Graduating in a recession and family formation

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Abstract

We study the consequences of graduating during the early 1990s Finnish deep recession on labor market outcomes and family formation during the 20 years following graduation. By exploiting variation in the local unemployment rate faced upon labor market entry, we find that the cohorts of men who obtain secondary education in unfavorable times postpone labor market entry and enrol into further education. This leads to initial earnings losses which fade away in about 4 years and are compensated by improved labor income and family formation in the long run. The corresponding group of women in secondary education does not experience increased education enrolment nor improved socioeconomic trajectories in the long run. We do not find a similar gender gradient in the long-run outcomes for tertiary education graduates, who all suffer large income losses with little recovery and little changes in their long-run fertility.

JEL codes: E32, I26, J12, J13, J22, J31

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1 Introduction

Graduating in recession times can have lasting scarring effects on the earnings and employment of labor market entrants.[1] Evidence on the interplay of labor market, fertility and marriage market decisions over the business cycle is especially important in light of the potentially unequal consequences of the economic crisis that followed the COVID-19 global pandemic (Alon et al., 2020). However, it is still largely unknown how business cycle conditions faced at graduation relate to family formation (two exceptions are Engdahl et al., 2022, and Schwandt and von Wachter, 2020). To fill this gap, in this paper we use rich population-wide information from several administrative registers to study the long-run consequences of the exceptionally deep recession that hit Finland in the early 1990's on labor earnings, fertility, marriage and cohabitation, and education enrolment for cohorts graduating in 1989–1999.

Following the fall of the Soviet Union in 1991, the Finnish unemployment rate rose sharply to more than 20% nationally during the early 1990s. The crisis hit the economy suddenly and with various degrees of severity across local labor markets. We thus exploit exogenous regional variation in the local unemployment rate faced at graduation for cohorts graduating in different years. In the absence of anticipation of the level of local unemployment rate faced upon graduating, the research design allows us to identify the long-run (up to 20 years later) socioeconomic losses following labor market entry in recession times, compared to being exposed to relatively lower local unemployment rates at graduation.

We find that the cohorts that face poor labor market conditions upon graduation experience a substantial initial drop in labor earnings. However, while for all graduate groups labor income recovers in about four years, education enrolment and family formation trajectories tend to differ substantially by education level and gender. The results are consistent with men obtaining secondary education degrees in unfavorable times postponing labor market entry and enrolling into further education. While being enrolled in further education, this group suffers earning losses, but these losses are more than counterbalanced by improved labor income and family formation in the long run. Women getting secondary education in recession times, on the other hand, do not appear to take the chance to enrol into further education, they post-pone cohabitation and marriage, and their socioeconomic outcomes do not improve in the long run. While we find a clear gender gradient in the results for the secondary education

[1] For instance, Kahn (2010), Oreopoulos et al. (2012), Altonji et al. (2016), Schwandt and von Wachter (2019) show that poor business cycle conditions faced at graduation can have substantial long-term consequences on labor market outcomes of Northern American graduates, while Päällysaho (2017) studies the Finnish case. See also von Wachter (2020) for a comprehensive review.

graduates in bad times, this is not the case for the tertiary education ones: despite a short-run increase in enrolment, men, like women, do not experience an improvement of their socioeconomic outcomes in the long run.

The analysis of the 1990s Finnish deep recession is particularly interesting for several reasons. First, the recession was the most severe economic crisis in Finland's peacetime history, and the most serious economic crisis among any OECD economy (Honkapohja and Koskela, 1999). Second, Finland has a generous welfare state and is a relatively gender-equal country (WEF, 2020), and therefore any observed gender imbalances can be seen as a lower bound to what can be expected in alternative institutional settings. Finally, the Finnish context also allows to use rich individual-level information from population-wide registers on educational achievement, graduation year and municipality, birthplace, and links to family members. This allows us to study the interplay between earnings, family formation and education dynamics over the business cycle in such a way that has largely been impossible in the past.

Our results offer two insights. First, it is key to have a sufficiently long time horizon to assess the relevance of business cycle conditions on labor market entrants' socioeconomic trajectories. This is consistent with Schwandt and von Wachter (2020), who study the US labor market entrants during the 1980s recession and find that their higher mortality and lower measures of socioeconomic status only appear in middle age.[2] Compared to Schwandt and von Wachter (2020), the use of detailed individual-level population records allows us to get a better understanding of family formation patterns, how they relate to income and enrolment trajectories, and the mechanisms explaining gender-specific earnings dynamics over the business cycle.

Second and related, facing a temporary disadvantage at labor market entry can result in responses on education and family formation decisions that ultimately shape earnings trajectories in the long run, even in the presence of initial earnings recovery homogeneous across groups of labor market entrants. Engdahl et al. (2022) also find short-lived drops in employment and earnings following graduation in recession times, and document a persistent increase in welfare benefit take up and a deterioration of family formation in the long run. While they focus on vocational high-school women, we study the family formation patterns of both high school and tertiary education men and women graduates, alongside with their enrolment rates.

Finally, while we focus on labor market entrants, our work is also related to the literature that analyzes the consequences of job loss on households' family formation (Huttunen and Kellokumpu, 2016), on gender-specific earnings losses (Illing et al., 2021), and over the business cycle (Schmieder et al., 2020; Bertheau et al., 2023).

[2]See also Currie and Schwandt (2014) for the relationship between unemployment and fertility.

The paper is structured as follows. In Section 2 we describe the data and analysis sample. Section 3 outlines our empirical strategy. Our main results are included in Section 4. Section 5 concludes.

2 Data and sample

2.1 Data sources and main definitions

We use rich information from population–wide administrative registers (FOLK and FLEED). In addition, we use information from the Medical Birth Registry to measure the number of children outcome. We sample people whose secondary or tertiary degree is obtained in 1989–1999. We select the highest degree obtained by age 30, and in case of multiple degrees we select the most recent one. All outcomes are measured in 1989–2019, between 0 and 20 years after the year of graduation. In the analysis we also include cohorts graduating in the late 1990s, when the economic conditions in Finland were less dramatic; this allows to exploit local unemployment variation both in severe recession times and during ordinary times. The sample is re-balanced by including 0 income entries in case a person exists in the registers but her income is missing.

The geographical area considered to define the local labor market in the analysis is the region.[3] In particular, the region where the person graduate is measured at the end of the graduation year, whereas the regional unemployment rate refers to people aged 16 to 64 and is defined as the share of people who are not employed out of those belonging to the labor force.

Figure 1 shows the unemployment rate in Finland in years 1987-2019 and the area bounded by dotted lines marks the specific graduation years that we consider in the analysis. Figure 2 further shows large variation in regional unemployment rates over time. At the peak of the crisis in 1993, some local labor markets experienced unemployment rate levels higher than 30%, whereas during the same year the unemployment rate in other regions was about half as much. Such a high variability in the local labor market conditions persisted also in later years, even when the global labor market conditions got generally more favorable for labor market entrants.

In terms of outcomes, labor income is deflated in 2010 EUR and is the primary labor market outcome; marriage and cohabitation are defined through indicator variables for being married or in cohabitation during the current year; the number of children,

[3]For ease of exposition, throughout we use the term "region", although the actual jurisdiction level that we use is that of "sub–regions". Sub-regions consist of one or several municipalities that are linked to each other through cooperation, employment and public transport communication. The number of sub-regions varies between 70 and 88 during the observation period.

also used to define whether a person had any children, is measured as a cumulative variable whose value is updated each year; student status (enrolment) reports whether in the current year the main activity of the person is being a student.

2.2 Sample description

The descriptive statistics for our sample are presented by gender in Table 1. Column (1) shows the statistics for all individuals, column (2) for women and column (3) for men. The share of individuals with a secondary degree in our sample is 46% and the share of individuals with a tertiary degree is 54%. The gender allocation is such that 38% of the women in the sample hold a secondary degree and 62% a tertiary degree, while 54% of the men are secondary educated and 46% tertiary educated. The women are on average slightly older at graduation, 23.3 years compared to 22.9 for men, which is explained by the fact that a larger share of women hold a tertiary degree associated with more years of education. Men have on average a higher yearly labor income in the year of graduation compared to women. Turning to the family outcomes measured 20 years after graduation, we see some gender differences, especially in the fertility outcomes. While 77% of women have at least one child and the average number of children is 1.8, only 70% of men have at least one child and the average number is 1.6. The share of women who are married is slightly higher compared to men, but the share of individuals who cohabit is fairly similar.

In order to observe the differences among individuals with different educational levels, we present the descriptive statistics by educational level in Table 2, where column (1) shows statistics for all individuals, column (2) for secondary educated and column (3) for tertiary educated. In general, tertiary educated individuals graduate at a higher age, their income in the year of graduation is more than double the income of secondary educated individuals and they have more children. Specifically, 77% of tertiary educated graduates have children 20 years after graduation, compared to 70% for secondary educated. There is also a difference in the number of children as the average number is 1.78 for individuals with a tertiary education and 1.63 for individuals with a secondary education. In addition, tertiary educated individuals are married and cohabit more often compared to secondary educated graduates.

Finally, we present the descriptive statistics by two groups of graduation cohorts in Table A-1. Column (1) shows the statistics for the entire sample, while column (2) present statistics for cohorts that graduated in years 1989-1993 and column (3) for cohorts that graduated in years 1994-1999. There are no major differences in the statistics for the two groups of graduation cohorts, except for the average regional unemploy-

ment rate upon graduation that is 12.4 % for the cohorts 1989-1993 and 17.5 for the cohorts 1994-1999. Furthermore, the yearly labor income is lower for the cohorts that graduated in years 1994-1999.

3 Empirical approach

We compare the outcomes across cohorts of labor market entrants who are exposed to different initial levels of regional unemployment rate. To this aim, we estimate the following model:

$$y_{irct} = \alpha_t + \beta_t U_{rc} + \delta_{rt} + \delta_{ct} + \varepsilon_{irct} \tag{1}$$

where individual i in region r graduates in calendar year c. We estimate regressions separately by time since graduation t, with $t \in [0,20]$. Note that U_{rc}, the area-specific unemployment rate faced at graduation year c, does not vary over time since graduation for a given individual. However, its coefficient is allowed to vary with the time since graduation. Finally, the model also includes the regional indicator variables δ_{rt} and the graduation year indicators δ_{ct}. The main coefficient of interest β_t captures the change in the outcome variable due to a unit increase in the local unemployment rate. The model is estimated by using variation in the local unemployment rate across cohorts of labor market entrants and regions (see Figure 2).

Focusing on labor market entrants is of particular interest because young people bear a high risk of suffering permanent scars from adverse labor market conditions. Moreover, by definition, newly labor market entrants have no prior work experience, which allows to abstract from concerns related to selection based on past employment history. Although this last point facilitates the identification of the effect of business cycle shocks on career trajectories, the estimates for the coefficient β_t can be causally interpreted only if the economic conditions at time of graduation are uncorrelated with other determinants of the outcome. A potential threat to internal validity is that individuals may delay graduation or move to a different local labor market as a response to adverse labor market conditions. Furthermore, the composition of workers for which the regression is estimated, may change with business cycles if the labor supply decisions are affected.

4 Results

4.1 Women and men with secondary education

The results in this section are based on the model introduced in Section 3. We start by presenting the results for secondary educated women in Figure 3 and men in Figure 4, followed by a discussion on the gender and educational differences in results.

Secondary educated women experience initial income losses followed by a recovery and shift to positive point estimates in about 7 years after graduation. In the long run, the difference in income between lucky and unlucky cohorts, resulting from adverse labor market conditions, is close to zero. Secondary educated women who face poor labor market conditions upon graduation increase their rate of enrolment in the 7 years following graduation. In the long run, they are not more likely to be classified as a student based on their main activity, when compared to corresponding cohorts that graduate in more favorable economic times. The results for the marriage and cohabitation outcomes are similar to each other. Secondary educated women experience an initial drop in the probability for marriage and cohabitation, but it is followed by a recovery in the first 10 years following graduation. In the long run, there is no significant difference in the share of individuals who are married or cohabit when we compare the lucky and unlucky cohorts. Furthermore, the results for having any children indicate that secondary educated women who graduate during a recession are more likely to have any children compared to cohorts graduating in better economic times. Regarding the number of children, there is initially no difference between lucky and unlucky cohorts, but over time the difference grows and becomes substantially positive in the long run.

The results for secondary educated men indicate that there is a sudden drop in income in the years following graduation, compared to cohorts graduating in better economic times. However, the drop is followed by a recovery during the 5 year period following graduation, and a shift to persistently positive values in the long run. Males with a secondary education experience a sharp increase in the enrolment rate in the short run, but the effect is not significantly different from zero in the long run. The results indicate that for this group of individuals, graduating in a recession pushes them to get more education, which has a positive impact on their income in the long run. The cohorts that graduate in a recession are less likely to be married or cohabit in the short run, compared to cohorts who graduate in better economic times. However, there is a convergence and shift to weakly positive values for estimates in 10 years after graduation. The results for having any children and for the number of children show a similar pattern . Initially, men with a secondary education experience a negative

impact in the first 5 years following graduation, but there is a shift to positive values for estimates that increase over time.

A comparison of the results for secondary educated women and men reveals, that in the long run men experience a more positive development of income. Furthermore, the results for the enrolment rate indicate that secondary educated men who graduate in a recession are much more likely to gain more education in the short run compared to corresponding cohorts. For secondary educated women the difference in the enrolment rate between cohorts that graduate in a recession and cohorts that graduate in better economic times, is also positive but smaller compared to secondary educated men. Women with a secondary education, are less likely to cohabit or be married compared to their corresponding cohorts graduating in more favourable times and this holds for the entire observation period. Male graduates are also less likely to cohabit and to be married in the short run compared to their corresponding cohorts, but there is a shift to positive values in the medium turn and the positive effect remains also in the long run. Finally, the results for fertility outcomes are very similar for secondary educated men and women. The coefficient estimate for the number of children 20 years after graduation is even larger for secondary educated women than for men.

4.2 Women and men with tertiary education

The results for women with a tertiary education are presented in Figure 5. This group of women experience a sudden drop in income, followed by a recovery in the 5 first years after graduation. In the long run, the income is lower for cohorts graduating in a recession, compared to corresponding cohorts who face better labor market conditions upon graduation. Regarding the rate of enrolment, there is a large initial drop in the year of graduation, followed by an immediate recovery in the following year, after which the difference compared to corresponding cohorts remains negative. Tertiary educated women who face adverse labor market conditions upon graduation, are less likely to be married or to cohabit, especially during the first 10 years following graduation. These women are somewhat less likely to have any children compared to cohorts that graduate in better economic times, but the difference remains imprecise and fades away in the long run. Regarding the number of children, graduating in a recession is associated with a slightly lower number of children in the period between 4 and 11 years after graduation, but after that there is a shift to positive coefficient estimates, although the estimates remain imprecise over the observation period.

The results for tertiary educated men are presented in Figure 6. There is an initial drop in income and a slow recovery, but the estimates remain negative over the entire

observation period. In the case of enrolment rate, graduating in a recession is associated with a higher rate of enrolment in the first 4 years, after which the difference compared to cohorts graduating in better economic times first disappears and then shifts between small positive and negative coefficient estimates. Unlucky cohorts are less likely to be married or to cohabit in the short run, but in the long run there is no statistically significant difference compared to lucky cohorts. For tertiary educated men, graduating in a recession is associated with an initial negative effect both on having any children and on the number of children. The estimates for both outcomes remain imprecise and close to zero or slightly positive in the long run.

A comparison of the gender differences in results reveals that tertiary educated men do not experience a similar recovery in income as the tertiary educated women do. In the long run the income for both women and men is negative compared to cohorts that graduate in more favorable conditions, but the difference for men is larger than for women. The long run results differ from the results for secondary educated men and women for whom initial losses fade away and coefficient estimates take positive values, especially for secondary educated men. Graduating in a recession initially increases the enrolment rate for tertiary educated men, similarly as for secondary educated men and women, but not for tertiary educated women. Graduating in a recession is associated with a decrease in cohabitation and marriage in the short run for both tertiary educated women and men. For tertiary educated women, the difference to cohorts that graduate in better economic times is larger than for tertiary educated men and it remains negative in the long run. The results for fertility outcomes for women and men with tertiary education differ from the results for men and women with secondary education. While secondary educated men and women experience a positive impact on both having any children and on the number of children in the long run, the results for tertiary educated individuals remain imprecise and close to zero.

5 Conclusions

In this paper we study the income, family formation and education enrolment trajectories of cohorts of newly graduates who entered the Finnish labor market in 1989–1999. During the early 1990s, Finland was hit by an exceptionally strong and unexpected deep recession. We exploit regional variation in the unanticipated unemployment rate level faced at graduation to study how local labor market conditions impact on people's long-run socioeconomic trajectories.

We find that education enrolment and family formation vary substantially by education level and gender. In particular, looking at secondary education male graduates,

we see a sharp short-run increase in their enrolment rates that mirrors their initial earnings losses; during the same period, marriage and cohabitation rates drop. In the medium and long run, however, earnings increase compared to the corresponding cohorts of males that graduate in more favorable conditions, and so do all the family formation outcomes considered. Interestingly, the corresponding group of women with secondary education graduating in bad times do not experience any improvement in their short-run enrolment rates nor in their long-run labor income and fertility. Instead, their family formation trajectories deteriorate.

Evidence on labor market entry conditions and fertility is still scarce but it is crucial to understand, among other things, how long-run earnings trajectories come about over the lifetime. Our analysis shows that economic recessions can be experienced in substantially different ways by different socioeconomic groups. Public policies aimed at providing economic relief to labor market entrants in bad times should take into account how the interaction between education enrolment and family formation decisions varies by gender and educational background and translates into long-run earnings differentials.

Tables and figures

Unemployment rate

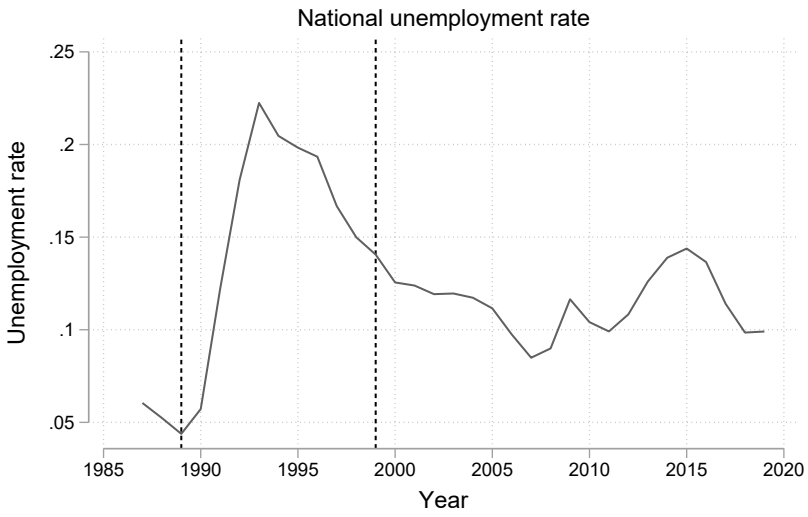


Figure 1: National unemployment rate

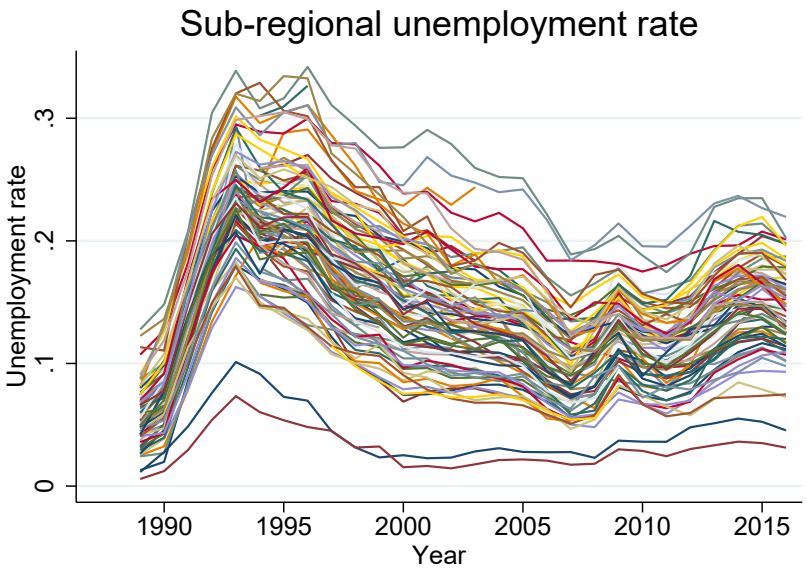


Figure 2: Sub-regional unemployment rate

Table 1: Descriptive statistics by gender

	All (1)	Women (2)	Men (3)
Education: compulsory	0.002	0.001	0.002
Education: secondary	0.456	0.377	0.537
Education: tertiary	0.542	0.621	0.461
Age at graduation	22.855	23.263	22.441
Yearly labor income (in 2010 EUR)	7,918.831	7,347.469	8,500.341
Regional unemployment rate	0.151	0.150	0.152
Observations	578,708	291,901	286,807
Any child (t=20)	0.736	0.768	0.704
Number of children (t=20)	1.713	1.814	1.611
Marriage (t=20)	0.565	0.580	0.550
Cohabitation (t=20)	0.725	0.724	0.727
Observations	549,960	254,330	295,630

Notes: All quantities are measured at time 0, except for the values of any child, number of children, marriage and cohabiting, measured at time 20.

Table 2: Descriptive statistics by education

	All (1)	Secondary (2)	Tertiary (3)
Male	0.496	0.583	0.421
Age at graduation	22.855	20.757	24.628
Yearly labor income (in 2010 EUR)	7,918.831	5,043.143	10,354.030
Regional unemployment rate	0.151	0.152	0.150
Observations	578,708	264,134	313,526
Any child (t=20)	0.736	0.696	0.770
Number of children (t=20)	1.713	1.634	1.778
Marriage (t=20)	0.565	0.482	0.633
Cohabitation (t=20)	0.725	0.686	0.758
Observations	549,960	248,468	300,533

Notes: All quantities are measured at time 0, except for the values of any child, number of children, marriage and cohabiting, measured at time 20.

Sub-regional UR, women with secondary education

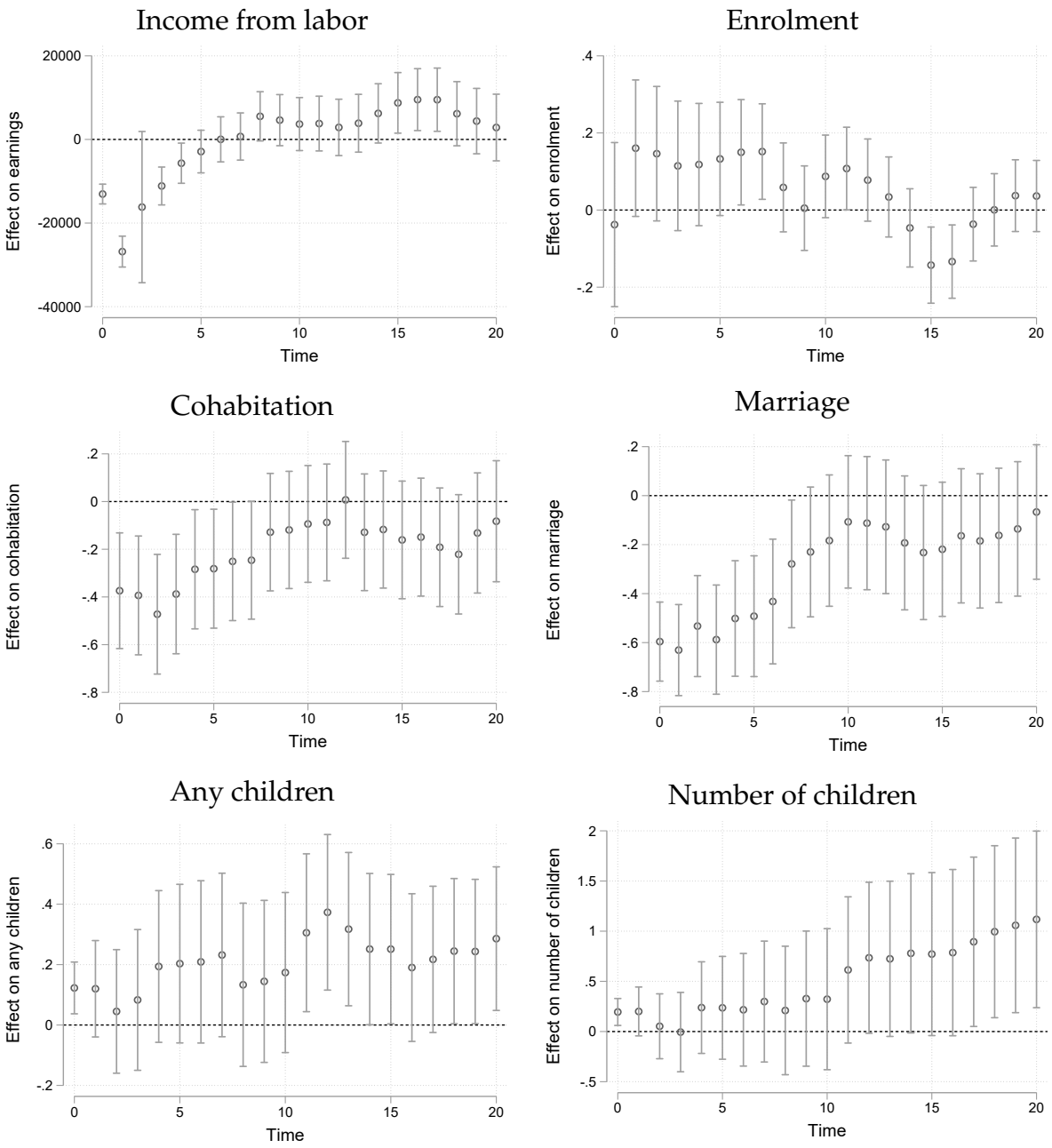
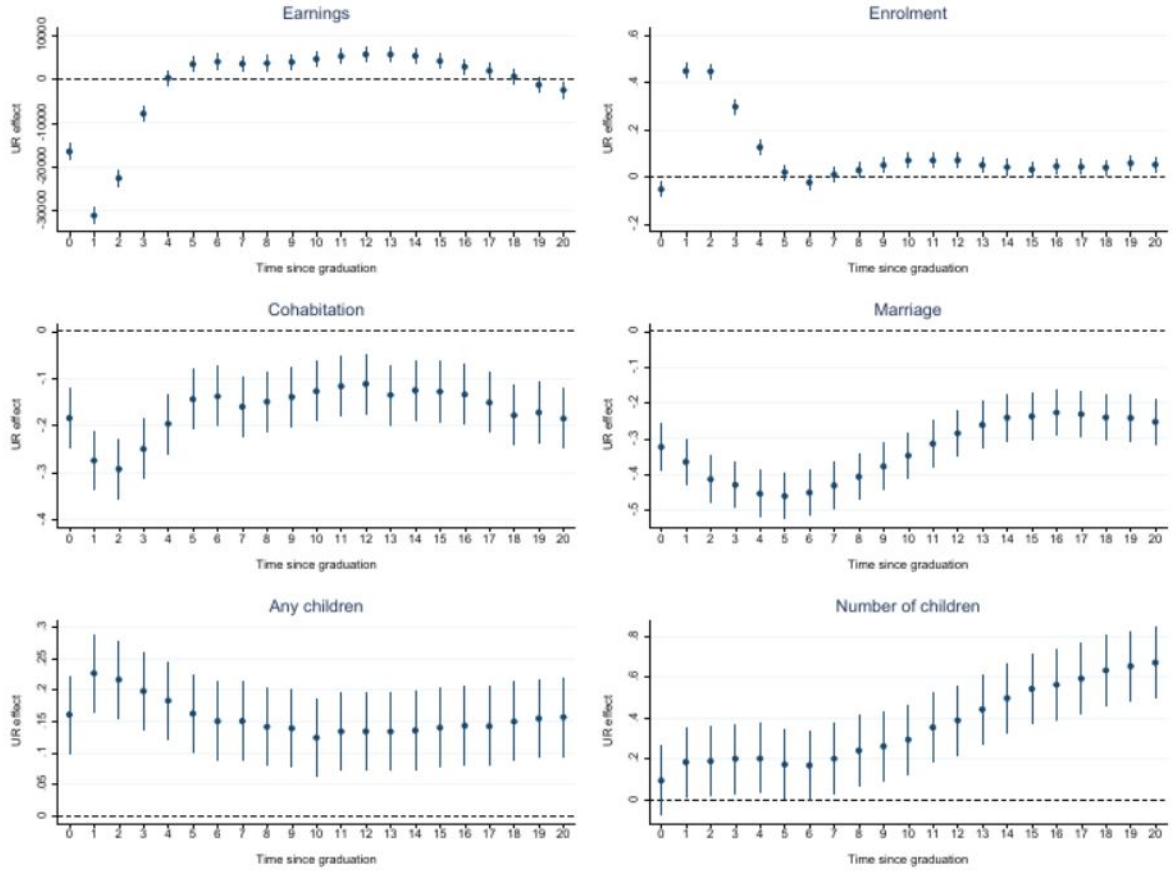


Figure 3: Results for women with secondary education.

Notes: The figure depicts the results for an estimation of the model presented in section 3. The dots are coefficient estimates and capture the change in the outcome variable due to a unit increase in the regional unemployment rate. The bars represent the 95% confidence interval.

Pooled regressions (women, secondary)

Figure 1: Women - secondary education



Results from by time regressions (women, secondary)

Table 1 – Results for secondary female.

Time	Income (1)	Enrollment (2)	Cohabitation (3)	Marriage (4)	Any child (5)	No. of children (6)
0	-13,064.560*** (1,208.239)	-0.038 (0.109)	-0.374*** (0.124)	-0.596*** (0.082)	0.123*** (0.044)	0.195*** (0.068)
1	-26,826.707*** (1,882.688)	0.160* (0.090)	-0.394*** (0.127)	-0.631*** (0.095)	0.120 (0.081)	0.200 (0.124)
2	-16,182.830* (9,227.330)	0.146 (0.089)	-0.472*** (0.128)	-0.533*** (0.105)	0.045 (0.104)	0.052 (0.165)
3	-11,133.644*** (2,311.206)	0.115 (0.086)	-0.388*** (0.128)	-0.588*** (0.114)	0.083 (0.119)	-0.005 (0.202)
4	-5,684.255** (2,450.179)	0.118 (0.081)	-0.284** (0.128)	-0.502*** (0.120)	0.194 (0.128)	0.238 (0.233)
5	-2,899.949 (2,601.763)	0.133* (0.075)	-0.282** (0.127)	-0.492*** (0.126)	0.203 (0.134)	0.236 (0.261)
6	20.117 (2,749.682)	0.150** (0.070)	-0.251** (0.127)	-0.432*** (0.130)	0.209 (0.137)	0.217 (0.286)
7	698.750 (2,877.789)	0.152** (0.063)	-0.246* (0.126)	-0.279** (0.133)	0.232* (0.138)	0.299 (0.307)
8	5,525.565* (3,003.115)	0.059 (0.059)	-0.128 (0.126)	-0.230* (0.135)	0.133 (0.138)	0.210 (0.327)
9	4,613.302 (3,118.755)	0.005 (0.056)	-0.119 (0.125)	-0.184 (0.137)	0.144 (0.137)	0.328 (0.344)
10	3,671.696 (3,235.087)	0.087 (0.055)	-0.094 (0.125)	-0.107 (0.138)	0.174 (0.135)	0.322 (0.359)
11	3,793.410 (3,340.556)	0.108** (0.055)	-0.088 (0.125)	-0.112 (0.139)	0.305** (0.133)	0.614* (0.372)
12	2,875.905 (3,439.743)	0.078 (0.054)	0.007 (0.125)	-0.127 (0.139)	0.373*** (0.131)	0.735* (0.384)
13	3,872.715 (3,525.546)	0.034 (0.053)	-0.129 (0.125)	-0.193 (0.139)	0.317** (0.129)	0.725* (0.395)
14	6,228.700* (3,616.558)	-0.046 (0.052)	-0.117 (0.125)	-0.232* (0.140)	0.251** (0.128)	0.780* (0.405)
15	8,744.816** (3,697.152)	-0.143*** (0.050)	-0.161 (0.126)	-0.219 (0.140)	0.251** (0.126)	0.772* (0.414)
16	9,518.917** (3,775.917)	-0.134*** (0.049)	-0.149 (0.126)	-0.164 (0.140)	0.190 (0.125)	0.786* (0.423)
17	9,501.051** (3,859.604)	-0.037 (0.049)	-0.192 (0.127)	-0.185 (0.140)	0.217* (0.124)	0.894** (0.431)
18	6,151.284 (3,914.149)	0.001 (0.048)	-0.221* (0.128)	-0.162 (0.140)	0.245** (0.123)	0.995** (0.437)
19	4,386.315 (3,989.651)	0.037 (0.047)	-0.132 (0.129)	-0.136 (0.140)	0.243** (0.122)	1.058** (0.444)
20	2,850.008 (4,066.692)	0.036 (0.047)	-0.083 (0.129)	-0.067 (0.140)	0.286** (0.121)	1.118** (0.449)
No. of obs.	2,211,612	2,211,612	2,211,612	2,211,612	2,211,612	2,211,612

Notes: The columns report estimates of the effect of unemployment rate experienced at time 0 on the following outcomes: labor earnings deflated in 2010 EUR and including 0's for the years the person is observed in the population registers and has missing income (Column 1); enrolment status (Column 2); cohabitation (Column 3); marriage (Column 4); any children born (Column 5); number of children (Column 6). All regressions are estimated separately by time since graduation and control for years since graduation, cohort fixed effects and region at time 0. The estimation sample includes 1989-1999 cohorts of secondary female observed between time 0 and 20. Outcomes are measured between and and every person is followed since time 0 regardless of graduation timing or level. Standard errors in parentheses. *, **, and *** denote significance at the 10%, 5% and 1% level.

Sub-regional UR, men with secondary education

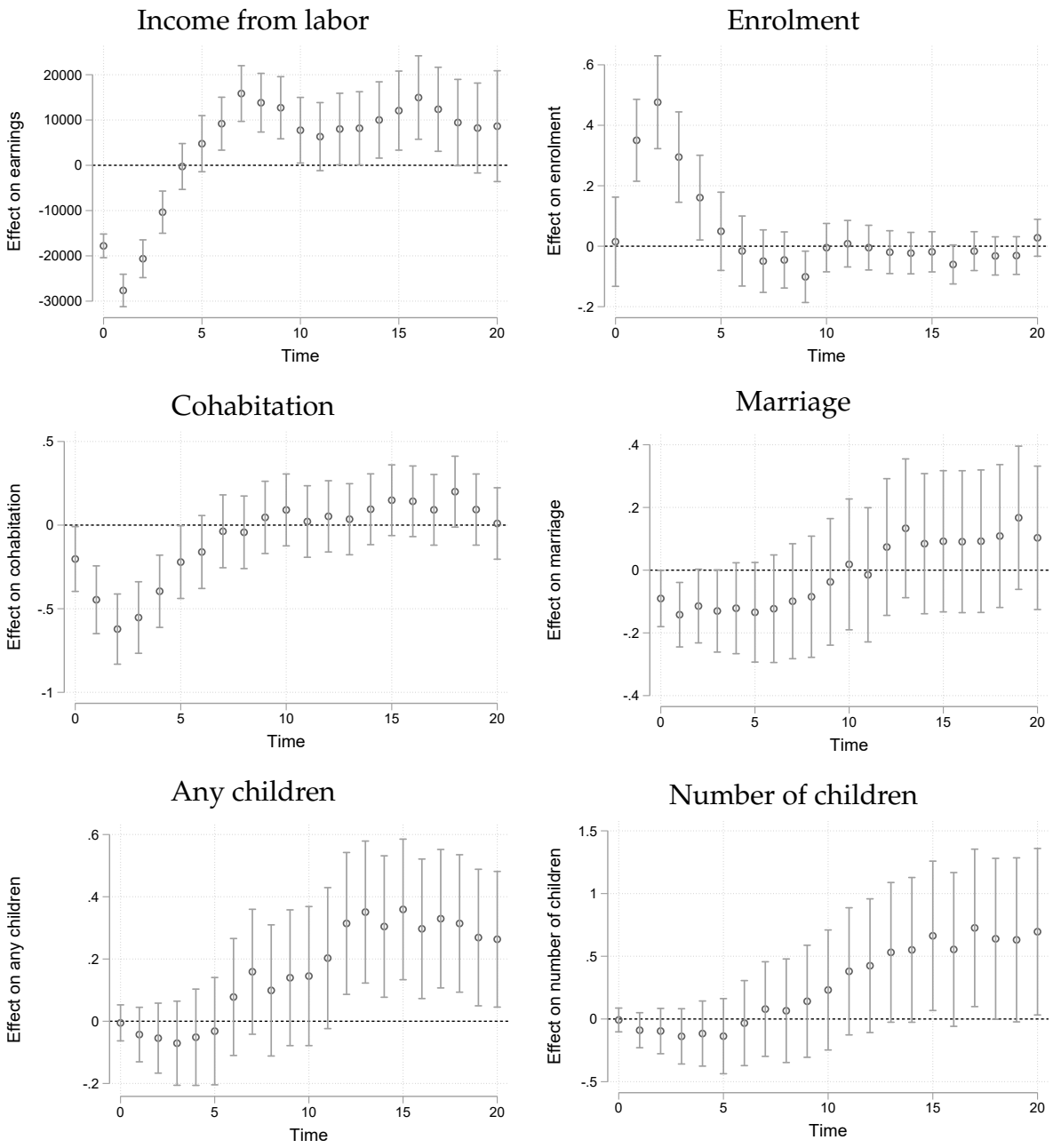
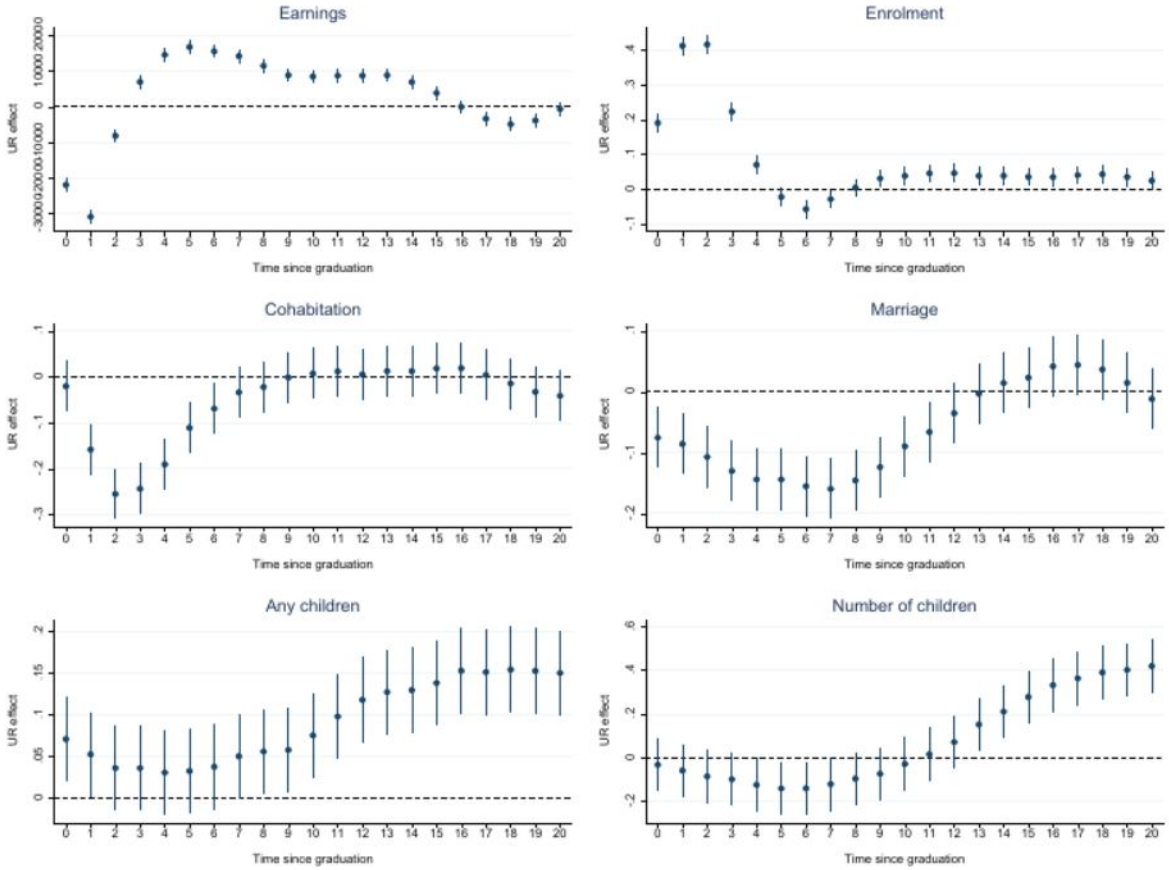


Figure 4: Results for men with secondary education.

Notes: The figure depicts the results for an estimation of the model presented in section 3. The dots are coefficient estimates and capture the change in the outcome variable due to a unit increase in the regional unemployment rate. The bars represent the 95% confidence interval.

Pooled regressions (men, secondary)

Figure 2: Men - secondary education



Results from by time regressions (men, secondary)

Table 1 – Results for secondary male.

Time	Income (1)	Enrollment (2)	Cohabitation (3)	Marriage (4)	Any child (5)	No. of children (6)
0	-17,792.402*** (1,332.560)	0.015 (0.075)	-0.203** (0.099)	-0.090** (0.046)	-0.005 (0.030)	-0.008 (0.048)
1	-27,639.135*** (1,827.071)	0.350*** (0.069)	-0.446*** (0.103)	-0.142*** (0.052)	-0.043 (0.045)	-0.090 (0.071)
2	-20,635.523*** (2,128.289)	0.476*** (0.078)	-0.622*** (0.107)	-0.114* (0.060)	-0.054 (0.057)	-0.096 (0.092)
3	-10,350.251*** (2,376.460)	0.295*** (0.076)	-0.553*** (0.109)	-0.130* (0.067)	-0.071 (0.069)	-0.138 (0.112)
4	-266.525 (2,584.153)	0.161** (0.071)	-0.396*** (0.110)	-0.121 (0.074)	-0.051 (0.079)	-0.116 (0.132)
5	4,768.592 (3,161.432)	0.049 (0.066)	-0.221** (0.111)	-0.134* (0.081)	-0.032 (0.088)	-0.137 (0.153)
6	9,184.234*** (2,981.408)	-0.016 (0.059)	-0.161 (0.111)	-0.123 (0.088)	0.078 (0.096)	-0.033 (0.173)
7	15,845.571*** (3,140.466)	-0.049 (0.053)	-0.037 (0.111)	-0.099 (0.094)	0.159 (0.102)	0.079 (0.192)
8	13,819.039*** (3,305.180)	-0.046 (0.047)	-0.043 (0.111)	-0.085 (0.099)	0.099 (0.107)	0.066 (0.211)
9	12,705.042*** (3,499.902)	-0.101** (0.043)	0.046 (0.110)	-0.037 (0.103)	0.140 (0.111)	0.141 (0.228)
10	7,740.086** (3,697.156)	-0.005 (0.041)	0.091 (0.110)	0.018 (0.106)	0.145 (0.114)	0.231 (0.244)
11	6,327.828* (3,834.182)	0.008 (0.039)	0.021 (0.109)	-0.015 (0.109)	0.203* (0.116)	0.380 (0.259)
12	8,003.960** (4,030.173)	-0.005 (0.038)	0.052 (0.109)	0.074 (0.111)	0.314*** (0.116)	0.425 (0.272)
13	8,171.091** (4,119.492)	-0.020 (0.036)	0.035 (0.108)	0.134 (0.113)	0.351*** (0.116)	0.531* (0.284)
14	10,007.232** (4,298.499)	-0.023 (0.035)	0.095 (0.108)	0.084 (0.114)	0.304*** (0.116)	0.551* (0.294)
15	12,066.833*** (4,455.453)	-0.019 (0.034)	0.149 (0.108)	0.092 (0.115)	0.359*** (0.115)	0.663** (0.304)
16	14,961.263*** (4,700.871)	-0.060* (0.033)	0.142 (0.108)	0.091 (0.115)	0.297*** (0.114)	0.554* (0.313)
17	12,366.291*** (4,734.501)	-0.016 (0.033)	0.091 (0.108)	0.092 (0.116)	0.330*** (0.113)	0.726** (0.320)
18	9,439.562* (4,860.930)	-0.032 (0.032)	0.200* (0.108)	0.109 (0.116)	0.314*** (0.113)	0.639* (0.327)
19	8,226.429 (5,065.360)	-0.031 (0.032)	0.093 (0.108)	0.167 (0.117)	0.269** (0.112)	0.631* (0.334)
20	8,634.312 (6,242.226)	0.028 (0.031)	0.010 (0.109)	0.103 (0.117)	0.263** (0.111)	0.696** (0.339)
No. of obs.	3,148,732	3,148,732	3,148,732	3,148,732	3,148,732	3,148,732

Notes: The columns report estimates of the effect of unemployment rate experienced at time 0 on the following outcomes: labor earnings deflated in 2010 EUR and including 0's for the years the person is observed in the population registers and has missing income (Column 1); enrolment status (Column 2); cohabitation (Column 3); marriage (Column 4); any children born (Column 5); number of children (Column 6). All regressions are estimated separately by time since graduation and control for years since graduation, cohort fixed effects and region at time 0. The estimation sample includes 1989-1999 cohorts of secondary male observed between time 0 and 20. Outcomes are measured between and and every person is followed since time 0 regardless of graduation timing or level. Standard errors in parentheses. *, **, and *** denote significance at the 10%, 5% and 1% level.

Sub-regional UR, women with tertiary education

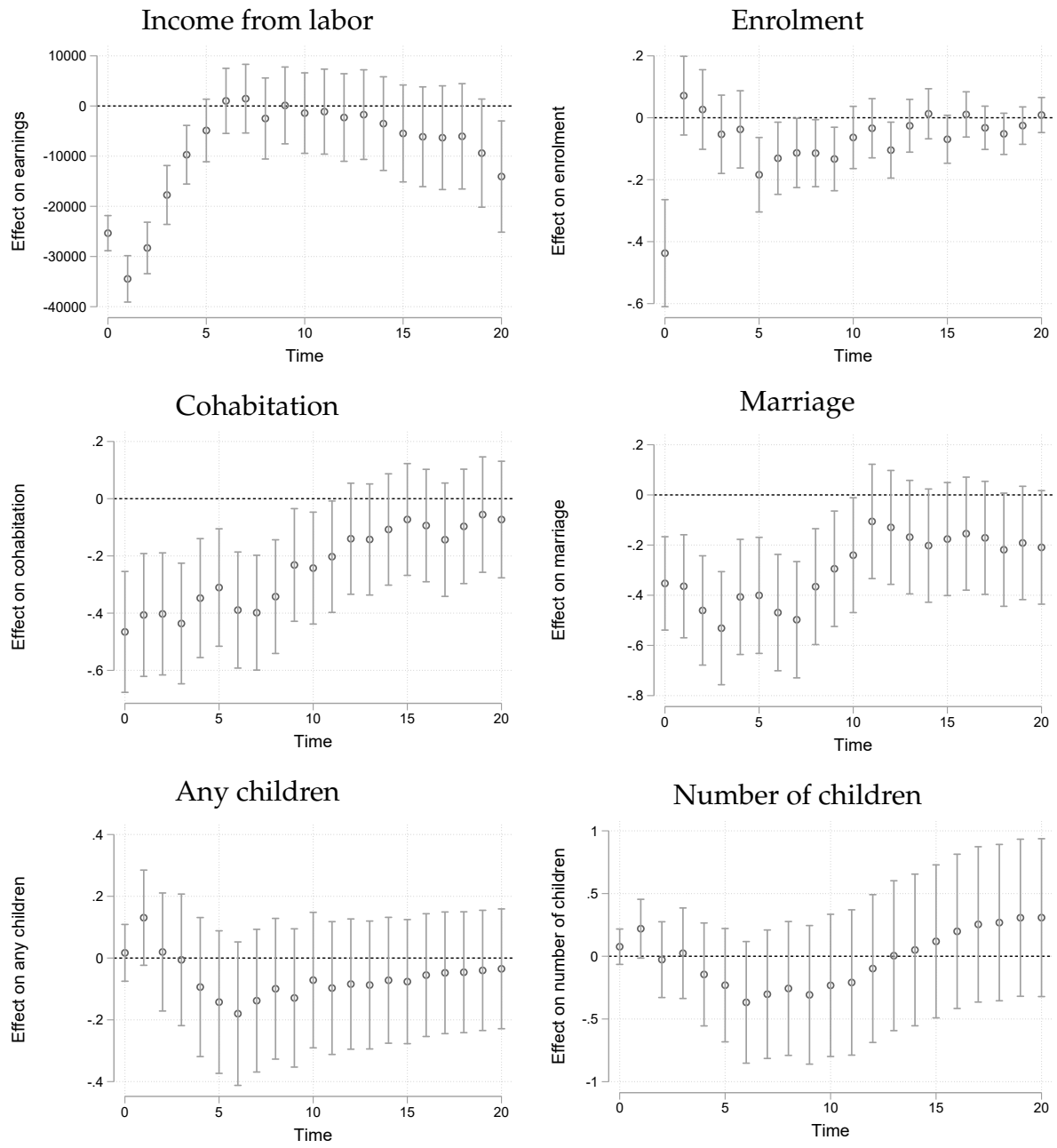
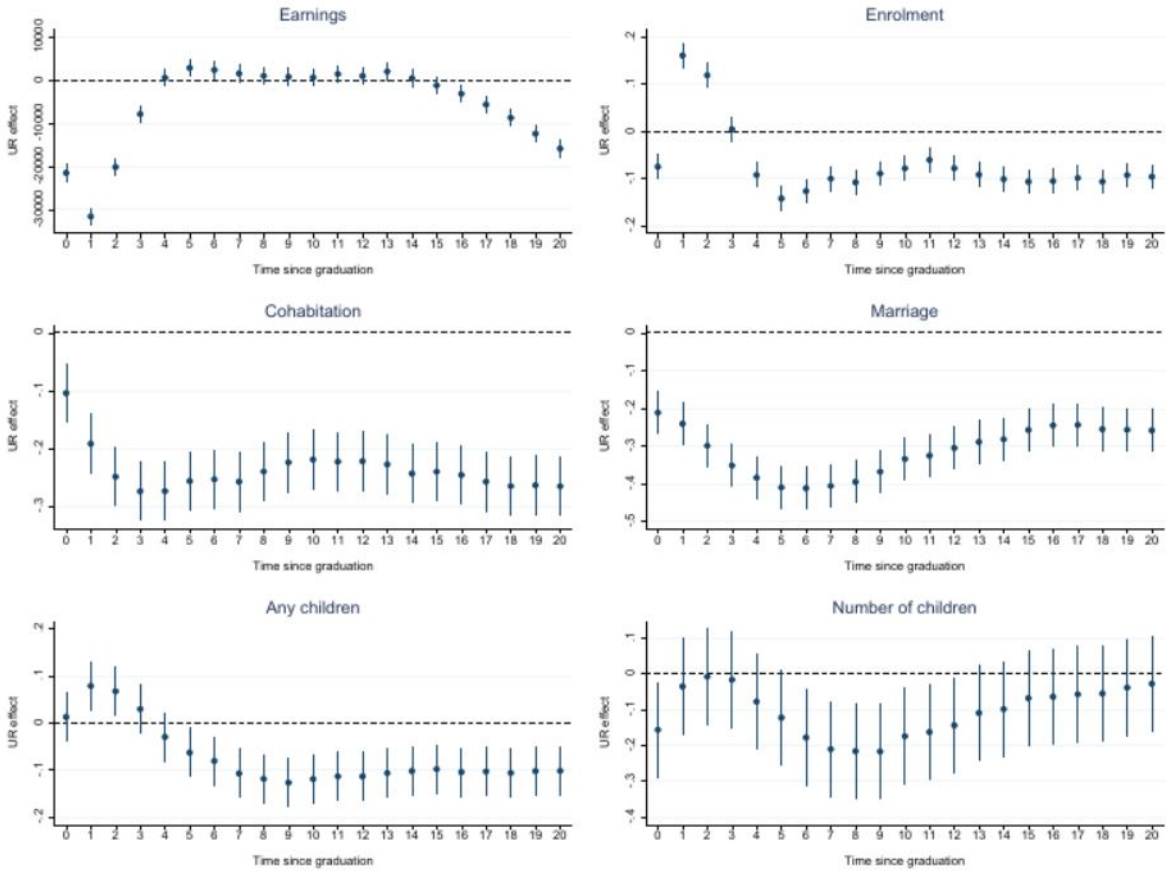


Figure 5: Results for women with tertiary education.

Notes: The figure depicts the results for an estimation of the model presented in section 3. The dots are coefficient estimates and capture the change in the outcome variable due to a unit increase in the regional unemployment rate. The bars represent the 95% confidence interval.

Pooled regressions (women, tertiary)

Figure 3: Women - tertiary education



Results from by time regressions (women, tertiary)

Table 1 – Results for tertiary female.

Time	Income (1)	Enrollment (2)	Cohabitation (3)	Marriage (4)	Any child (5)	No. of children (6)
0	-25,345.004*** (1,786.399)	-0.437*** (0.088)	-0.466*** (0.108)	-0.353*** (0.095)	0.017 (0.047)	0.076 (0.072)
1	-34,461.477*** (2,358.801)	0.071 (0.065)	-0.406*** (0.110)	-0.364*** (0.105)	0.131* (0.079)	0.220* (0.120)
2	-28,295.086*** (2,616.354)	0.027 (0.066)	-0.403*** (0.109)	-0.461*** (0.111)	0.020 (0.098)	-0.027 (0.154)
3	-17,737.504*** (2,993.326)	-0.053 (0.065)	-0.436*** (0.108)	-0.531*** (0.115)	-0.006 (0.109)	0.024 (0.184)
4	-9,715.972*** (2,981.126)	-0.038 (0.064)	-0.347*** (0.106)	-0.407*** (0.117)	-0.094 (0.115)	-0.145 (0.209)
5	-4,880.058 (3,180.998)	-0.184*** (0.061)	-0.311*** (0.105)	-0.400*** (0.118)	-0.143 (0.118)	-0.231 (0.230)
6	1,015.935 (3,310.316)	-0.131** (0.059)	-0.389*** (0.103)	-0.469*** (0.118)	-0.180 (0.118)	-0.367 (0.247)
7	1,457.220 (3,493.225)	-0.114** (0.057)	-0.398*** (0.102)	-0.498*** (0.118)	-0.138 (0.118)	-0.303 (0.261)
8	-2,495.901 (4,120.707)	-0.114** (0.055)	-0.342*** (0.101)	-0.366*** (0.118)	-0.099 (0.116)	-0.257 (0.272)
9	110.151 (3,906.967)	-0.133** (0.052)	-0.232** (0.100)	-0.294** (0.117)	-0.129 (0.114)	-0.308 (0.282)
10	-1,418.768 (4,090.870)	-0.064 (0.051)	-0.243** (0.100)	-0.240** (0.117)	-0.071 (0.112)	-0.232 (0.289)
11	-1,127.145 (4,320.632)	-0.034 (0.049)	-0.203** (0.099)	-0.106 (0.116)	-0.097 (0.110)	-0.209 (0.296)
12	-2,299.112 (4,453.405)	-0.104** (0.046)	-0.140 (0.099)	-0.130 (0.116)	-0.084 (0.108)	-0.098 (0.301)
13	-1,724.120 (4,556.277)	-0.026 (0.043)	-0.143 (0.099)	-0.168 (0.115)	-0.087 (0.106)	0.005 (0.305)
14	-3,517.866 (4,762.130)	0.013 (0.041)	-0.108 (0.099)	-0.202* (0.115)	-0.072 (0.104)	0.050 (0.308)
15	-5,476.866 (4,928.320)	-0.070* (0.040)	-0.073 (0.100)	-0.176 (0.115)	-0.076 (0.103)	0.119 (0.311)
16	-6,134.830 (5,072.021)	0.011 (0.037)	-0.094 (0.100)	-0.154 (0.115)	-0.055 (0.101)	0.199 (0.314)
17	-6,322.911 (5,272.735)	-0.032 (0.036)	-0.143 (0.101)	-0.171 (0.115)	-0.048 (0.100)	0.254 (0.316)
18	-6,050.586 (5,356.476)	-0.052 (0.034)	-0.097 (0.102)	-0.219* (0.115)	-0.046 (0.100)	0.268 (0.318)
19	-9,396.697* (5,498.215)	-0.025 (0.031)	-0.056 (0.103)	-0.192* (0.115)	-0.040 (0.099)	0.307 (0.319)
20	-14,065.711** (5,655.244)	0.009 (0.029)	-0.073 (0.104)	-0.209* (0.115)	-0.035 (0.099)	0.308 (0.321)
No. of obs.	3,695,387	3,695,387	3,695,387	3,695,387	3,695,387	3,695,387

Notes: The columns report estimates of the effect of unemployment rate experienced at time 0 on the following outcomes: labor earnings deflated in 2010 EUR and including 0's for the years the person is observed in the population registers and has missing income (Column 1); enrolment status (Column 2); cohabitation (Column 3); marriage (Column 4); any children born (Column 5); number of children (Column 6). All regressions are estimated separately by time since graduation and control for years since graduation, cohort fixed effects and region at time 0. The estimation sample includes 1989-1999 cohorts of tertiary female observed between time 0 and 20. Outcomes are measured between and and every person is followed since time 0 regardless of graduation timing or level. Standard errors in parentheses. *, **, and *** denote significance at the 10%, 5% and 1% level.

Sub-regional UR, men with tertiary education

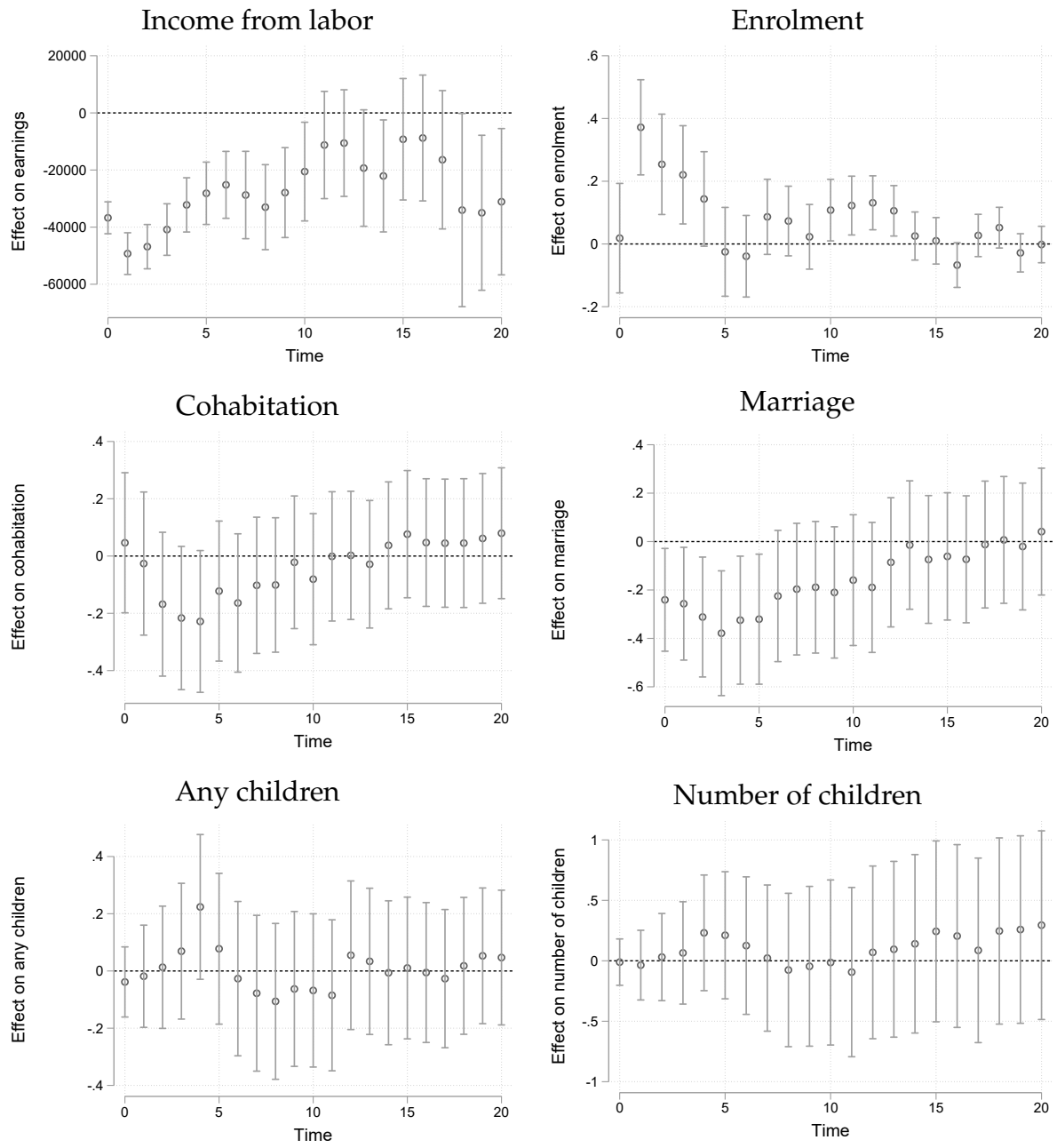
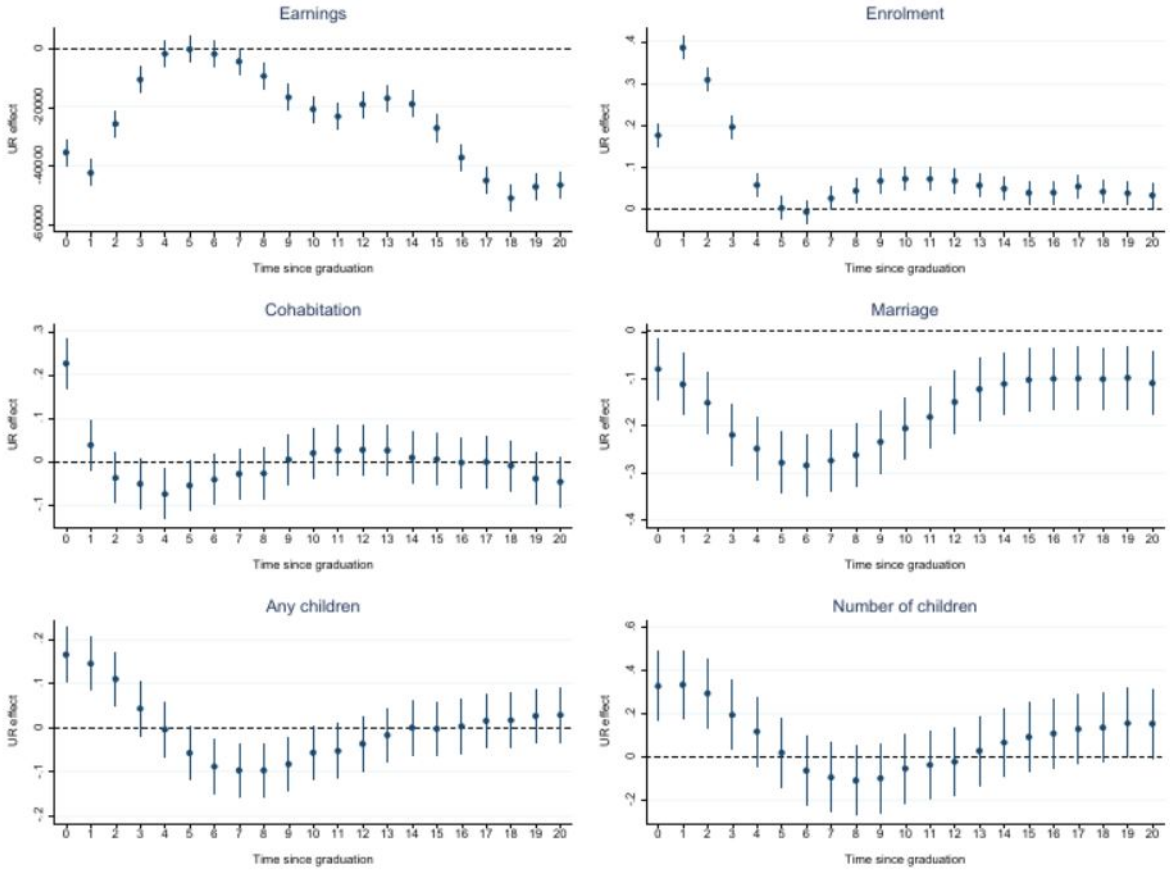


Figure 6: Results for men with tertiary education.

Notes: The figure depicts the results for an estimation of the model presented in section 3. The dots are coefficient estimates and capture the change in the outcome variable due to a unit increase in the regional unemployment rate. The bars represent the 95% confidence interval.

Pooled regressions (men, tertiary)

Figure 4: Men - tertiary education



Results from by time regressions (men, tertiary)

Table 1 – Results for tertiary male.

Time	Income (1)	Enrollment (2)	Cohabitation (3)	Marriage (4)	Any child (5)	No. of children (6)
0	-36,728.883*** (2,850.025)	0.019 (0.089)	0.046 (0.125)	-0.241** (0.108)	-0.038 (0.063)	-0.011 (0.098)
1	-49,275.406*** (3,727.535)	0.372*** (0.077)	-0.026 (0.127)	-0.257** (0.119)	-0.019 (0.091)	-0.036 (0.147)
2	-46,836.930*** (3,956.598)	0.254*** (0.082)	-0.168 (0.128)	-0.312** (0.126)	0.013 (0.109)	0.031 (0.184)
3	-40,846.090*** (4,605.626)	0.220*** (0.080)	-0.216* (0.128)	-0.379*** (0.131)	0.069 (0.121)	0.065 (0.216)
4	-32,209.379*** (4,844.519)	0.143* (0.077)	-0.228* (0.126)	-0.325** (0.135)	0.224* (0.129)	0.231 (0.244)
5	-28,141.619*** (5,567.884)	-0.025 (0.072)	-0.122 (0.125)	-0.321** (0.137)	0.078 (0.134)	0.211 (0.268)
6	-25,189.023*** (5,977.578)	-0.039 (0.066)	-0.164 (0.123)	-0.225 (0.138)	-0.027 (0.138)	0.126 (0.290)
7	-28,751.006*** (7,805.141)	0.086 (0.061)	-0.102 (0.121)	-0.196 (0.139)	-0.078 (0.139)	0.023 (0.308)
8	-33,004.547*** (7,594.876)	0.073 (0.057)	-0.101 (0.120)	-0.189 (0.139)	-0.106 (0.139)	-0.076 (0.324)
9	-27,901.605*** (8,033.026)	0.023 (0.053)	-0.022 (0.118)	-0.210 (0.138)	-0.063 (0.138)	-0.045 (0.337)
10	-20,545.385** (8,818.746)	0.108** (0.050)	-0.081 (0.117)	-0.159 (0.138)	-0.068 (0.137)	-0.014 (0.348)
11	-11,243.326 (9,578.990)	0.122** (0.048)	-0.001 (0.115)	-0.189 (0.137)	-0.085 (0.135)	-0.093 (0.357)
12	-10,569.384 (9,525.440)	0.131*** (0.044)	0.002 (0.114)	-0.086 (0.136)	0.055 (0.133)	0.070 (0.364)
13	-19,308.645* (10,403.741)	0.106** (0.041)	-0.029 (0.114)	-0.014 (0.135)	0.034 (0.130)	0.095 (0.371)
14	-22,070.689** (10,003.779)	0.025 (0.039)	0.037 (0.113)	-0.074 (0.135)	-0.006 (0.128)	0.141 (0.377)
15	-9,230.241 (10,844.479)	0.010 (0.038)	0.076 (0.113)	-0.061 (0.134)	0.010 (0.126)	0.244 (0.382)
16	-8,777.083 (11,245.390)	-0.067* (0.036)	0.047 (0.114)	-0.073 (0.134)	-0.006 (0.125)	0.205 (0.386)
17	-16,405.963 (12,360.313)	0.027 (0.034)	0.045 (0.114)	-0.012 (0.134)	-0.027 (0.123)	0.087 (0.389)
18	-34,032.051** (17,255.672)	0.052 (0.033)	0.045 (0.115)	0.007 (0.134)	0.018 (0.122)	0.247 (0.393)
19	-34,970.359** (13,849.158)	-0.028 (0.031)	0.062 (0.116)	-0.020 (0.134)	0.053 (0.121)	0.259 (0.396)
20	-31,095.588** (13,067.275)	-0.002 (0.030)	0.080 (0.117)	0.041 (0.134)	0.047 (0.120)	0.295 (0.398)
No. of obs.	2,702,745	2,702,745	2,702,745	2,702,745	2,702,745	2,702,745

Notes: The columns report estimates of the effect of unemployment rate experienced at time 0 on the following outcomes: labor earnings deflated in 2010 EUR and including 0's for the years the person is observed in the population registers and has missing income (Column 1); enrolment status (Column 2); cohabitation (Column 3); marriage (Column 4); any children born (Column 5); number of children (Column 6). All regressions are estimated separately by time since graduation and control for years since graduation, cohort fixed effects and region at time 0. The estimation sample includes 1989-1999 cohorts of tertiary male observed between time 0 and 20. Outcomes are measured between and and every person is followed since time 0 regardless of graduation timing or level. Standard errors in parentheses. *, **, and *** denote significance at the 10%, 5% and 1% level.

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Appendix: Additional tables and figures

Table A-1: Descriptive statistics by cohorts

	All cohorts (1)	Cohorts 1989-1993 (2)	Cohorts 1994-1999 (3)
Education: compulsory	0.002	0.001	0.003
Education: secondary	0.456	0.457	0.456
Education: tertiary	0.542	0.543	0.541
Male	0.496	0.489	0.501
Age at graduation	22.855	22.831	22.876
Yearly labor income (in 2010 EUR)	7,918.831	8,350.388	7,549.941
Regional unemployment rate	0.151	0.124	0.175
Observations	578,708	266,700	312,008
Any child (t=20)	0.736	0.739	0.734
Number of children (t=20)	1.713	1.717	1.709
Marriage (t=20)	0.565	0.575	0.556
Cohabitation (t=20)	0.725	0.732	0.720
Observations	549,960	254,330	295,630

Notes: All quantities are measured at time 0, except for the values of any child, number of children, marriage and cohabiting, measured at time 20.