their employer. Those receiving unemployment benefits must actively look for work using an activity plan controlled by the unemployment

agency. Unemployed individuals must be willing to take on any job offered to them or take part in courses aimed at assisting the unemployed. The unemployment benefit equals about 60% of an individual's previous income and parents of minor children receive an extra fixed sum. The unemployed are entitled to these benefits over a period of 104 weeks maximum (2 years). These regulations remained the same during the period of our study.

Figure 1: Total fertility rate and percentage of the unemployed male labor force, Norway 1994–2014



Source: Statistics Norway: Total fertility rate: www.ssb.no/en/statbank/table/04232; Male unemployment; www.ssb.no/en/statbank/table/08517.

In Norway, there are strong incentives for being employed before having children because the welfare system provides more generous economic benefits to employed parental leave takers. Since 1993 parents can take approximately a year of paid leave with 100% wage compensation up to a relatively high fixed ceiling. One part of this period is reserved for the mother, a second for the father, in the sense that it cannot be transferred to the other parent, and a third is divided as per their choosing. The length of assigned leave for mothers and fathers increased during the period of our study. To receive the benefit, parents are required to have been employed for at least 6 out of the 10 months

preceding the period of leave. This condition creates a strong incentive to be in full-time employment before having children. Women who are ineligible for the benefit may receive a low, fixed lump-sum payment following childbirth (there is no similar payment for fathers). Parental leave benefits for unemployed parents are calculated based on the amount they receive in unemployment benefits.

Gender equality in Norway is high, and during the last 20 years it has been an explicit governmental aim to increase the proportion of women who combine working full-time with having young children (Ellingsæter and Jensen 2019). During the period under investigation there has been a steady increase in the number of women working full-time (Dommermuth, Kornstad, and Lappegård 2019). However, the proportion of women working part-time is higher than the European average.[3] This pattern of high female labor market participation combined with a high degree of part-time work has been described as "gender equality light" (Rønsen and Skrede 2010).

3. Literature review

Previous studies that have investigated the relationship between unemployment and fertility can generally be grouped into two types: studies that focus on aggregate unemployment and studies that focus on individual unemployment. It is rare that they account for both dimensions at the same time.

Focusing on individual unemployment, several studies suggest a lower risk of birth among the unemployed than among the employed. In Norway, using administrative register data, such a negative effect is found for women's risk of first birth in the years 2000–2015 (Dommermuth and Lappegård 2017). Using data from the French Generations and Gender Survey for the period 2005 to 2011, Pailhé and Régnier-Loilier (2017) find that childless unemployed people less frequently plan to have a child in the short term and that those who have experienced unemployment less frequently have a child. By contrast, unemployment does not directly affect the frequency of subsequent births among women and among men who have already become fathers. Others suggest a positive relationship between individual unemployment and fertility, especially among women. In a comparative study of France, West Germany, and the United Kingdom, using data from the European Community Household Panel (1994–2001), Schmitt (2012) shows evidence for a weak negative relationship between unemployment and the probability of first birth among men and a weak positive relationship among women in both Germany and the United Kingdom.

[3] According to Eurostat, 40% of employed women in Norway worked part-time in 2010, whereas the European average was 30.5% (Eurostat 2021).

Regarding aggregated unemployment, several studies that are based on macro data only suggest that unemployment rates are negatively associated with fertility. Studying the consequences of the economic recession in the 1980s and 1990s, Adserà (2011) reports that an increase in unemployment rates in Europe had a negative impact on the number of childbirths. She also finds a stronger negative relationship between unemployment rates and fertility in countries where unemployment rates have been increasing and maintaining higher levels over time, compared with countries with more fluctuating unemployment rates (Adserà 2011). Based on macro data on fertility and unemployment from 2001 to 2010 in 28 OECD countries, Goldstein et al. (2013) show that the increase in unemployment rates following the financial crisis in 2008 lowered fertility rates, especially first-birth rates among the younger age groups.

Several studies look at the relationship between aggregated unemployment and individual fertility. In Norway, using administrative register data, Kravdal (2002) finds that increased aggregate unemployment rates at the municipal level reduced the risk of first, second, and third births among Norwegian women in the years 1992–1998. Using register data, Dommermuth and Lappegård (2017) reach the same conclusions for the years 2010–2015. In addition, they find that the negative impact of unemployment rates at the municipality level on fertility increased significantly in the later period when there was a decline in total fertility rates (2010–2014) compared with the previous period when fertility rates increased (2000–2009). For the years 1992–1998, Kravdal (2002) finds that aggregated unemployment had a negative impact on fertility among women and that the relationship grew increasingly negative throughout the 1990s.

In their analysis of 10 European countries using European Social Survey data from 2004 and 2011, Fahlén and Oláh (2018) find a negative relationship between increased unemployment rates and women's intentions to have their first child. Especially for men, the negative relationship between fertility intentions and unemployment rates was stronger in periods when the unemployment rates in Europe were especially high (Fahlén and Oláh 2018).

In their study looking at both individual unemployment and aggregated unemployment and using data from the National Longitudinal Survey of Youth 1997, Yu and Sun (2018) find that neither individual-level nor aggregate-level unemployment has a universal influence on birth risks among young American men and women. However, they find that the effects vary depending on educational attainment and social background (parent's education). More specifically, the relatively advantaged with well-educated parents and a college education are more likely to postpone childbearing when becoming unemployed than the less advantaged. However, the less advantaged are more likely to postpone having children when faced with higher local unemployment rates.

4. Theoretical considerations

4.1 Links between individual unemployment and fertility

A common starting point for investigating the unemployment–fertility relationship is the idea that people postpone having children until they can provide for them economically and perceive that they will also be able to do so in the future. An individual lacking employment or steady income may prefer to postpone decisions about having children until the situation is less uncertain and may be less likely to have a/another child overall (Kreyenfeld 2016; Kreyenfeld, Andersson, and Pailhé 2012; Vignoli, Drefahl, and De Santis 2012; Vignoli, Mencarini, and Alderotti 2020; Vignoli, Tocchioni, and Mattei 2020). In addition, having been or currently being unemployed may increase individuals' concern and doubt about their financial future and career prospects (Solaz et al. 2020; Yu and Sun 2018).

Following Becker's theory on fertility, the cost of a child is related to how much time parents spend on their children and how much they want to invest in them (Becker 1991). This means that the cost of a child is not fixed but varies depending on parental ambitions and requirements regarding child 'quality.' It has been emphasized that low income per se does not necessarily produce low fertility because people adjust their material ambitions and requirements regarding child 'quality' accordingly (Kravdal 2002). Overall, unemployment results in people having a lower income than they have grown accustomed to while being employed. For many, this means that they will be unable to fulfill their material ambitions and expectations for their child, which in turn may decrease their fertility (Kravdal 2002).

Alternatively, childbearing may be considered a potentially favorable strategy and alternative to unemployment or economic uncertainty. First, through what is referred to as a substitution effect, individual unemployment may reinforce individual fertility because it provides a convenient period for childrearing and providing care (Adserà 2005; Busetta, Mendola, and Vignoli 2019). Second, when an individual no longer has a job to lose the opportunity cost of childbearing decreases, which could have a positive effect on childbearing (Yu and Sun 2018). Third, according to the uncertainty reduction theory proposed by Friedman, Hechter, and Kanazawa (1994), individuals may respond to economic uncertainty by having a child. This argument is based on a fundamental assumption that individuals always aim to reduce uncertainty. Becoming a parent and creating a long-term social commitment to the child and the family results in a more predictable situation that thereby reduces uncertainty.

It should be noted that the potential effects of individual unemployment on childbearing may be influenced by self-selection into unemployment. On the one hand, people with health problems, which are associated with lower fertility (Syse et al. 2022),

may be more likely to be unemployed, which could help underpin a negative relationship between unemployment and fertility. On the other hand, people with stronger preferences for children and family life combined with lower ambitions in the labor market may be more inclined to be unemployed, which could drive a positive relationship between unemployment and fertility.

4.2 Links between aggregate unemployment and fertility

Unemployment at the aggregate level is indicative of a society's economic condition in general and several aspects of aggregated unemployment may contribute to a negative effect on childbearing. Overall, high unemployment levels in society imply more economic distress and increased individual uncertainty, creating stronger expectations of becoming (or staying) unemployed in the future. Observing that job opportunities are becoming scarcer and that the general income level is decreasing may induce people to view their current employment situation as more uncertain (Adserà 2011). This could even be the case if they are not currently unemployed.

On the other hand, there are also aspects of aggregated unemployment that could contribute to a positive effect or lessen its negative effect on childbearing. First, the stigma related to job loss diminishes when the unemployment level in society is high and may thereby make it less harmful to childbearing decisions (Brand 2015). The argument is that unemployment will be seen as less of an individual failure than before, and more as a collective fate (Brand 2015). Thus, if higher unemployment levels in society reduce the stigma connected to being unemployed its negative effect on fertility may diminish. Second, when unemployment levels are high there are fewer opportunities for work advancement and employment mobility is reduced. In such a situation, instead of prioritizing job searching or career advancement, people may prioritize family life and having children (Yu and Sun 2018).

Unemployment may influence fertility among childless people and parents differently. Unemployment and failure to gain a foothold in the labor market feed peoples' feelings of uncertainty and distress (Kreyenfeld and Andersson 2014). Mills and Blossfeld (2003) argue that such uncertainties in the early stages of adult life are negative for fertility and that young couples who are less settled in the labor market and are considering becoming parents for the first time 'now or later' may be pushed into a 'later' or a 'wait and see' stage if they experience unemployment.

Furthermore, the experience of unemployment and its consequences for childbearing may differ between genders. It should be noted that how unemployment affects men's chance of having a child will also account for women's economic situation, as childbearing decisions are to a large extent the result of joint decisions made by both

partners. Investigating how unemployment affects women's chance of having a child will have the same implication.

A dual-earner family model is common in many countries, but no country has complete gender equality in employment and on average men contribute more to the family income. This is the case in Norway, despite high levels of gender equality. Accordingly, the financial constraints on the family caused by unemployment will be stronger when the male partner loses a job and his income than when the female partner does. In addition, based on social role theory (Eagly, Wood, and Diekman 2012), the necessity and pressure to land a new job when having lost the previous one may also vary between genders. For men, unemployment may cause more distress because it implies that they can no longer live up to the social expectation of being the main economic provider. Women may not feel the same pressure to get a new job and instead are more likely to take unemployment as an opportunity to focus more on filling their role as caregivers. This would be in line with the argument on self-selection into unemployment, where a combination of stronger preferences for family life and lower ambitions in the labor market result in a higher likelihood of unemployment and thus a positive unemployment–fertility relationship for women.

From the above discussion of the potential mechanisms behind the relationship between unemployment and fertility, it is not clear how unemployment may affect fertility. Our analyses will provide a comprehensive picture of the complexity of the unemployment–fertility relationship, addressing the open question of the nature of the relationship.

4.3 Changes in the links between unemployment and fertility over time

We also investigate whether the unemployment–fertility relationship has changed over time. Theoretically, we could argue that the relationship between unemployment and fertility is affected by the importance of employment in a society. Thus, when faced with a strong expectation of being employed, lacking a job and being unable to fulfill such expectations may underpin stronger feelings of uncertainty and distress than previously. In Norway, the importance of being employed and well-integrated into the labor market increased during the period of this study. Paid work and full employment are cornerstones of the public policy system in the Nordic welfare state (Halvorsen and Stjernø 2008), and with an aging population and decreasing proportion of people of working age there is increasing concern about maintaining a sustainable welfare system. To face these challenges, policymakers aim to increase the share of people in the labor force, whether by students finishing their education in the standard time and entering the labor market as soon as possible or by more women working full-time when they have young children.

Whether the relationship between unemployment and fertility has changed over time is empirically an open question. If there has been such a change it is not clear how it may have altered, reinforced, or diminished the unemployment–fertility relationship because it is unclear how unemployment affects fertility overall, as discussed above.

5. Data and methods

This study uses high-quality data from Norway, including individual records from several administrative registers covering the total population of Norway. All administrative registers in Norway include a personal identification number, which makes it possible to link information from different registers. Our data cover the years 1994–2014 and include detailed information on the date of birth of all children,[4] economic activity, educational attainment, marital status, and age.[5] Based on yearly information, individuals not categorized as resident (meaning they are unregistered, emigrated, or dead) in the register data were excluded from the samples from that year on (censored). Using event history analysis, this study aims to investigate the impact of individual and aggregated unemployment by gender on whether one has children or not (for more details about the models, see below); therefore, we constructed four separate samples to account for each of these groups (women without and with children, and men without and with children).

The first sample consists of 929,121 women aged between 20 and 45 years (born between January 1, 1955, and December 31, 1994), who had not already given birth to any child before 1994. This age range was chosen because very few births occur before age 20 and after age 45 years. Because we only have access to data on individual employment status as of 1994, we were unable to follow all women of the same age. We included all women who had not had a child in 1994 or were childless when they turned 20 years old. A potential bias is that the fertility behavior in the birth cohorts not followed from age 20 years may deviate from the younger cohorts followed from the age of 20 years. However, we assume that the significance of the explanatory variables for first birth is the same for the different birth cohorts in the sample.

Based on the same age specifications as the first sample, the second sample includes 479,872 mothers who had at least one child. If the women had at least one child between 1994 and 2014 they were included in the sample the year the child was born. The third sample consists of 1,171,313 men born between January 1, 1950, and December 31, 1994, aged between 20 and 50 years without any children in 1994. This age range is broader than among women to reflect men's somewhat longer childbearing period. Based on the

[4] This includes both biological and adopted children because the register does not distinguish between the two.
[5] We use the latest available version of municipality classification relevant to our study (2013), and our data follow this classification for consistency.

same specifications as the third sample, the fourth sample includes 468,220 fathers with at least one child. If the men had a child before 1994, they were included in the sample as of 1994. If they had their first child between 1994 and 2014, they were included in the sample as of the year the child was born.

5.1 Variable description

Our dependent variable was designed as a dichotomous variable, with the value 1 when an individual has a/another child during a given year and 0 if s/he is still at risk of having a/another child. Our main explanatory variables were economic activity and aggregated unemployment. Economic activity separates individuals who are employed, unemployed, students, or neither of these (categorized 'other'). Employed includes those with a pensionable income above the public pension base rate.[6] Unemployed includes those who received unemployment benefits for any length of time during the year, assuming that even being unemployed just for a limited period during the year is indicative of an uncertain economic situation and relationship to the labor market. The data allow us to identify people registered as students; however, some students have an income above the public pension base rate while still being full-time students. Therefore, students with an income above three times the public pension base rate were defined as employed and students with a lower income than this were defined as students. 'Other' includes those without income above the public pension base rate who are not registered as a student nor receive unemployment benefits (e.g., homemakers, young adults not eligible for unemployment benefits). Unfortunately, the available data prevented us from including information about the partner's economic activity.

Dagsvik, Kornstad, and Skjerpen (2013) find that when jobs become scarce, a considerable number of women, especially those with lower education, stop searching for new jobs when they become unemployed. This leads to data on female unemployment rates underestimating the total aggregated unemployment rate. To measure aggregated unemployment we therefore used the data on men's unemployment rates in the municipality. We constructed a variable with five values corresponding to different levels of male unemployment rates in percentages at the municipal level (i.e., 0%–2.9%, 3%–3.9%, 4%–4.9%, 5%–5.9%, and ≥6%).[7] To control for changes in fertility over time we include time in 5-year intervals with the first period being 6 years (i.e., 1994–1999, 2000–

[6] The public pension base rate, also called *grunnpensjon* (G), is a base rate used for calculating the Norwegian state pension. The public pension base rate is adjusted annually and is approved each year by the Norwegian parliament. One G was equal to 38,080 kroner in 1994 and 88,370 kroner in 2014.

[7] The municipal unemployment rate is estimated based on the proportion of the total workforce who are unemployed. The total workforce is a combined sum of employed and those registered completely unemployed. Because our observation unit is a year, we use the unemployment numbers in the fourth quarter of every year.

2004, 2005–2009, and 2010–2014). The changes in fertility levels during the period of our study are captured in these intervals (see Figure 1); i.e., in the first two intervals fertility levels were stable, in the third interval fertility increased, and in the last interval fertility levels decreased. Educational attainment includes four groups based on the categories of the International Standard Classification of Education (ISCED): compulsory (ISCED 0–1), secondary (ISCED 2–4), short university (ISCED 5–6), and long university (ISCED 7–8).

Because fertility levels, average income, and education profiles are somewhat different for immigrant women than Norwegian-born women, we included a dummy variable separating those born in Norway from those born abroad (Dommermuth and Lappegård 2017). We also control for current age in 5-year intervals (i.e., 20–25, 26–30, 31–35, 36–41, 42–45, and 46–50 years).

In the models for mothers and fathers we included a parity variable that refers to how many children an individual had when we began following him or her in the analysis. In addition, in the models for mothers and fathers we control for union status; i.e., whether the individual is single or in a union, either cohabiting or married. Unfortunately, we do not have information on cohabitation among childless individuals and because the majority of first births take place within cohabitation, it would not make sense to only control for whether or not they are married.

The variables referring to economic activity, aggregated unemployment, and educational attainment were measured one year before the observation year to reduce endogeneity problems with our outcome variable. However, we acknowledge that this strategy does not completely avoid the endogeneity problem. Because we used yearly data, there still might be cases where a pregnancy occurs before the unemployment, but the problem is reduced by lagging the data by 1 year. Descriptive statistics for the variables included in the analysis are presented in Table 1.

Table 1: Descriptive statistics of variables included in the models for the four samples: Childless women, childless men, mothers, fathers; percent

Variable	Childless women	Childless men	Mothers	Fathers
Economic activity				
Employed	52.9	59.0	75.3	87.5
Student	28.7	16.5	5.3	1.5
Unemployed	6.8	11.6	8.0	7.4
Other	11.6	12.9	11.5	3.6
Aggregated unemployment				
0.0–2.9%	61.4	62.1	70.7	70.8
3.0–3.9%	24.9	24.2	22.7	22.6
4.0–4.9%	9.9	9.6	5.	5.6
5.0–5.9%	2.9	2.9	0.5	0.6
6–%	0.9	1.1	0.4	0.4
Time period				
1994–1999	28.2	28.4	9.0	8.8
2000–2004	24.0	23.9	22.5	22.1
2005–2009	25.2	25.1	34.2	34.0
2010–2014	22.5	22.6	34.4	35.2
Educational attainment				
Compulsory	21.4	29.8	19.5	20.2
Secondary	41.2	43.0	36.0	42.3
Short university	31.4	21.2	36.4	27.1
Long university	6.1	5.9	8.1	10.4
Immigrant status				
Norwegian-born	82.1	82.4	83.7	85.0
Born outside Norway	17.9	17.6	16.3	15.0
Age				
20–25 years	46.9	36.3	8.5	3.5
26–30 years	26.3	24.7	21.9	14.5
31–35 years	13.3	15.7	30.4	27.1
36–41 years	7.7	11.5	29.1	32.6
42–45 years	5.9	5.7	10.0	14.1
46–50 years		6.0		8.2
Parity				
1 child			41.6	43.2
2 children			43.3	42.0
3 children			13.3	13.0
4 children			1.8	1.9
Union status				
Single			20.2	17.3
Married/cohabiting			79.8	82.7
Number of observations	6,308,414	9,322,594	4,490,486	4,491,362

5.2 Method

To analyze the unemployment–fertility relationship we use discrete-time event history analysis where we follow individuals over time. This method enables us to estimate the probability of an individual having a child during the observation period, having not experienced the event previously (Allison 1984). The observation period (1994–2014) in the analyses consists of 21 time units, specified in 1-year periods.

In our first-birth model, childless women and childless men are followed from age 20 years until they reach the year they have their first child, women turn 45 years old or men turn 50 years old, they die, emigrate, or reach the end of the observation period in 2014: whichever comes first. In our higher-order birth models we follow mothers and fathers for each parity transition. That is, we follow them from the year they have their first child until they have their second child, from second until third child, third until fourth child, or fourth until fifth child, until they turn 45 (women) or 50 (men) years old, die, emigrate, or reach the end of the observation period in 2014: whichever comes first. This means that one person may be included in the data several times depending on their number of children.

For the first birth we use the age variable to account for duration, while for higher-order births, duration is measured as the number of years since the last birth (the age of the youngest child). We categorized the age of the youngest child into 3-year intervals.

Based on this, we estimated logistic regressions for the risk of first birth for childless women and childless men, and the risk of higher-order births for mothers and fathers. In the results section we specify the estimates in odds ratios for the explanatory and control variables.

Based on our study, we cannot claim a causal unemployment–fertility relationship. As discussed in the theoretical considerations section, unemployment is not random and there might be selectivity in who becomes unemployed, which could influence fertility. This is not accounted for in our modeling because it requires information such as individual preferences and health problems, which is not available from register data. However, we do consider that there might be local factors that affect both fertility behavior and unemployment behavior. Norway consists of more than 400 municipalities that differ from one another in various ways, such as population size, economic activity, values, and attitudes. For example, ideas and values vary across regions: some municipalities are more influenced by religious ideas, and hence have more traditional family values than others (Rindfuss et al. 2007). Here, we use a fixed-effect procedure where we include a set of dummy variables that represent the unobserved and time-independent characteristics linked to each of the municipalities.

6. Results

6.1 Main findings

Table 2 shows the relative risk of first birth for childless men and women, and the relative risk of higher-order births for mothers and fathers. Starting with individual unemployment, for first births the general pattern is a negative association between individual unemployment and the relative risk of having a child. That is, the relative risk of first birth was 9% lower for unemployed childless women than for the reference group of employed women and 21% lower for unemployed childless men than for the reference group of employed fathers.

Table 2: Relative risks (odds ratios) of first birth for childless women and men, and relative risks (odds ratios) of higher-order births for mothers and fathers

	Childless women	Childless men	Mothers	Fathers
Economic activity				
Employed	1	1	1	1
Student	0.26 (0.26–0.27)	0.32 (0.32–0.33)	0.64 (0.63–0.65)	0.79 (0.78–0.81)
Unemployed	0.91 (0.90–0.92)	0.79 (0.78–0.80)	1.02 (1.01–1.03)	0.94 (0.93–0.95)
Other	0.59 (0.58–0.60)	0.35 (0.35–0.36)	1.05 (1.04–1.06)	0.93 (0.91–0.95)
Aggregated unemployment				
0.0–2.9%	1	1	1	1
3.0–3.9%	1.02 (1.01–1.03)	1.03 (1.02–1.04)	0.96 (0.95–0.97)	0.97 (0.96–0.97)
4.0–4.9%	1.02 (1.01–1.04)	1.05 (1.03–1.06)	0.85 (0.84–0.87)	0.87 (0.85–0.88)
5.0–5.9%	1.04 (1.02–1.06)	1.10 (1.08–1.12)	0.85 (0.81–0.89)	0.84 (0.80–0.88)
6+%	1.02 (0.99–1.06)	1.07 (1.04–1.11)	0.81 (0.76–0.86)	0.83 (0.78–0.88)
Time period				
1994–1999	1	1	1	1
2000–2004	0.93 (0.92–0.93)	0.91 (0.91–0.92)	1.14 (1.13–1.15)	1.11 (1.09–1.12)
2005–2009	0.96 (0.95–0.97)	0.94 (0.93–0.95)	1.14 (1.13–1.16)	1.12 (1.11–1.14)
2010–2014	0.87 (0.86–0.88)	0.86 (0.85–0.87)	1.10 (1.09–1.12)	1.10 (1.08–1.11)
Educational attainment				
Compulsory	1	1	1	1
Secondary	0.87 (0.86–0.88)	1.09 (1.08–1.10)	0.97 (0.96–0.98)	1.04 (1.03–1.05)
Short university	1.08 (1.07–1.09)	1.30 (1.28–1.31)	1.27 (1.26–1.28)	1.25 (1.24–1.26)
Long university	1.22 (1.21–1.24)	1.50 (1.49–1.52)	1.52 (1.50–1.54)	1.48 (1.46–1.50)
Immigrant status				
Norwegian-born	1	1	1	1
Born outside Norway	1.21 (1.20–1.22)	1.15 (1.14–1.16)	1.03 (1.02–1.03)	1.18 (1.17–1.19)
Age				
20–25 years	1	1	1	1
26–30 years	1.64 (1.62–1.65)	2.32 (2.30–2.34)	1.20 (1.19–1.22)	1.50 (1.47–1.52)
31–35 years	1.59 (1.57–1.60)	2.75 (2.72–2.77)	1.15 (1.14–1.17)	1.69 (1.66–1.72)
36–41 years	0.77 (0.76–0.78)	1.60 (1.58–1.62)	0.61 (0.60–0.62)	1.25 (1.23–1.27)
42–45 years	0.15 (0.15–0.16)	0.61 (0.60–0.62)	0.12 (0.12–0.13)	0.69 (0.68–0.71)
46–50 years		0.22 (0.21–0.23)		0.40 (0.39–0.41)

Table 2: (Continued)

	Childless women	Childless men	Mothers	Fathers
Parity				
1 child			1	1
2 children			0.27 (0.27–0.27)	0.30 (0.30–0.30)
3 children			0.14 (0.14–0.14)	0.16 (0.16–0.17)
4 children			0.19 (0.18–0.20)	0.21 (0.21–0.22)
Union status				
Single			1	1
Married/cohabiting			2.16 (2.13–2.18)	2.02 (1.99–2.04)
Log-likelihood	–1,540,481.1	–1,721,259.5	–1,265,139.7	–1,247,545.0
Number of observations	6,308,414	9,322,594	4,490,486	4,491,362

Note: Numbers for 95% confidence intervals in parentheses. All models contain dummy variables for the municipality of residence (municipal fixed effects). In the models for mothers and fathers we include the age of the youngest child, which is categorized into 3-year intervals.

For higher-order births, there were opposite results for mothers and fathers. The overall pattern was that mothers' unemployment was positively associated with having a child, whereas for fathers it was negatively associated. That is, the relative risk of having a child was 2% higher for unemployed mothers compared with the reference group of employed mothers and 6% lower for unemployed fathers compared with the reference group of employed fathers.

There was a positive association between the level of aggregated unemployment and the risk of first birth. For instance, for childless men living in an area where the aggregated unemployment rate was 5.0%–5.9%, the relative risk of first birth was 10% higher than for the reference group (aggregated unemployment rates less than 3%). For women the relative risk of first birth was 4% higher. For mothers and fathers, higher aggregated unemployment lowered the risk of higher-order births. Those living in an area where the unemployment rate was 3.0%–3.9% had a 4% lower relative risk of having a child compared with the reference group. For those living in an area where the unemployment rate was equal to or greater than 6% the relative risk of having a child was 19% and 17% lower for mothers and fathers respectively compared with the reference group.

6.2 Changes over time

To investigate whether the unemployment–fertility relationship changed over time, we added separate models with an interaction term between (1) economic activity (including individual unemployment) and time period, and between (2) aggregated unemployment and time period. To illustrate the main results from these models we computed the relative

risks of first and higher-order births, presented in Table 3a and b (economic activity and time period) and Table 4a and b (aggregated unemployment and time period).

Starting with individual unemployment, the results show that the association between individual unemployment and the risk of first birth varies over time (Table 3a). For childless men the negative association became more negative following the time periods up until 2010, from which point on it became less negative. For childless women the negative association grew stronger after the turn of the millennium and stayed negative over the following time periods.

The picture was different for mothers and fathers (Table 3b). When looking at all time periods combined, there was a small positive association between individual unemployment and mothers' relative risk of birth (Table 2). However, when looking at the specified time periods we found that this positive association was strongest in the period 1994–1999 and that during the other periods there was either no or only a small positive association (Table 3b). For fathers, the negative association between individual unemployment and the relative risk of higher-order birth diminished with each period passed (Table 3b).

Table 3a: Computed relative risks (odds ratios) of first birth by economic activity across time period for childless men and women

	Childless women				Childless men			
	1994–1999	2000–2004	2005–2009	2010–2014	1994–1999	2000–2004	2005–2009	2010–2014
Employed	1	1	1	1	1	1	1	1
Student	0.28	0.27	0.27	0.24	0.37	0.33	0.30	0.27
Unemployed	0.95	0.88	0.89	0.89	0.83	0.77	0.75	0.79
Other	0.60	0.59	0.60	0.57	0.37	0.36	0.35	0.32

Notes: The results are based on the model in Table 2 plus an interaction term between the variables 'economic activity' and 'time period.' Estimated relative risks have been computed from the main effects of economic activity and the interaction term.

Table 3b: Computed relative risks (odds ratios) of higher-order birth by economic activity across time period for mothers and fathers

	Mothers				Fathers			
	1994–1999	2000–2004	2005–2009	2010–2014	1994–1999	2000–2004	2005–2009	2010–2014
Employed	1	1	1	1	1	1	1	1
Student	0.57	0.58	0.67	0.70	0.73	0.77	0.82	0.86
Unemployed	1.08	1.00	1.02	1.00	0.85	0.93	0.97	0.99
Other	1.17	1.07	1.04	0.97	0.92	0.90	0.95	0.96

Notes: The results are based on the model in Table 2 plus an interaction term between the variables 'economic activity' and 'time period.' Estimated relative risks have been computed from the main effects of economic activity and the interaction term.

Regarding aggregated unemployment, the main findings showed that aggregated unemployment was positively associated with first birth (Table 2). When looking across the time periods, this was not the case for all of them (Table 4a). For those living in an

area where the unemployment rate was 3.0%–3.9%, the association remained slightly positive across the time periods. For those living in areas where the unemployment rate was 4.0% or higher, the association changed from positive to negative across the time periods. The pattern was the same for men and women.

For higher-order parities the overall finding was a negative association between aggregated unemployment and the relative risk of higher-order births (Table 2). However, across the time periods (Table 4b) there was a stronger negative association between aggregated unemployment and the relative risk of birth in 1994–1999 than in the other periods. In the time periods after 2005 the association becomes less clear, with either no or a slightly positive association. We see the same patterns for both mothers and fathers.

Table 4a: Computed relative risks (odds ratios) of first birth by aggregated unemployment across time period for childless women and men

	Childless women				Childless men			
	1994–1999	2000–2004	2005–2009	2010–2014	1994–1999	2000–2004	2005–2009	2010–2014
0.0–2.9%	1	1	1	1	1	1	1	1
3.0–3.9%	1.04	1.00	1.00	1.02	1.06	1.01	1.02	1.02
4.0–4.9%	1.04	1.02	0.94	0.96	1.09	1.03	0.95	0.96
5.0–5.9%	1.05	1.01	0.84	0.84	1.12	1.04	0.98	0.98
6–%	1.05	0.91	0.90	0.89	1.12	0.92	0.88	0.83

Notes: The results are based on the model in Table 2 plus an interaction term between the variables 'aggregated unemployment' and 'time period.' Estimated relative risks have been computed from the main effects of aggregated unemployment and the interaction term.

Table 4b: Computed relative risks (odds ratios) of higher-order birth by aggregated unemployment across time period for mothers and fathers

	Mothers				Fathers			
	1994–1999	2000–2004	2005–2009	2010–2014	1994–1999	2000–2004	2005–2009	2010–2014
0.0–2.9%	1	1	1	1	1	1	1	1
3.0–3.9%	0.84	0.96	0.99	1.02	0.85	0.96	0.99	1.00
4.0–4.9%	0.53	0.94	0.99	0.99	0.55	0.95	0.96	1.00
5.0–5.9%	0.62	0.96	0.93	0.92	0.64	0.93	0.91	0.91
6–%	0.66	0.92	1.02	0.90	0.67	0.93	1.01	1.01

Notes: The results are based on the model in Table 2 plus an interaction term between the variables 'aggregated unemployment' and 'time period.' Estimated relative risks have been computed from the main effects of aggregated unemployment and the interaction term.

6.3 Sensitivity tests

To check whether our results are robust, we performed several sensitivity tests (available upon request), and some potential issues must be addressed before concluding. A set of municipality dummies were included to account for the municipalities' unobserved characteristics. When we ran the models without the dummies, some of the findings changed. For childless women the association between aggregated unemployment and the relative risk of first birth turned negative for all groups, except for childless women living in an area where unemployment rates were equal to or above 6%. For the other groups the direction of the association remained the same but the magnitude decreased, and for childless men the association between unemployment rates in the ranges 3.0%–3.9% and 4.0%–4.9% and the relative risk of first birth became more uncertain. Based on this, we believe that municipality dummies should be included in the model specification.

Because we ran the models for men and women separately, we cannot draw any conclusions about gender differences in the unemployment–fertility relationship based on them (see Mood 2010). However, by adding both men and women to the sample and including an interaction term between the unemployment variables and gender, we can test whether there actually are gender differences. The results show that the interaction between the unemployment variables and gender is statistically significant, which means that unemployment influences men and women differently and matches the results from the separate models for men and women.

Information on partnership status is only available for parents and thus only included in our models for higher-order parities. Although we cannot compare the models directly, we wanted to check whether leaving partnership status out of the model specification had a notable impact on the association between unemployment and births. For mothers and fathers the association between aggregated unemployment and the relative risk of having another child remained the same. For individual unemployment, however, the association turned more negative for fathers, whereas for mothers it became more uncertain. Partnership and fertility are strongly woven together, and these findings show the importance of controlling for partnership status.

The unemployment–fertility relationship could vary across age groups and across parities for higher-order births. To see whether this was the case we added an interaction term between the unemployment variables and the age groups, and between the unemployment variables and parity. The results for the different age groups showed no clear indication of such variation across the age groups. For the childless, there was a negative association between individual unemployment and the risk of first birth for men in all age groups and for women in the age group 26 years and older. For mothers, there was a positive association between individual unemployment and the risk of first birth in all age groups except those aged 31–35 years, where there was a slightly negative association. For fathers, the association was negative in the age groups up until age 35

years. For the childless, there was a positive association between aggregated unemployment and the risk of first birth for those in their 20s, whereas the association for those in their 30s was negative. For parents, there was a negative association between aggregated unemployment and the risk of having a child for the age groups up until age 35 years, and thereafter the association becomes slightly positive but more uncertain. The estimates for different parities among parents showed that there was a negative association between individual unemployment and the relative risk of birth for fathers with one child, whereas for mothers with one child the association was more uncertain. For fathers and mothers with two or more children, the association was positive.

There was a negative association between aggregated unemployment and the relative risk of birth for mothers and fathers with one or two children, whereas it was positive for those with three or more children. However, for both mothers and fathers with two children, it was positive if they lived in a municipality where unemployment rates were equal to or greater than 6%.

7. Discussion

In this article we have investigated the relationship between unemployment and childbearing by distinguishing between individual and aggregated unemployment measured at the municipality level over a 21-year period. We differentiated by gender and separated individuals with and without children. Our analyses were based on register data on the total population of Norway from 1994 to 2014, which provides a strong foundation for studying the significance of unemployment in general and changes across different time periods.

Our results showed that there was a negative association between individual unemployment and the risk of first and higher-order births for childless men and childless women as well as for fathers, whereas the association was positive for mothers. The negative association between individual unemployment and risk of birth is in line with the argument that people experiencing unemployment may prefer to postpone having children until the situation is less uncertain and they consider themselves more able to provide economically for a child (e.g., Kreyenfeld 2016; Solaz et al. 2020).

That we found similar patterns for childless men and childless women but not for mothers and fathers may reflect the state of gender equality in Norway. The level of gender equality in Norway is high and gender equality within couples is especially strong before they have children (Ellingsæter 2014). However, gender differences are still apparent in the division of labor, especially among couples with young children. Despite high gender equality in Norway, the actual situation is described as "gender equality light" (Rønsen and Skrede 2010); i.e., women take more responsibility for the care of

children and household chores and are more likely to be working part-time. The (small) positive relationship between higher-order birth risk and individual unemployment among mothers is in line with social role theory (Eagly, Wood, and Diekman 2012), which assumes that unemployment may worry men more because it implies that they are not able to fulfill the social expectation of being the main economic provider. Meanwhile, women may instead be more likely to see unemployment as an opportunity to fulfill their role as main caregiver. The positive relationship could also be indicative of a substitution effect occurring, where having a child functions as a favorable and alternative strategy to unemployment because the unemployment period provides a convenient time slot for childbearing and childcare.

Our results also showed a negative association between aggregated unemployment and higher-order births, and a small positive association between aggregated unemployment and first births. These results contradict the results found in the study by Kravdal (2002), which has a similar study setup. However, our study covers a longer time span and we included dummy variables for each municipality in the models to account for unobserved characteristics of the municipalities. Interestingly, when leaving out the dummy variables for municipalities the association turns negative, which shows that municipality-specific characteristics are influencing the unemployment–fertility relationship and should be controlled for.

There is no obvious reason for there being a negative association between aggregated unemployment and births among parents and not among childless couples. An argument for expecting higher levels of aggregated unemployment levels to result in a lower risk of birth is that even when individuals are employed, higher unemployment levels in society could contribute to increasing both distress and individuals' perceived uncertainty about their future economic situation (Adserà 2011). On the other hand, an argument for expecting higher levels of the aggregated unemployment level to result in a higher risk of birth is that when faced with fewer opportunities for work advancement and reduced employment mobility, people may prioritize other aspects of life such as family life and having children (Yu and Sun 2018).

The distress and increased uncertainty resulting from higher unemployment rates could have a stronger impact on parents who are already responsible for providing for their children, while childless people may lower their expectations regarding job advancement and work mobility and instead prioritize having children.

Further, we found that the relationship between unemployment and fertility changed over time, but not in a uniform way: it either grew weaker, only showing a minor change, or was stable during the time span of our study, depending on which sample group we analyzed. For childless men and childless women, the negative association between individual unemployment and the risk of first birth was consistent over time. Earlier, we argued that people may experience more uncertainty and increased distress from

unemployment if stronger expectations of being employed are present, meaning that becoming unemployed will result in being unable to fulfill them. There are no indications of this being the case among childless individuals. Rather, the uncertainty and distress from unemployment seem consistent over time.

For both mothers and fathers, the association between individual unemployment and birth diminished over time. One explanation for this development could be related to the increasingly gender-equal division of responsibility for being the family's economic provider. Because dual-earner families are more economically stable than single-earner families, partners in dual-earner families can rely on each other for economic support to a larger degree if either one becomes unemployed, resulting in a lower economic risk related to having children when one half of the couple becomes unemployed. Considering the significant increase in the share of families that follow this work pattern (Dommermuth, Kornstad, and Lappegård 2019), we can also assume the risk to have lessened in general.

Turning to aggregated unemployment, for childless individuals the main picture was that the association between aggregated unemployment and risk of first birth goes from positive to negative during the period of our study, similarly to the influence of individual employment. However, if we compare the influence of individual and aggregated unemployment on first-birth risk, the influence of aggregated unemployment was not uniform across the time periods, whereas the influence of individual unemployment was consistently negative over time. This could suggest that people's employment situation has more influence on whether people have their first child than local unemployment rates. This may be because individuals' employment situation has more direct consequences for their everyday life and economic situation.

For parents, the association between aggregated unemployment and the risk of higher-order births went from being negative to being more ambiguous, showing both slightly positive and negative associations depending on the level of unemployment. When discussing above why the association between individual unemployment and risk of higher-order birth decreased over time, one interpretation was related to increased gender equality in providing economically for the family. Similarly, because in dual-earner families the partners can rely on each other more for economic support if one of them becomes unemployed, the changed association between aggregated unemployment and having another child can also be explained by such families being more resilient to distress and uncertainty from observing high or increasing local unemployment rates .

All in all, there are three main conclusions from our study. First, individual unemployment matters more for fertility behavior than aggregated unemployment. Second, individual unemployment is more significant for transitioning to parenthood than for higher-order births. Lastly, the unemployment–fertility relationship did not grow

more negative over the duration of the study, but there were changes over time depending on the sample group.

Our study does not come without limitations. We are not able to control for the duration of unemployment spells because our data only give us information on whether a person has received unemployment benefits during a given year. It is possible that unemployment influences childbearing decisions differently depending on whether it is short- or long-term. We also do not have information on partners, including their employment status. It is likely that the impact of both individual and aggregated unemployment varies depending on whether the partner is unemployed. The next step following this investigation would be to study the unemployment–fertility relationship from a couple's perspective and see whether the partner's position in the labor market influences people's risk of having a child. For instance, if only one member of the couple is employed the other has someone to rely on for economic support, thereby buffering the impact of unemployment on fertility decisions. Alternatively, if both partners are unemployed, unemployment could have a stronger negative impact on whether the couple has children together. Parents may view their economic situation more from a family perspective than an individual perspective. There could also be gender differences in the effect of a partner's position in the labor market. Although to different degrees, men are the main economic provider in most countries. This means that the role of individual employment situations in the couple's joint fertility decisions could be unbalanced: for instance, unemployment of the male partner could have a greater influence on the couple's fertility decisions than unemployment of the female partner (Stein, Willen, and Pavetic 2014). As discussed above, increased gender equality in who is the main economic provider could influence how a partner's position in the labor market influences the risk of having a child.

Finally, our study is limited to the period up until 2014. Data following 2014 will allow us to obtain insight into the more current unemployment–fertility relationship in Norway. However, the value of this study lies in its broad approach to investigating this relationship. It has proven that when looking at the unemployment–fertility relationship it is crucial to consider whether one is looking at individual or aggregated unemployment, men or women, parents, or people without children, what period one is studying, as well as municipality heterogeneity. Many studies have shown that each of these factors may influence the relationship between unemployment and fertility. Because of data restrictions, however, it has been difficult to include them all in the same study. Including multiple dimensions in one study gives clearer insight into the complexity of the unemployment–fertility relationship and helps us to improve our understanding of contemporary fertility dynamics.

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