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ABSTRACT

Early Labor Market Prospects and Family Formation*

We use quasi-random variation in graduation years during the onset of a very deep national recession to study the relationship between early labor market conditions and young females' family formation outcomes. A policy-pilot affecting the length of upper-secondary vocational tracks allows us to compare females who graduated into the onset of the Swedish financial crisis of the 1990s to those graduating during the final phase of the preceding economic boom while netting out the main effect of the policy. We find pronounced, but short-lived, negative labor market effects from early exposure to the recession for low-grade students in particular. In contrast, we document very long-lasting effects on family formation outcomes, again concentrated among low-grade students. Young women who graduated into the recession because of the policy-pilot formed their first stable partnerships earlier and had their first children earlier. Their partners had lower grades, which we show to be a strong predictor of divorce, and worse labor market performance. Divorces were more prevalent and the ensuing increase in single motherhood was long-lasting. These negative effects on marital stability generated persistent increases in the use of welfare benefits despite the short-lived impact on labor market outcomes. The results suggest that young women respond to early labor market prospects by changing the quality threshold for entering into family formation, a process which affects the frequency of welfare-dependent single mothers during more than a decade thereafter.

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

Keywords: family formation, female labor supply, cost of recessions

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1 Introduction

The interplay between labor markets and marriage markets is a core topic within economics and social science in general.[1] A key question within this broad topic is how labor market outcomes, most notably unemployment and wages, affect the timing of marriage and the choice of partner and how this process translates into longer-run outcomes such as fertility and marital stability. Inspired by the growing literature on the impact of graduating in a recession, this paper studies how early labor market prospects affect family formation decisions and outcomes among female high school graduates. We present evidence from a rare case of quasi-random variation in exposure to a rapidly evolving and very deep national recession. The exogenous variation arises due to an experimental policy-pilot within Swedish vocational high schools. Combined with two decades of longitudinal population-wide administrative registers, this unique setting allows us to provide plausibly identified evidence on the impact of early exposure to a deep recession on short and long-term labor market outcomes and to trace out the extent to which these early labor market prospects alter key aspects of the family-formation processes including the incidence, timing, quality and dissolution rates of formed partnerships with a follow-up period spanning across two decades.

Our analysis is set at the onset of one of the "Big Five" financial crises (Reinhart and Rogoff (2008)); the very deep Swedish recession of the early 1990s. This large-scale financial crisis was associated with major declines in economic performance for an extended period and many aspects of the crisis resemble those of the great recession starting in the US in 2008 that spread throughout the world. The recession abruptly ended a long period of overheated labor markets and therefore generated a massive five-fold increase in youth unemployment rates within three years.

Our empirical approach rests on the combination of rapidly deteriorating labor market conditions and a quasi-random prolongation of education. This allows us to compare female graduates who enter the labor market during the initial phase of a very deep recession to graduates from the same cohort who enter just before the start of the recession and therefore had the opportunity to receive some initial labor market experience before the recession started. Our identification strategy uses a comprehensive policy pilot that prolonged Swedish vocational upper-secondary school programs from two to three years with a gradual implementation just at the onset of the great Swedish recession.[2] We instrument enrollment in three-year rather than two-year tracks by the predetermined roll-out scheme of longer vocational track programs across municipalities.[3] The fact that some, but not all, of the cohorts received severely deteriorated initial labor market conditions at exit when enrolled in a longer program allows us to net out the direct impact of the policy reform through differences-in-differences identification. To this end, we derive an instrument for the aggregate business cycle conditions on graduation based by the interaction between the pilot-induced share of three-year tracks with the realized aggregate conditions at predicted time of exit. After conditioning on on municipality fixed effects and cohort dummies this variation facilitates

[1] See Becker (1973) for a seminal contribution or Blau and Winkler (2017) for a more recent overview.

[2] Anticipation effects are unlikely as the pilot roll-out was determined well before the recession started.

[3] The strategy extends the work of Hall (2012) who evaluated the overall effect of program duration. Other studies using the same identification strategy include Grönqvist and Hall (2013), Grönqvist et al. (2017) and Hall (2016). The respective studies examines the impact of the prolonged programs on fertility, crime and future employment.

quasi-experimental identification of the impact of graduating in a recession within enrollment cohorts.[4]

Our data are drawn from linked administrative registers which cover the entire Swedish working-age population during 1985-2013 and we follow the labor market careers and family decisions of the youths for up to 19 years after graduation. The data contain information on the year, municipality and high school track (program) that each student enrolled in, as well as the graduation records of the same students. These data are linked to information on grades from compulsory school (i.e. before high school), employment, earnings, welfare receipt, information on further education, childbearing, marriage, cohabitation (with common children) and the identity of the partner. To these data we link information on national female youth unemployment rates that we use to indicate the severity of the recession for each graduation year.

Before turning to the main results, we assess the conditional randomness required by our strategy. We show that the instrumented unemployment rate at graduation is unrelated to the number of enrolled vocational students as well as these students' predetermined characteristics (compulsory school grades, immigration status and parental education).[5]

We then document that labor market outcomes were adversely affected by graduating during the recession, in particular for youths with low compulsory school grades. The labor market impact was, however, short lived. Labor market outcomes (employment/earnings) are no longer statistically related to the initial unemployment rate beyond the three-year horizon. This is well in line with previous studies of low-educated youths.[6] Notably, we find an increase in the use of welfare benefits (social assistance) that lasts throughout our 19-year-long follow-up period.

The main focus of our paper is on assessing if and how these labor market effects feed into the family formation process. To fix ideas, we present a stylized model of endogenous partnership quality thresholds that mimics our setting and labor market results. The model highlights that females will reduce their required match quality when short-run labor market prospects deteriorate if the marginal returns to early income are higher when single, e.g. because of pooling of incomes within partnerships. A lower partnership threshold leads to more partnerships being formed with, on average, poorer quality spouses and, as a consequence, more divorces.

Our empirical results strongly point in this direction, at least for students with low compulsory school grades who were hit the hardest in terms of labor market outcomes. Females who graduate during a

[4] We do not perform a corresponding analysis for males in the main part of the paper (results are, however, reported at the end for completeness) since they participated in a full year of mandatory military service at age 19-21 which breaks the tight relationship between study duration and year of market entry that we rely on for identification. Note however that the two experiments (males, females) should each be viewed in isolation since the potential partner-pools' exposures to the recession in both cases are unrelated to the identifying variation arising from the policy pilot. This is because the average cohort-gap between partners is 3 years in our data, and because few partnerships (13%) are formed within a cohort. The relevant partner pool of the women of interest is therefore unaffected (in a direct sense) by the within-cohort variation in pilot intensity, and consists of men who entered the labor market on average 3 years earlier, in better labor market conditions.

[5] The responsiveness to variation in unemployment rates is not statistically different for two- and three-year track graduates and drop-out rates are not affected by the unemployment rate at predicted graduation.

[6] See e.g. Genda et al. (2010) and Speer (2016) for low educated men and Hershbein (2012) for females. Nordström Skans (2011) shows evidence of persistent, but non-permanent, scarring effects of graduation-year unemployment experiences among Swedish high school graduates. Cockx (2016) argues that low-educated youth entering a labor market in a downturn are expected to experience only temporary penalties in wages and earnings because skills acquired during vocational training do not erode during periods of inactivity. However, because they are at the bottom of the qualification ladder, they cannot shield themselves against negative shocks by moving to a lower-skilled job. This makes the short-term impact of a recession more severe for low- than for high-educated youth.

recession are more likely to form an early partnership through marriage or cohabitation with a common child (a very common and non-stigmatized form of partnership in the Swedish context). Similarly, the age at first child-birth is reduced. As with the labor market impact, these effects are particularly pronounced for graduates with low initial grades. Thus, the results suggest that the family-formation process speeds up when women's labor market prospects deteriorate.

The speedier family formation process appears to be achieved at the cost of lower quality partnerships. The labor earnings of the spouses are lower, which could have been mechanical if spousal market conditions had been correlated. However, the average partner is 3 years older (and the age is unaffected by the woman's exposure to the recession) and the partner's labor market conditions should therefore not be (at least directly) related to the local intensity of the policy pilot that drives our identifying variation. This suggests that the lower earnings instead reflect a more negative selection of males within the available partner pool, e.g. due to less restrictive quality thresholds. Consistent with this interpretation, we find that spouses are drawn from a lower part of the compulsory-school grade distribution, which we show is a strong predictor of partnership dissolution. Furthermore, we show that the incidence of failed partnerships (divorces) is substantially increased for females graduating during a recession. Jointly, the higher rates of early partnership formation, the increased divorce rates, and the indications of reduced partner quality, suggest that young females choose lower thresholds for acceptable partnerships when labor market prospects on graduation are dreary. Further evidence suggests that early exposure to the recession caused deteriorated health for the women in their mid-20s.

Finally, we show that these reduced thresholds lead to an elevated propensity to become a single mother at an early age and an elevated propensity to receive welfare benefits that persist much longer than the impact on labor market outcomes. We show that the persistent increased use of welfare benefits is tightly linked to single motherhood and the formation of low-quality partnerships.

We end the paper by redoing the analysis for men, even though our identifying variation is less sharp for these due to the interruption of military service participation. The results show similar impacts on labor market outcomes in the short run and, as for the women, no long-run impact. The impacts on family formation are much more muted, and appear to, in particular, relate to a postponement of partnership formation (i.e. the reverse to the impact on women).

Overall, our results suggest that the threshold for an acceptable partnership is endogenous to aggregate labor market conditions at graduation. Deep recessions that destroy the labor market prospects of low-grade females may make these graduates accept poor quality partnerships that they would not accept when labor market prospects are more favorable. These poor partnerships propagate into negative long-run consequences in terms of welfare benefit usage and poorer health, despite of the short-run nature of the labor-market effects. Thus, the long-run negative utility consequences of deep recessions are likely to be substantial even when labor market effects are short-lived.

Our study brings new insights into the large literature on the labor-market consequences of graduating during a recession. Prior studies in this vein show that graduating during a deep recession has substantial negative effects on the later earnings of young graduates, suggesting that the welfare consequences recessions are large, see e.g. Stevens (2007), Kahn (2010), Genda et al. (2010), Bell and Blanchflower (2011),

Oreopoulos et al. (2012), Hershbein (2012), Cockx (2016), Speer (2016) and Schwandt and von Wachter (2018). We contribute to this set of studies by presenting a rare case of quasi-random within-cohort variation – arising from an experimental policy pilot – in exposure to a rapidly evolving and very deep national recession.

Our main contribution, however, is relative to the set of studies analyzing how labor market prospects and marriage market outcomes are interrelated. Most notably, a few recent studies has focused on the role of relative labor market prospects of men vs. women, see most notably Autor et al. (Forthcoming) and Blau et al. (2000). We contribute by providing a very detailed account of how family formation outcomes for women evolve over time as a result of exogenous variation in early labor market prospects of graduating young females. Our focus is also clearly related to, but more distinct than, a set of studies analyzing the general association between family formation and business cycles.[7] Our analysis zooms in on early labor market prospects for females and their partnership choices.[8] We believe that females are particularly interesting in this setting. Since they mate earlier than men, i.e. nearer the time of career entry, interactions between early labor market prospects and marriage outcomes are particularly relevant for them. Indeed, this intricate interplay between marriage markets and labor markets is often raised as a reason for excluding them in studies of the labor market impact of graduating in a recession, see e.g. Kahn (2010) or the overview by Kondo (2016).

The rest of the paper is organized as follows. In Section 2 we describe the severe Swedish economic crisis of the 1990s, how the upper secondary school system is organized, and the policy pilot that we rely on for identification. This is followed by a presentation of the data used (Section 3) and a description of our empirical approach (Section 4). In Section 5 we present our main results and discuss some robustness checks before we conclude by summarizing our findings in Section 6.

2 Background: economic environment and institutions

2.1 The 1990s economic crisis in Sweden

The 1990s crisis in Sweden was the most turbulent period in the Swedish labor market since WWII. It was a large-scale financial crisis associated with major declines in economic performance for an extended period. It was therefore included on the list of the "Big Five" financial crises by Reinhart and Rogoff (2008). At a general level, it provides a close parallel to the recent Great Recession in the US and elsewhere.[9]

The Swedish crisis was the result of a combination of various factors including monetary policies in the 1980s, budget deficits, poorly timed sequence of financial deregulations (removing credit rationing in the mid 1980s) and tax reforms (removing tax subsidies for housing credits in 1990-91), and a collapse of international trade (Bharadwaj et al., 2015; Englund, 1999).

[7] See for instance Schaller (2013) and Currie and Schwandt (2014) on the fertility of US youths, and Kondo (2016) for a general overview.

[8] A handful of papers investigate the impact of economic conditions at the time of graduation/marriage on fertility (see e.g. Hofmann and Hohmeyer (2016) for Germany) or marriage formation (see e.g. Kondo (2012) for the US), but do not look at partnership choice, nor at the interplay of family formation with labor-market and welfare outcomes.

[9] Indeed, many prior observers such as the New York Times, September 22, 2008 and Time, September 24, 2008, have compared the Great Recession to the Swedish crisis.

Before the crisis, Sweden experienced an unprecedented economic boom with a very tight labor market. Unlike other European countries, unemployment in Sweden remained low (below 5%) throughout the 1980s. In the later part of the 1980s, the Swedish economy experienced a boom which pushed unemployment further down to 1.5% in 1989. This exceptionally strong period in the Swedish labor market was followed by the worst recession since the 1930s. Adult unemployment rate sharply increased: from less than 2% in 1990, it went to around 10% in three years (see Figure 1). Youth unemployment rates had a similar time pattern, but with even more pronounced magnitudes; in 1993-1995, male and female youth unemployment rates peaked at above 20%.

The unemployment rate remained high until the late 1990s, when it started to decline; by 2002 aggregate unemployment rates had reached 5%. As noted by Bharadwaj et al. (2015), the recent US labor market crisis in many ways resembles the Swedish crisis of the 1990s. In both the Swedish and US crises, there was a rapid increase in the unemployment rate and debts in the real estate sector played an important role (in downtown Stockholm, the price of real estate decreased by 35 percent in 1991 (see Englund (1999))).

2.2 Upper secondary education and the policy pilot

In this section we describe how the Swedish upper secondary school system was organized during the late 1980s and early 1990s, and the policy pilot that generated exogenous variation in graduation years within cohorts at the onset of the great Swedish recession.

In Sweden, all youth who have completed compulsory school, which almost all do in June of the year they turn 16, are currently eligible for a three-year upper secondary education. Enrollment is voluntary and students apply to specific tracks/programs based on their grades from compulsory school. During the period of interest attendance was almost universal. Students normally attended a school in their municipality of residence, but if the desired track is not offered they were free to apply to programs in other municipalities. The system provided a set of broad academic programs preparing students for university education and a set of specific vocational tracks which prepared students for working life in different occupations. About 45 percent of the students in upper secondary school enroll in vocational programs during the years (around 1990) which we analyze (Grönqvist and Hall (2011)).

The universal 3-year upper secondary school system was introduced during the academic year starting in 1992.[10] Before this reform, vocational programs were only 2 years long. while the academic programs, with few exceptions, lasted three years. However, prior to the full-scale implementation a policy pilot allowed some compulsory school graduates to enroll in three-year long vocational programs. This pilot thus covered a subset of students enrolling during 1987 to 1991. Starting in 1987, the nation-wide policy pilot was gradually rolled out across a number of municipalities. The purpose of the pilot scheme was to evaluate the consequences of introducing three year vocationally-oriented education programs at the national level.[11] The prolongation of the programs came with some changes in the curriculum. The new

[10] It was fully implemented with the 1995 enrollment cohort.

[11] The policy pilot has been thoroughly documented by Hall (2009, 2012) and Grönqvist and Hall (2011, 2013). Hall (2009, 2012) exploits this policy pilot to evaluate the impact of prolonging vocational tracks from two to three years on educational outcomes. There are also a number of governmental reports describing/evaluating different dimensions of the experiment, see e.g. SOU (1989, 1990, 1992).

three-year programs included a richer set of general (theoretical) courses and more workplace training. Students attending these programs were also granted basic eligibility to higher education (which was one of the main purposes of the reform).

The key administrative unit for schools in Sweden is the The National Board of Education. It was responsible for the roll-out of the pilot scheme and therefore also the allocation of pilot slots by program type and municipality. The pilot covered 500 places in 1987, 6000 places in 1988, 10 000 places in 1989, 11 200 places in 1990 and 12 800 places in 1991 (see Table B1 in appendix). The numbers for 1988 to 1991 correspond to between 11-20 percent of the total number of slots in vocational tracks during the pilot years. A class in the pilot would always replace a class in a corresponding two-year track, implying that the total number of available places in vocational tracks was not expanded (see, Hall (2012)).

The ambition of the government was to distribute the prolonged programs across regions with varying industry structures but also to vary the intensity of the pilot, i.e. to replace a large share (or all) of the slots in vocational programs in some regions while allocating fewer slots to others.[12] Thus, both the number of participating municipalities and the number of pilot tracks within these participating municipalities increased over time.

In 1987 only 22 out of 284 (i.e. 8 percent) of the municipalities were included in the pilot scheme. The share increased to 40 percent in 1988, reached 50 percent for the 1989 cohort and remained rather stable until 1991 (Grönqvist and Hall, 2011). All 24 counties (except one in 1988) were covered each year after 1987. The gradual roll-out implied that many of the participating municipalities offered both two and three year programs during the policy pilot. Within some municipalities, the same type of program was simultaneously offered both in the regular 2-year format and as a 3-year long pilot program (Grönqvist and Hall, 2011).

All in all, the gradual roll-out of the prolonged programs generated a setting with both spatial and temporal variation with respect to the possibility of applying to and entering a three year program. This, in turn, pushed students belonging to the same cohort into the labor market before, or in different phases of the recession, a fact that is crucial for our identification strategy. The degree of freedom of the choice of track length thus was dependent on where the student resided as well as on the year that he or she applied to upper secondary school. We return to how we exploit this setting in Section 5 when we discuss our empirical strategy.

2.3 Military service and the excluded males

In the 1990s, military service was compulsory for men, and a majority served. Military training was typically 7 to 15 months long, and most individuals enlisted during their 19th to 21st year, regardless of the duration of upper secondary school. The pilot-intensity did not affect the timing of military service. This implies that the males had a much looser relationship between the graduation year and the time of labor market entry than females. Since our identification relies on the notion that graduation years shift the timing of labor market entry, we thus focus our analysis on women and refer all results regarding men to a final section.

[12] See Grönqvist and Hall (2011) for more details.

3 Data

The data used in this paper come from different administrative records maintained by Statistics Sweden. The records cover the entire population during 1985-2013. One of the central registers for this study is the *Upper secondary school application register*, which contains information on when and where an individual enrolled in upper secondary school as well as from what track (academic/vocational, length and type of track). We use the *Upper secondary school graduation register* to obtain the actual graduation year from upper secondary school. Linking the two registers allows us to identify drop outs, 'on-time' and late graduates.

The population of interest consists of all females who enrolled in upper secondary school during 1987-1991. We focus on females who enrolled in a vocational track (either in a two- or a three-year track) directly after 9^{th} grade, in the year they turn 16 (we verify that the sample choice is innocuous). The very few students enrolling in tracks without a correspondence in both pilot and normal tracks are excluded.[13] Our sample consists of a maximum of 77,975 individuals each year (67,689 without dropouts).

We consider outcomes for 19 years after the person graduates from vocational training; that is from age 18-19 up until age 37-38. We measure later labor-market performance and various aspects of family formation.

To measure labor market performance, we use an indicator for employment which takes the value one in years when annual labor earnings exceed the *de facto* monthly minimum wage and zero otherwise.[14] Similarly, we use a measure of annual earnings deflated by the minimum wage, i.e. we divide the (annual) sum of gross labor earnings by the monthly minimum wage.[15] We generate a dummy variable indicating whether the individual belongs to a household that receives means tested welfare benefits (social assistance) during the year (from 1990).[16] With regards to educational attainment, we translate information on the highest degree obtained into accumulated years of schooling.

For family formation outcomes we measure the "household status" which separates between living at parents' home, married, cohabiting with partner and common child and single. "Single" cannot be separated from cohabiting without a common child. These data are available from 1990 onwards. We also measure the number of (biological) children. From these data, we derive a series of variables for regression purposes: whether and when the individual first engaged in a stable partnership (marriage or cohabitation with a common child), whether and when this first partnership ended, whether and when the individual had her first child, and her total number of children. All these outcome variables are measured by (or up until) the age of 38 (the last age where we observe all enrollment cohorts in our sample). In

[13] This restriction excludes students who enrolled in three-year Graphic and Handicraft tracks. Our results are robust to re-introducing these two pilot tracks.

[14] There is no formal minimum wage in Sweden as these are defined in collective agreements. Instead, we use the wages of janitors as our proxy since their wages consistently stay in the very lowest part of the wage distribution.

[15] In addition, we scale earnings by the share of the year the graduate is exposed to the labour-market, i.e., by 0.5 year in the year of graduation and by 1 otherwise. The reason is that students typically graduate in June.

[16] Welfare benefits (Social assistance) is determined at the household level. It is a means-tested grant of last resort provided by the municipalities as poverty relief and is granted to households without assets whose necessary living expenses are higher than their income. Living expenses are calculated as a function of household composition (i.e. number of children by age, number of adults,..), housing costs, and well-motivated special costs (e.g. due to medical conditions). Thus, graduates residing at their parents' home will qualify for benefits only if the joint household income is too low. Around 88% of females still reside at their parents' home in the year of graduation, but this percentage falls to 40% three years after graduation, and 17% six years after graduation.

each year, we link women to their partners (if in a relationship) to obtain information on their current partners' characteristics (GPA from compulsory school, annual earnings, education level and age).[17] We also exploit data on the identity of the father for each (biological) child. This allows us to generate the number of partners women had children with (if any).

Individual background characteristics include: sex, age, immigrant background (born in a Nordic country or not), GPA in the last year of compulsory school (percentile ranked among students who enrolled in vocational school), and the municipality of residence in the last year of compulsory school. The students are also linked to their biological parents to obtain information on the parents' highest education level. This linkage is also used to construct sibling fixed effects (using the identity of biological mother) which we use in a robustness check.

Initial labor-market conditions are captured by annual sex-specific national youth unemployment rates (for age group 15-24).[18]

3.1 Summary statistics

Summary statistics for our sample of females enrolling in vocational high schools are shown in Table 1. We first show a column for all and then zoom in on the highest and lowest quintiles of compulsory school GPA. Unsurprisingly, the dropout rate is higher for low-achieving students than for high-achieving ones (27% and 5% respectively). Similarly, 8% of low-achieving students graduated later than expected (based on enrollment year and track duration), while only 3% of high-achieving students did so.[19] Eleven percent of low-achieving students graduated from a three-year track, which could be compared to 25% of the high-achieving students. This translates into a higher number of total accumulated years of schooling by age 38 for high-achieving students (13.7 versus 11.6 for low-achieving students).

Labor market outcomes follow similar patterns. On the year of graduation, 70% of low-GPA group and 83% in the high GPA group are employed according to our metric. Their annual earnings were 48 and 55 percent of a full-time employed minimum wage earner upon graduation.

Low-grade women were much more likely to be welfare recipients at age 38 than high-grade women (7%, vs. 1%). Turning to family formation, we find that low GPA women are less likely to form partnerships but they have more children if they do. By the age of 38, 83% (87%) of low (high)-achieving women had ever formed a stable partnership, and similar shares had at least one child. The average number of children (conditional on ever having one) was 2.26 and 2.17 (for low and high-achieving women, respectively). Low-GPA women formed their stable partnership and had their first child much earlier than high-GPA women (25 and 27 years old, respectively). Low-grade women had a much higher probability to mate with low-grade men (43%, while the corresponding share for high-achieving women was 20%). The average cohort-gap between partners in our data was 3 years, both for low- and high-

[17] For men graduating from 9^{th} grade in 1988 or later we observe their grades in the graduation register; for men graduating before 1988 we rely on information from the application register to upper secondary school. Thus, the coverage is lower for the earlier cohorts and is dependent on the individual having applied to upper secondary school. Our regressions using partner's GPA are thus estimated on a smaller sample of women.

[18] Annual unemployment rate by age and gender are available from the OECD. See the Annual Labor Force Statistics at OECD.Stat (http://stats.oecd.org/index.aspx?r=707579#).

[19] For a breakdown of vocational students by program types upon enrollment, see Table B2. Most vocational students enrolled in business and services programs (30%), health care (27.4%) and caring services (12.7%).

GPA women, and only 13 percent of partnerships were formed within a cohort. Moreover, Table 1 clearly indicates that divorce rates were much higher for low-grade females – twice higher than those of high-grade females (49% and 23% respectively). Divorce rates were systematically higher when women mated with low-achieving partners, and divorce rates reached a maximum for low-GPA women forming partnerships with low-GPA men (52%).

4 Empirical strategy

4.1 Identification strategy and model

We investigate how the unemployment rate at graduation affects early and later outcomes related to family formation and careers. To explain our identification strategy, it is useful to first define the timing structure. Two items are important:

- $t = c + d + e$: We measure responses in an outcome year t which is given by the enrollment cohort (c) + track duration (d) + the number of years of potential experience (e) after the track ends.
- $Grad = c + \tilde{d}$: The actual graduation year is given by the enrollment cohort (c) plus (endogenous) study duration $\tilde{d}$.

With this notation in mind, consider the following fixed-effects model explaining a generic outcome Y for individual i in year t:

$$Y_{i,t} = \alpha + \beta_e UR_i^{Grad} + \lambda_{c(i)} + \delta_{d(i)} + \chi_{e(i,t)} + \kappa_{j(i)} + \zeta X_i + \epsilon_{i,t} \tag{1}$$

The variable of interest, UR_i^{Grad}, captures the observed national female unemployment rate faced by individual i at the time of actual graduation. The formulation implies that β_e relates aggregate unemployment during graduation to outcomes at different horizons of potential experience e as in Oreopoulos et al. (2012).[20] Graduation unemployment UR_i^{Grad} is determined by enrollment cohort + track duration (i.e. $c + d$) for students who graduate on time, but will change with study duration $\tilde{d}$ for those who do not graduate on time.

To capture the direct impact of potential experience, we let $\chi_{e(it)}$ represent a set of dummies for each value of e. Similarly, the dummy $\delta_{d(i)}$ captures track duration (two- versus three-year track). Since track duration varies within cohort, we can further include a fixed effect for each cohort of enrollment ($\lambda_{c(i)}$) to capture all other cohort-specific factors which, e.g., may have affected the children at earlier ages. We further include fixed effects for each municipality $\kappa_{j(i)}$ of residence before enrollment. The vector X_i includes individual (time-invariant) background characteristics and ϵ_{it} is the error term.

The identifying variation needed to estimate the β_e-vector arises because two-year and three-year track students who enrolled in the same year face different unemployment rates upon graduation. The difference is close to zero for earlier enrollment cohorts when the business cycle was stable, and increases for later cohorts as the crisis unfolds (see Figure 1).

[20] Given the presence of experience fixed effects, individuals are compared at different ages (a one-year age gap) but the difference is captured by dummy $\delta_{d(i)}$ for track duration d.

For a causal interpretation based on model (1), study duration cannot be allowed to respond to the unemployment rate at graduation. This implies that the selection into 3-year tracks, and endogenous deviations of actual study times ($\tilde{d}$) from track duration (d) must be unrelated to future unemployment, otherwise the β_e will be biased.[21]

To deal with these issues, we use the policy pilot to instrument both the track duration and the unemployment rate at graduation (UR_i^0). We follow Hall (2012) and others (Grönqvist and Hall (2013), Grönqvist et al. (2017) and Hall (2016)), and instrument track duration by the municipality-level, time-varying, pilot intensity as determined by the National Education Board. The instrument – denoted P_{cj} – is the extent to which the individual's municipality of residence participated in the pilot by the time he or she enrolled in upper secondary school, measured as the share of the available vocational tracks which constituted three-year tracks.[22] This generates a setting where the opportunity to enroll into a 3-year track depends on the interaction between where she lived and the enrollment cohort. We define the instrument based on place of residence before completing compulsory school to rule out selective migration of students across municipality borders (as in Hall (2012)).

Similarly, we define an instrument for unemployment at graduation (UR_i^0) using the same logic. Let $\phi_{c,j}$ denote this instrument, where:

$$\phi_{c,j} = P_{c,j} * UR_{c+3} + (1 - P_{c,j}) * UR_{c+2} \tag{2}$$

UR_{c+3} is the unemployment rate faced three years after enrollment by students who resided in municipality j belonging to enrollment cohort c. Similarly, UR_{c+2} is the unemployment faced two years after enrollment by students who resided in municipality j and enrollment cohort c. The intuition is straightforward. To the extent that unemployment at graduation changes from one year to another as the crisis unfolds, $\phi_{c,j}$ will be separately identified from the effect of the pilot.

We estimate a Two Stage Least Squares (2SLS) model. Standard errors are clustered at the level of the instruments, i.e. municipality*cohort ($j \times c$). Using V=($\delta_{d(i)}$, UR_i^0) to denote the endogenous variables, the first stages of the IV-model can be written as :

$$V = \tau^V + \delta^V \phi_{c,j} + \rho^V P_{c,j} + \lambda^V_{c(i)} + \kappa^V_{j(i)} + \chi^V_{e(i,t)} + \xi^V X_i + \nu^V_{i,t} \tag{3}$$

Note that in our setup, vocational students graduated between 1989-1994 which is either *before or during* the recession. Thus, β_e does not capture the impact of experiencing vs. not experiencing the recession. Instead the strategy compares students who graduated straight into an ongoing recession to those who had the chance to enter the labor-market in the late stages of the preceding boom.

[21] β_e will be downward biased if students who postpone graduation in an economic downturn have unobserved favourable characteristics (e.g. financial resources and other parental characteristics) that allow them to do so. Similarly, if low-achieving students drop out when the economy deteriorates, β_e will be downward biased.

[22] Following Hall (2012), P_{cj} is zero for municipalities not offering any vocational tracks. The results are virtually unchanged when setting P_{cj} to missing for those municipalities.

4.2 Evaluating the identifying assumptions

The IV strategy allows us to deal with selection into two- versus three-year track and its interaction with the unemployment rate. It generates a setting where some students are pushed in the labor market in different years, and a subset of these face sharp and sizable increases in national unemployment rates from one year to another.

The instruments $P_{c,j}$ and $\phi_{c,j}$ are valid under the assumptions that they are uncorrelated with any unobserved variables affecting the outcomes of interest and that they had no impact on the outcomes other than through influencing whether the person enrolled in a two- or in a three-year track and the timing of graduation relative to the aggregate business cycle. This entails assuming that the availability of pilot tracks ($P_{c,j}$) and the predicted unemployment rate at graduation ($\phi_{c,j}$) did not affect the individual's choice of whether to enroll in upper secondary school (at all), and of whether and when to enroll in vocational school (as opposed to academic studies).

To assess the validity of these assumptions, Table 2 shows results from regressions that relate the instruments to important background characteristics (GPA from compulsory school, immigration status, parental education) conditional on municipality fixed effects and cohort dummies (i.e. the same model structure as in the main analysis). Reassuringly, the results show that the instruments are unrelated to these predetermined student characteristics, suggesting that the policy roll-out is a valid instrument.

In Table 3 we further analyze the impact of sample selection by studying the relationship between the instruments and indicators of high school progression. We find no effect from our instruments on the probability to enroll in upper secondary school at all, on the probability of enrolling in vocational studies as opposed to academic studies, or on the probability of delaying enrolment into vocational studies (i.e. later than at age 16) – see columns (1)-(3). That $\phi_{c,j}$ does not impact these decisions is intuitive as all our students enroll in 1987-1991 – i.e. before the crisis – so anticipation effects are indeed unlikely. Based on these findings, we use vocational school graduates who enrolled on time (i.e. at age 16) as our baseline sample, but we also verify that the results are robust to reintroducing students enrolling at other ages.

Another potential concern is that that UR_i^0 is unobserved for drop-outs. Estimates in column (4) Table 3 show that the predicted unemployment rate is completely unrelated to the number of students dropping out from vocational schools. Importantly, the *composition* of dropouts (as measured by compulsory school GPA) is not related to the instruments either (see column (5)). In our main analysis we therefore exclude dropouts from the regression models but in the robustness section we also discuss reduced-form estimates that include these dropouts and, as expected, results are somewhat attenuated but qualitatively robust.

Finally, we analyze if the impact of an additional year of vocational education varies with initial economic conditions. To test if the impact of unemployment rate at graduation has differential labor-market effects for different education levels, we exploit variation in municipality-level unemployment rates and run the following model for three- and two-year track students separately:

$$Y_{it} = \alpha + \beta_e UR_{cj}^0 + \lambda_c + \kappa_j + \chi_e + \zeta X_i + \epsilon_{it} \tag{4}$$

Results for labor market outcomes are shown in Table 4. These suggest that the impact of local unemployment is independent of the duration of vocational studies: The estimates for the impact of initial unemployment are not significantly different between two- and three-year track students in any of the years since graduation. This suggests that the returns to an additional year of education are orthogonal to initial economic conditions.[23]

5 Results

In this section we report the results from the instrumental variable estimation using the identification strategy presented in Section 4. We first show the first stages and the impact on labor-market outcomes. Next, we present a stylized model of partnership choice, show the impact of early labor market prospects on family formation and dissolution and perform an extensive set of robustness checks. We then turn to health outcomes and end by presenting results for men to complete the picture.

5.1 First-stage

We first report estimates for the first stage regressions in Table 5. For completeness, we start by showing the impact of the pilot intensity $P_{c,j}$ on the three-year track dummy although our primary interest concerns the impact of the pilot-unemployment interaction $\phi_{c,j}$ on actual graduation unemployment. The results in the first column confirm that the pilot intensity $P_{c,j}$ had the expected strong impact on the probability that students enroll in a three-year rather than a two-year track vocational track.[24] More importantly from our perspective, the results in column (2) confirm that ϕ_{cj} is an important predictor of unemployment rate at graduation. A ten percentage point increase in ϕ_{cj} increases the unemployment rate faced at graduation by 5.1 percentage points. The effect is significant at the 1% level. The last rows report R-squared statistics for both regressions as well as the Kleibergen-Paap Wald rk F statistic (which is much higher than the eigenvalue of 7.03 (for 10% maximal IV size)). Both cross-effects, i.e. from ϕ_{cj} on the two year dummy and P_{cj} on graduation unemployment, are irrelevant. Overall, these results show that both instruments provide a strong exogenous shock to track choice and observed unemployment rate at graduation.

5.2 Effects on labor-market and educational outcomes

5.2.1 Short-run impact

Before turning to the long-term consequences of unemployment rate at graduation, we focus on its impact on employment and annual earnings (deflated by the minimum wage) in the year of predicted graduation.

[23] This is an imperfect (but conservative) way to test for this. Ideally, β_e should capture the sole impact of track-specific skills, and not that of characteristics that drive selection into two- and three-year tracks (e.g. unobserved ability). As Model (4) does not deal with endogenous selection into tracks, β_e captures both selection effects the impact of track-specific skills.

[24] The coefficient suggests that increasing the share of three-year tracks by 10 percentage point in a person's home municipality increases the probability that she begins a three-year track by 4.5 percentage points. This estimate is in line with Hall (2012), who finds that increasing the share of three-year tracks by 10 percentage point in a person's home municipality increases the probability that she begins a three-year track by 5.8 percentage points. Hall (2012) explains the absence of a one-to-one correspondence between the share of three-year tracks and the probability that a person begins such a track by "the possibility to attend schools outside one's home municipality, as well as by pilot intensity being measured as the share of three-year tracks rather than the share of slots."

Table 6 shows instrumental variable estimates separately for the bottom, median and top quintiles of the compulsory school GPA distribution. The results show that the unemployment rate at graduation has a large negative effect on employment probabilities. Low-achieving graduates are particularly affected. Our estimates imply that a one percentage point increase in the unemployment rate at graduation lowers their probability of employment by 7.6% in the year of graduation for this group. This implies that the 5 percentage point increase in the aggregate unemployment rate that students faced at the onset of the recession resulted in a 38% lower probability of graduation-year employment for low-achieving students. The corresponding estimate for high-achieving students is -2.3%, and not significant at conventional levels.

Focusing on earnings instead gives a similar picture. The graduates suffer large losses in earnings in the year of graduation when entering during high-unemployment years. Earnings of low-achieving students in the year of graduation correspond to 3.5 percent of full-time minimum wage employment or 8.4% percent of average earnings lower from a one percentage point increase in the unemployment rate. The corresponding estimate for high-achieving students is equal to -5.8% (both effects are significant at the 1% level).

5.2.2 Persistence

Our results above showed that young vocational graduates who enter the labor market in a deep recession suffer significant initial employment and earnings losses. Here, we investigate whether these initial losses persist over time.

Figures 2a and 2b show the effect of graduating in a recession on employment and earnings respectively, for each year since (predicted) graduation. On each graph, the purple (blue) line shows the estimated impact for the bottom (resp. top) quintile. Our results indicate that the impact of unemployment rate at graduation is rather short-lived, irrespective of GPA quintile. We find that employment and earnings are no longer statistically related to the initial unemployment rate after three years. Our results are in line with theoretical predictions and findings for the US according to which low-educated workers suffer large but short-lived declines in earnings and employment.[25] Both the timing and magnitude of the effect are in line with results obtained on high-school female graduates in the US (Hershbein, 2012).[26] The one economic outcome where we find persistent – and even permanent – effects is on the probability of belonging to a household that receives welfare benefits. These results are shown in Figure 2c. As we will see later, this permanent effect is likely to be explained by the family formation process and not by 'pure' labor-market effects.

The initial labor demand shock may possibly induce women to shift from working into education. But, if anything, Table 7 suggests the opposite. Table 7 displays the estimated effects of unemployment rate at graduation on the probability of delaying graduation from vocational studies, as well as on the

[25] For instance, Speer (2016) documents severe but short-lived effects of leaving school in a recession for men with 9 to 12 years of education. He finds that in the case of a severe recession (defined as a four percentage point rise in the unemployment rate), year-one earnings fall by 45%, although the effect is largely gone after the first year. The results are also in line with Genda et al. (2010) and earlier Swedish evidence on scarring effects (see Nordström Skans (2004)).

[26] Hershbein (2012) finds that a woman who graduated in a severe recession (in which the unemployment rate rose by 3 percentage points), would be 7.5 percentage points (or about 12 percent) less likely to be working one year after graduation. Following this sharp drop in the first year, the net effect begins to diminish, and full recovery is reached five years out.

accumulated years of schooling by age 38. We do not find that females delay graduation from vocational studies when the economy deteriorates, suggesting that vocational students do not strategically remain in school. On the whole, our results in fact suggest that low-achieving students respond to early adverse conditions by accumulating somewhat *less* education (although the effect is small in magnitude and only weakly significant). A one percentage point increase in initial unemployment rate decreases the years of schooling at age 38 by 0.3%.

5.3 Effects on family formation

We now turn to the effects of graduating during a deep recession on family formation. Before turning to the empirics, it is useful to consider the theoretical rationale for why the aggregate economic conditions may intersect with partnership formation and how this can be related to long term outcomes.

To fix ideas, think about a marriage market where agents, in each period, receive draws from a distribution of match qualities. Thus, agents will accept the best offer in the period if it has an expected value that is better than the expected value of waiting until the next period. Divorces occur if an accepted match turns out to be of a low quality. In such a setting, agents will accept matches of worse expected quality in a recession if recessions reduce the value of staying single relative to the value of forming a marginal partnership. Under these conditions, matches formed in recession will be of lower expected (and, hence, true) quality and lead to more divorces.

Turning to the long-run consequences, it is obvious that the partnership decisions will have a long-run impact on those margins that are affected by the partnership process. In particular, it is useful to highlight those outcomes that are related to single parenthood. Most notably, welfare usage is closely complementary to being a single parent. And, as we showed above, graduating during a recession generates a persistent increase in the use of welfare benefits, despite the short-run impact on labor market outcomes. We return to the intersection of these elements below.

To make this more precise, we define (below) a stylized model of partnership choice. We do not model the equilibrium outcomes because we are interested in illustrating how agents on one side of the market change their behavior in a stable environment. In terms of the income shocks, this corresponds to our empirical setting because the relevant males (who, on average, are three years older) belong to other cohorts and their labor market prospects will be unrelated to the pilot intensity which provides our identifying variation. It is, however, clear that changes in the partnership thresholds of agents on one side of the market (here: women) should affect the marriage probability of (in particular, less attractive) agents on the other side (here: men). We still abstract from feedback effects on the male side. This is mostly to keep the model simple, and to not cloud the intuition about how the relevant women's choices may change with economic conditions, but it is also likely to be an innocuous assumption to the extent that the identifying variation only moves a small part of the overall marriage market of the relevant males.

5.3.1 A stylized model of partnership choice

Formally, we define an indirect period-specific utility function $V(I, q)$ where individuals derive utility from income I and from marital quality q in each period.[27] Individuals live for two periods (1 and 2). In period 1 they draw a marital offer of quality q and decide if they want to accept it or not. In period two, the formed marriages are dissolved with probability ϕ (which may be a decreasing function of q).

Individuals who remain single when entering period 2, draw marriages of fixed quality μ, whereas divorcees draw new partners of the same fixed quality μ but pay a utility penalty λ. Our forcing variable of interest is income in the first period I, so to simplify we let income in the second period be fixed at J. The discount factor is denoted by β. Hence, in the first period, the individual trades off first-period marriage with expected (indirect) utility:

$$V(I, q) + \beta[(1 - \phi)V(J, q) + \phi(V(J, \mu) - \lambda)] \tag{5}$$

against staying single and deriving

$$V(I, s) + \beta V(J, \mu) \tag{6}$$

where s denotes the single-life substitute for marital happiness in period 1. We are interested in how variations in first-period income affect the willingness to enter partnerships in the first period. Changes in the willingness to mate operate through changes in the minimum acceptable match quality. Denote this threshold value by q^* and note that it satisfies equality between Equations (5) and (6). Simplify to:

$$V(I, q^*) - V(I, s) + \beta[(1 - \phi)V(J, q^*) - (1 - \phi)V(J, \mu) - \phi\lambda] = 0 \tag{7}$$

Treating ϕ as a constant, and denoting the derivatives of V by V'_I and V'_q respectively, we get the impact of first-period income on the partnership threshold as:

$$\frac{dq^*}{dI} = \frac{V'_I(I, s) - V'_I(I, q^*)}{V'_q(I, q^*) + \beta(1 - \phi)V'_q(J, q^*)}. \tag{8}$$

This implies that the partnership threshold will be a positive function of first-period income if the marginal utility of income is higher if single than if within a formed marginal partnership. An obvious reason for why this may be the case is if couples are pooling incomes. To make this explicit, we follow Fernandez et al. (2005) and let the utility function take the form :

$$V(I, q) = ln(\frac{I + I^P}{2}) + q \tag{9}$$

if in a partnership, where I^P denotes partner income, and

$$V(I, s) = ln(I) + s \tag{10}$$

if single. This simplifies Equation (8) to

[27] The model lends elements from Boulier and Rosenzweig (1984) and Fernandez et al. (2005).

$$\frac{dq^*}{dI} = \frac{\frac{I^P}{I(I+I^P)}}{1+\beta(1-\phi)} > 0. \tag{11}$$

Equation (11) implies that fewer and better marriages are formed if short-run labor market prospects improve. The higher is the partner's income share of total income, the larger is the effect, suggesting that, on average, female thresholds should respond more than male thresholds. Note also that the intuition is valid as long as the partner's income is not perfectly correlated with the own income. This is typically the case if economic conditions are rapidly evolving because of the age gap between the two sides of the market as discussed above.

Letting the divorce probability ϕ be a function of match quality, e.g. by letting $\phi = 1 - q$, does not change the intuition. It induces additional terms in the denominator and generates a straightforward relationship between income and divorces:

$$\frac{dq^*}{dI} = \frac{\frac{I^P}{I(I+I^P)}}{1+\beta 2q^* + \beta[\lambda - \mu)]} > 0. \tag{12}$$

$$\frac{d\phi}{dI} = \frac{dq^*}{dI} * \frac{d\phi}{dq^*} < 0. \tag{13}$$

Thus, the agents accept to form partnerships where the dissolution risk is higher when the labor market returns are low, which naturally leads to more divorces.

5.3.2 Empirical effects on family formation

We study family formation outcomes using the same empirical approach as we used for analyzing the labor market process. We make one adjustment, however. Instead of letting the effect of the unemployment rate at graduation (and the fixed effects) vary by years of *potential labor-market experience* (see Equation (1)), we here let the effect of the unemployment rate at graduation (and the fixed effects) vary by *years since enrollment* (=age). By doing so, we explicitly compare individuals of the same age (although with different potential experience) but with different initial exposure to the recession. We make this adjustment since age appears substantially more important than potential experience for family formation outcomes.

Table 8 shows the estimated effects of graduation unemployment. Similarly to the labor market effects we found in the previous section, we see that the impact on family formation is heterogeneous across the ability distribution. The median and top quintiles of the GPA distribution do not seem to be affected at all. In sharp contrast, low-achieving students, who also suffered most in terms of the short-run labor market effects, are affected on several dimensions. The remainder of the discussion in this section will thus focus on this sub-group.

Panel A of Table 8 shows that initial conditions at graduation have a pronounced effect on the timing of family formation for students with low compulsory school GPA. Those who graduate in a deep recession leave their parents' home earlier. At age 19, they are 5% less likely to remain at their parents' home, but the effect does not persist over time. As noted in the data section, we cannot measure if they

cohabit with a partner or if they live alone unless they have children together with the partner. More strikingly, low-grade women who graduate in a recession enter their first "stable" partnership (marriage or child together) earlier, and have their first child earlier (both coefficients are significant at the 5% level). According to the estimates, a 5 percentage point increase in the unemployment rate at graduation accelerates the transition to the first stable partnership – or the first birth – by almost two years.

Although initial labor-market conditions induce inter-temporal adjustments in family formation, Panel B shows that these conditions do not affect long-run family formation. Graduating in a recession does not impact the frequency of ever entering a stable partnership, the propensity to ever have a child, or the total number of children by age 38.[28]

5.3.3 Partner quality and family dissolution

In Table 9, we investigate whether shifts in the timing of partnership formation reflect poorer quality (and more short-lived) marriages. In Panel A, we first look at partner's characteristics, as captured by partner's compulsory school GPA, partner's earnings, age and education level. Partner's characteristics are measured when females are aged 27, which is the average age when forming the first stable partnership.[29] Again, most of the response is driven by low-GPA women. Low-GPA women who graduate in a recession form partnerships with lower-achieving men both in terms of labor earnings and in terms of compulsory school GPA. Figure 3a shows that the effect on partner earnings is significant for a wider range of ages. Between age 26 and 30, women have partners with significantly lower earnings (the effect ranges between -0.043 and -0.078) if they graduated in a recession. This translates into lower earnings at the couple level between ages 27 and 29 (see Figure 3b). That the earnings of the partners are reduced could partly be mechanical if the spouses also experience worse conditions at graduation. However, this should not be the case since the labor market prospects of these on average 3 years older men should be unrelated to the pilot intensity, at least in a direct sense. Importantly for this argument, we find no relationship between graduating during a recession and the age of the partner. Furthermore, our results for partner's compulsory school GPA provide fairly direct evidence that women who graduate when unemployment is high choose to form partnerships with less (scholastically) able men.[30]

If poor economic conditions at graduation induce the early pairing of poorly matched couples who would otherwise not marry, the divorce rate should also increase. Indeed, further results presented in Panel B of Table 9 imply that a one percentage point increase in the unemployment rate at graduation leads to a 11.5% higher probability to have ended the first stable partnership by the age 38 (the effect is significant at the 5% level). This increase in divorce rates is consistent with the choice to mate with lower-grade partners since grades are very strong predictors of divorces for both men and women in our data. For females, the divorce rate at age 38 among youths with compulsory school grades below the

[28] A potential concern is that models on e.g. completed fertility/age at first partnership are estimated on selected subsamples of women, e.g. women who had at least one child or women who ever entered a partnership. We find no effect of initial economic conditions on the frequency of ever entering a stable partnership or the propensity to ever have a child, which suggests that endogeneous sample selection is not a concern here.

[29] Note that the partner's characteristics measured at age 27 do not necessarily correspond to those of the first stable partner.

[30] The effect is significant for a wide range of ages: between ages 26 and 31, women are in partnerships with lower-GPA men (not shown).

median is more than ten percentage points higher than the rate for youths with grades above the median (37% versus 25%). The corresponding figures for men are 30% versus 20%.[31]

The increase in divorce rates is reflected in a higher proportion of single mothers: a one percentage point increase in unemployment rates at graduation increases the probability of being a single mother at age 38 by 12.4%. It is also reflected in the number of fathers that the mothers have children with. Women facing high unemployment at graduation are more likely to have children with more than one father at age 38.

Overall, our findings suggest that temporary shocks to labor market conditions induce the formation of earlier partnerships, and that this intertemporal adjustment is achieved through a lower quality threshold. This affects family dissolution in the longer-run.

5.3.4 Long-term consequences of poor partnerships

The effects on family quality may explain the persistent increases in the use of welfare benefits despite of short-lived impact on labor market outcomes that we documented above. In particular, it is well-known that welfare usage is closely complementary to being a single parent. Thus, initial economic conditions may lead to a long-term increase in the joint probability of being a single mother and being on welfare. Table 10 analyzes this hypothesis in detail. The table first shows the overall impact on the incidence of welfare usage at age 38 to be 2 percentage points. It then decomposes this effect by estimating how graduating in a recession affects the probability of a series of joint events. There is no impact on the joint event of being childless and receiving welfare benefits. In addition, there is no effect on the probability of being in a partnership with child and receiving welfare benefits. But graduating in a recession has a causal impact on the joint event of being a single mother and receiving welfare (coeff: 0.019, significant at the 5% level).

To further substantiate the link between welfare usage and partnership quality, additional results in the same table explore the relationship to partner's compulsory school GPA using a similar strategy. The results show that there is no effect of graduating during a recession on the joint event of forming the first partnership with a high-GPA partner and being on welfare in the long run. On the other hand, poor initial economic conditions lead to a an increased probability (almost 1 percentage point) of forming the first partnership with a low-GPA partner and being on welfare in the long run.

5.4 Robustness checks

Here we verify that our results are robust to a number of specifications. For simplicity, we report estimates for a selected set of outcomes (being a welfare-dependent single mother; employment) for the bottom quintile of vocational students (otherwise specified). We also make sure that the identifying assumptions (see section 4.2) hold for the bottom quintile of the GPA distribution (see results in Table B3).

Table B4 shows a number of robustness checks on the model, as well as a number of alternative specifications on the sample. Panel A reports the estimated impact of initial economic conditions on

[31] To further substantiate our results, we check whether partnership duration is affected by dreary labor marketconditions at entry. We find that women in the bottom quintile of the GPA distribution have a higher probability of having (ever) been in a partnership at age 38 that lasted less than 5/10 years (results not shown but available upon request).

the probability of being a welfare-dependent single mother at age 38. The first column displays the baseline model. Column (2) shows that the results are unchanged when including program fixed effects. Columns (4)-(5) further show that results are robust to excluding late graduates from vocational school, or graduates who engage in further education (i.e. who ever enrolled in university by the age of 38). Panel B reports the estimated effect of initial economic conditions on employment, in the short and long run. In each column, the coefficients shown are on the interaction of the instrumented unemployment rate at graduation and selected experience groups. Consistently with earlier results, the baseline model (column 1) shows that the short-term impact on employment is large, significant and negative. Following the sharp drop on the year of graduation, it starts to diminish, and full recovery is reached three years out. Estimates in columns (2)-(5) show that this pattern is robust across different specifications. In particular, it is robust to controlling for current unemployment rate (column (3)).

Causal interpretation of our results relies on the exogeneous timing of labor-market entry. We argue that our IV strategy generates a setting where students are exogeneously pushed in the labor market. If that is true, our results should be robust to the inclusion of sibling fixed effects, which remove all unobserved heterogeneity that is common within a family. We re-estimate our preferred specification controlling for sibling fixed effects. Our results are virtually unchanged.[32]

As noted earlier, UR_i^0 is unobserved for dropouts, and these are mechanically excluded from the regression models. A potential concern is that dropping out may be endogeneous to initial economic conditions, in which case β_e would be biased. We showed in section 4.2 that the number and composition of dropouts was not likely to be endogeneous to worsening economic conditions. In Table B5, we further check that the results are unchanged when re-introducing dropout students in the sample and running the reduced form of the model. Column (1) shows the reduced form estimates excluding dropouts, while column (2) shows the reduced form estimates including dropouts. The results are very similar. Note that the coefficients of interest are smaller in magnitude. This is due to the fact that we estimate here an intention-to-treat parameter, not a local average treatment effect as before.

5.5 Health

Interruptions of the initial process of career progression caused by recession at career entry can have lasting consequences on other relevant outcomes, including health.[33] Another channel whereby initial economic conditions may affect subsequent health is family formation and dissolution (see e.g. Van den Berg and Gupta (2015)), which we showed was substantially altered by unemployment upon graduation. To capture the potential health effects of recessions at career entry, we use data on sickness and disability benefits receipt from 1990 onwards (a detailed presentation of the data can be found in Appendix C).

[32] Our sample uses the whole sample of boys and girls. Due to power concerns, we use all vocational students, irrespective of GPA quintiles. All variables (excepted the sibling dummy) are interacted by sex. A one percentage point increase in unemployment rate at graduation increases by 1.5 percentage points the probability of being a welfare-dependent single mother at age 38 (at the 10% significance level). A one percentage point increase in unemployment rate at graduation decreases by 3.4 percentage points the probability of being employed on the year of (predicted) graduation (significant at the 1% level), and by 1.8% the probability of being employed 1-2 years after graduation (significant at the 5% level).

[33] There is both theoretical and empirical evidence that income and unemployment spells influence health. Income and higher life-time earnings are generally thought to improve health (see Currie (2009); Galama and Van Kippersluis (2010); Grossman (1972)). Unemployment is associated with lower health, adverse health behaviours and higher mortality rates (see e.g. Sullivan and Von Wachter (2009)).

For each year since graduation, Figure A1 shows the impact of initial unemployment rate on the amount of sickness benefits in the current year (see Figure A1a), the receipt of sickness benefits (Figure A1b) and the receipt of disability pension (Figure A1c). An obvious downside of this analysis is that sickness and disability benefits are closely tied to employment since the sickness insurance system include work requirements for entitlement. In that respect, the sharp drop in sickness benefits receipt that we observe in the short-run merely reflects the strong negative initial employment effect documented in Section 5.2. However, as employment and earnings are no longer statistically related to the initial unemployment rate after three years into the labour market, any change in sickness or disability benefits after that period can be more readily interpreted in terms of health, and perhaps even well-being, in particular since mental health (depression, burnouts) accounts for a large proportion of these claims in Sweden (OECD, 2013). With that in mind, our results suggest that adverse initial economic conditions increase the probability of receiving sickness benefits (as well as the overall amount of sickness benefits) between ages 24 and 26. Notably, this broadly coincides with the period during which females mate and have their first children. We find no significant effect on disability receipt over the period under study.

5.6 What about males?

This final section investigates how males respond to initial labor market prospects. Recall that in the presence of military service, males have a much looser relationship between the graduation year and the time of labor market entry. This is because most men enlist during their 19th to 21st year, regardless of duration of upper secondary school. As we study males' labor market and family formation outcomes using the exact same empirical approach as we used for females, the results presented here are only suggestive. Results for employment and earnings are presented in Table B6 and Figure A2. Both the dynamics of the effects and the order of magnitude of the estimates are similar to females. Young males who enter the labor market in a deep recession suffer significant employment and earnings losses in the short-run, but these initial losses do not persist after four years. To some extent, this suggests that males are more affected by labor market conditions since estimates are similar, despite of the additional noise generated by the military service intermission. In stark contrast with our results for females, we do not find a permanent effect on welfare receipts (see Figure A2c). Overall, our results for males' family formation suggest opposite patterns for male than for females, at least in terms of timing. Men who graduate in a recession stay longer at their parent's home (up until five years after graduation, see Figure A3), and tend to delay partnership formation (see Panel A of Table B7). As it is the case for women, the effects are only significant for men in the bottom quintile of the GPA distribution. Partner characteristics do not seem to be significantly affected (not shown), and men do seem to divorce *less* when graduating in a recession (see Panel B of Table B7). These results are consistent with work and family formation not being substitutes for men, but also with the idea that men are less attractive on the marriage market when their labor market prospects deteriorate relative to women as shown by (Autor et al., Forthcoming). It also corroborates the idea according to which delayed partnerships lead to better partnership quality (Becker, 1974) since time spent searching for a partner may lead to increased match quality.

6 Conclusions

The paper uses a policy pilot that prolonged educational programs in Swedish vocational upper secondary education during a period of sharply deteriorating economic conditions to estimate the impact of early labour market prospects on careers and family outcomes.

In the short run, youths who graduate during a recession fare worse on the labor market than youths who were able to enter the labor market shortly before the recession. This is particularly true for low-performing students. Consistent with most previous studies of low-educated youths, the labor market effects are, however, short lived. In contrast, the use of welfare benefits is persistently increased.

The consequences on family formation margins among low-performing students are both pronounced and persistent. Poor labor market prospects speeds up the family formation process. This is visible in terms of the timing of leaving the parents home (*earlier* when graduating during a recession), the timing of first partnership, and the timing of the first child. Strikingly, timing effects for males are the opposite. The additional speed of female family formation is, however, achieved at the cost of lower quality partnerships. The partners have lower grades and lower labor earnings and divorces are more prevalent and earlier.

We further show that the long-run increase in the use of welfare benefits is driven by the increased prevalence of single mothers using such benefits. The increased welfare use is also closely related to the mating with lower quality partners as measured by partners compulsory-school GPA, a variable which serves as a strong predictor of divorces.

Jointly, the results suggest dreary labor market prospects on graduation generate persistent scars through the family-formation process despite of the transitory impact on employment and earnings. The reason appears to be that partnership thresholds are endogenous to short-run labor market variations and lower thresholds make women be more likely to become single mothers and persistently rely on welfare benefits. The results therefore clearly highlight that labor market experiences and family decisions of young women are deeply intertwined even in a developed country with high female labor market participation rates such as Sweden. The results further suggest that the utility losses of poor initial labor market conditions for females are likely to be much more long-lasting than would be suggested by the labor market trajectories.

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Figure 1: Unemployment Rate (15-64), Sweden, 1987-2013, OECD.

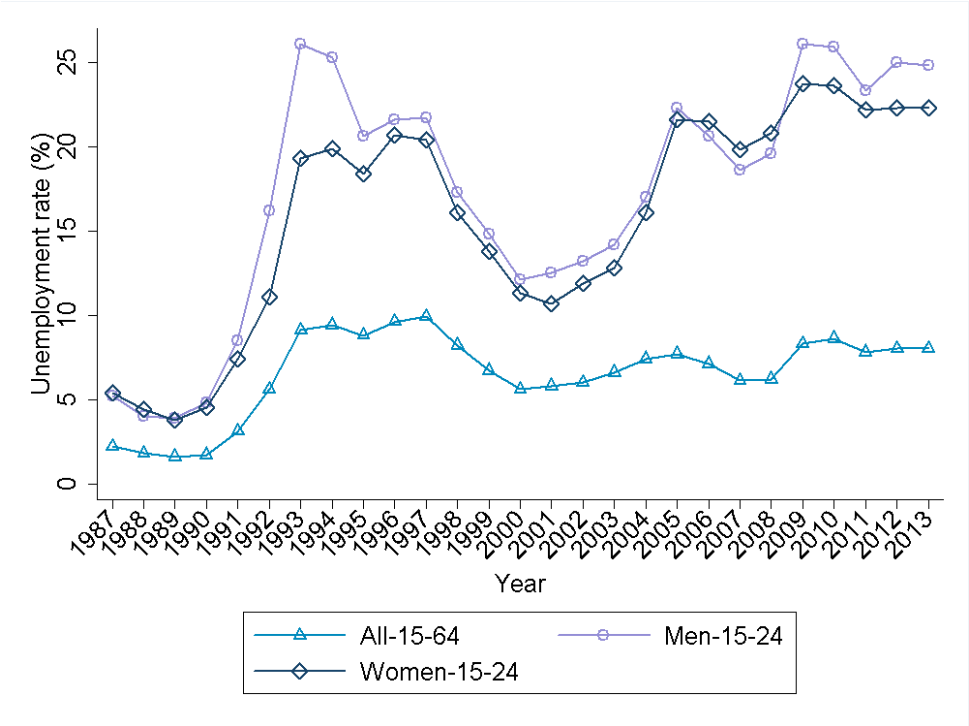
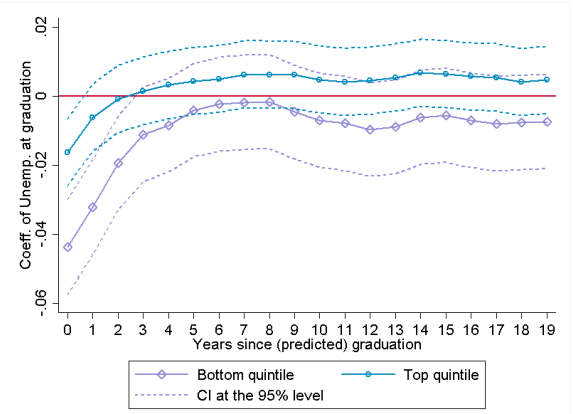
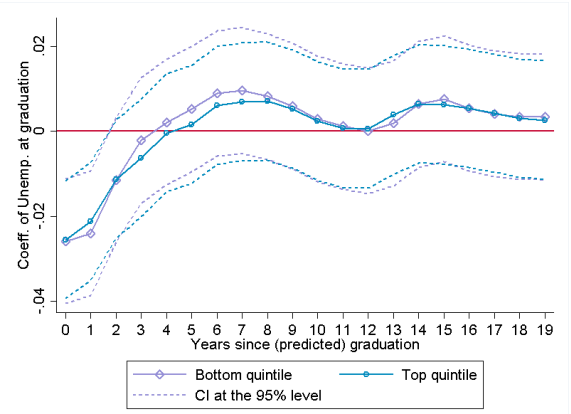


Figure 2: The effect of unemployment rate at graduation on labor-market outcomes and welfare receipt for each year since (predicted) graduation – IV specification.

(a) $\mathbb{P}$(Annual earnings≥monthly minimum wage)



(b) Annual earnings



(c) $\mathbb{P}$(Belongs to a household that received welfare benefits during that year)

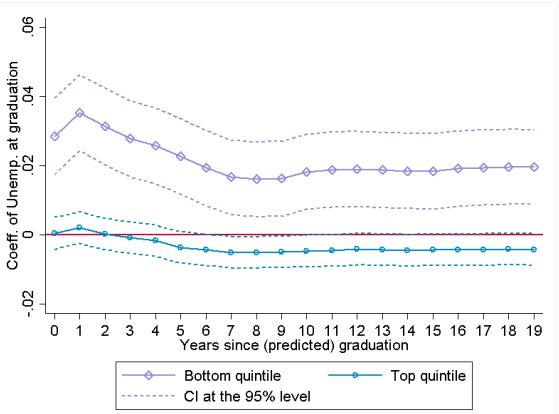
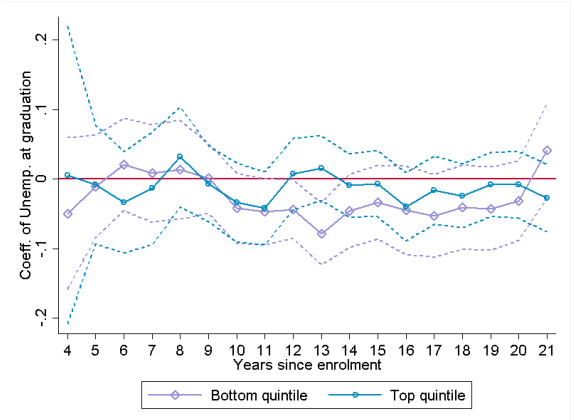


Figure 3: The effect of initial economic conditions on partners' and couple annual scaled earnings, for each year since enrollment in vocational studies – IV specification.

(a) Partner's scaled earnings (if partner)



(b) Couple's scaled earnings (if in couple)

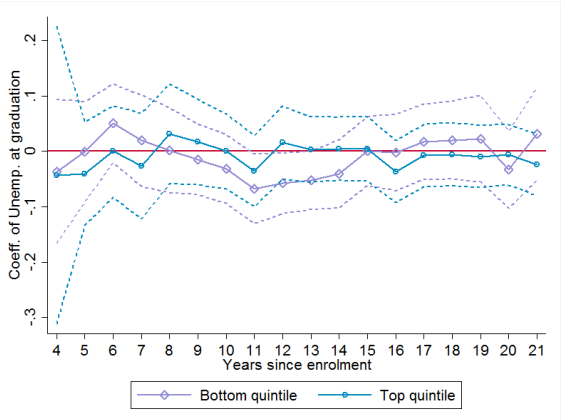


Table 1: Summary statistics for the sample of female vocational students

	All		Low GPA[a]		High GPA[a]	
	mean	sd	mean	sd	mean	sd
Education						
Age enrolled in upp. sec.	16.22	(0.28)	16.21	(0.28)	16.25	(0.28)
Age at predicted graduation from upp.sec.	18.14	(0.47)	18.07	(0.42)	18.26	(0.52)
Age at observed graduation from upp.sec.	18.22	(0.60)	18.20	(0.66)	18.30	(0.58)
Share Dropouts	0.12	(0.32)	0.27	(0.44)	0.05	(0.22)
Share Late graduates	0.05	(0.22)	0.08	(0.26)	0.03	(0.18)
Percentile ranked GPA 9th grade[b]	50.06	(28.80)	8.56	(4.93)	88.73	(6.48)
Graduated from a three-year track	0.17	(0.38)	0.11	(0.31)	0.25	(0.43)
Accumulated years of schooling by age 38	12.62	(2.02)	11.62	(1.57)	13.69	(2.13)
Labor-market outcomes at graduation						
Employment[c]	0.77	(0.42)	0.70	(0.46)	0.83	(0.38)
Annual earnings[d]	0.52	(0.40)	0.48	(0.43)	0.55	(0.39)
Welfare receipt at age 38	0.03	(0.16)	0.07	(0.25)	0.01	(0.08)
Family formation and fertility by age 38						
Ever in a stable partnership	0.85	(0.36)	0.83	(0.38)	0.87	(0.34)
Age at first stable partnership (if ever in one)	26.79	(4.63)	25.73	(4.89)	27.32	(4.37)
Ever had a child	0.87	(0.34)	0.85	(0.35)	0.88	(0.32)
Number of children at age 38 (if ever had a child)	2.17	(0.86)	2.26	(1.00)	2.17	(0.77)
Age at birth of first child (if ever had a child)	26.66	(4.84)	25.11	(4.97)	27.67	(4.46)
Partner's characteristics (at age 27)[e]						
Partner's with low GPA	0.29	(0.46)	0.43	(0.49)	0.20	(0.40)
Age difference	-3.32	(3.58)	-3.38	(3.85)	-3.34	(3.42)
Share in same cohort	0.13	(0.33)	0.13	(0.33)	0.13	(0.33)
Family dissolution by age 38						
Ever ended first partnership (if ever in one)	0.33	(0.47)	0.49	(0.50)	0.23	(0.42)
Ever ended first partnership (if partner was low GPA)	0.40	(0.49)	0.52	(0.50)	0.30	(0.46)
Ever ended first partnership (if partner was high GPA)	0.29	(0.45)	0.41	(0.49)	0.22	(0.41)
Nb. of individuals	77,975		15,722		16,013	

Notes: The sample includes female vocational students observed in the year of (predicted) graduation – including dropouts. [a] Low (high) GPA students refer to students in the bottom (top) quintile of the GPA distribution in 9th grade. [b] GPA in 9th grade is ranked within enrollment cohort, among the sample of students enrolling into a vocational track. [c] We assume than an individual is employed (or to some extent active on the labour-market) if her earnings in the current year are higher than the monthly full-time minimum wage (see Section 3 for details) [d] Annual earnings are scaled as months of full-time minimum wage (see Section 3 for details). [e] 'Partner' refers to a stable partner whose characteristics are measured when the woman is 27 years old (which is the average age when women form a first stable partnership).

Table 2: Correlation between instruments and individual pre-treatment characteristics.

	Dependent variable	
	Predicted unemployment at graduation (ϕ_{cj})	Pilot intensity (P_{cj})
	(1)	(2)
GPA rank in 9^{th} grade	0.000	-0.000
	(0.000)	(0.000)
Born in a Nordic country	0.020	-0.002
	(0.017)	(0.002)
Mother's years of schooling	0.001	0.000
	(0.000)	(0.001)
Father's years of schooling	0.000	0.000
	(0.001)	(0.000)
N. of individuals	68,573	68,573
ϕ_{cj}	✓	
Pilot intensity P_{cj}		✓
Cohort fixed effects	✓	✓
Municipality fixed effects	✓	✓

Notes : (i) Marginal effects are presented (ii) Standard errors (in parentheses) are clustered at the municipality*cohort ($j \times c$) level. (iii) Each model is estimated using the sample of students present in the year of (predicted) graduation – including dropouts. The number of individuals here is lower than in Table 1 due to missing values on mother's and father's years of schooling. (iv) *** Significant at 1% level. ** Significant at 5% level. * Significant at 10% level.

Table 3: The effect of predicted unemployment rate at graduation (ϕ_{cj}) and pilot intensity (P_{cj}) on the individual's choice of whether to enroll in upper secondary school (at all), whether to enroll in a vocational track (vs. an academic one), of delaying enrollment in vocational studies, of dropping out of vocational studies, and on the composition of dropouts.

	Dependent variable				
	$\mathbb{P}$(enrolls in upp. sec. school)	$\mathbb{P}$(enrolls in vocational track)	$\mathbb{P}$(delays enrollment in voc. track)	$\mathbb{P}$(drops out from voc. track)	GPA rank (for dropouts)
	(1)	(2)	(3)	(4)	(5)
Predicted unemp. grad. (ϕ_{cj})	0.000	-0.000	-0.000	-0.001	0.206
	(0.002)	(0.002)	(0.001)	(0.002)	(0.621)
Pilot intensity (P_{cj})	0.001	0.011	0.006	0.012	-6.531
	(0.013)	(0.016)	(0.005)	(0.017)	(4.151)
GPA rank in 9^{th} grade	0.004***	-0.010***	-0.000***	-0.003***	-
	(0.000)	(0.000)	(0.000)	(0.000)	-
Born in Nordic country	0.017***	0.072***	-0.132***	-0.002	3.329**
	(0.005)	(0.005)	(0.009)	(0.007)	(1.411)
Cohort fixed effects	✓	✓	✓	✓	✓
Municipality fixed effects	✓	✓	✓	✓	✓
Mean of dependant variable	0.86	0.38	0.02	0.12	31.13
Nb. of individuals	255,471	199,884	78,003	76,574	8,880

Notes : (i) Marginal effects are presented (ii) Standard errors (in parentheses) are clustered at the municipality*cohort ($j \times c$) level. (iii) Model (1) is estimated using the sample of students observed three years after graduation from compulsory school– including dropouts. Since not all students in compulsory school enrolled in upper secondary school, P_{cj} and ϕ_{cj} are measured at the municipality*cohort ($j \times c$) level, where j stands for municipality of residence at age 16 (as information on the municipality of residence during the last year of compulsory schooling is only available from the *Upper secondary application register*) and c stands for the year the individual finishes compulsory school. (iv) Models (2)-(5) are estimated using the sample of students observed in the year of (predicted) graduation – including dropouts. We estimate Model (2) conditional on enrolling in upper secondary school at age 16, Model (3) conditional on enrolling in vocational studies, Model (4) conditional on enrolling in vocational studies at age 16, and Model (5) conditional on enrolling in vocational studies at age 16 and dropping out. Unconditional estimations of Models (2)-(4) yield very similar results (not shown). (v) *** Significant at 1% level. ** Significant at 5% level. * Significant at 10% level.

Table 4: The impact of unemployment rate at graduation (at the municipality level), for two- and three-year track students separately.

	Dependent variable : Employment					
	Two-year track students sample (1)		Three-year track students sample (2)		Diff (3)	
	$\beta_{e,2}$	*Nb obs*	$\beta_{e,3}$	*Nb obs*	$\beta_{e,2}$-$\beta_{e,3}$	*Nb obs*
Years since (predicted) graduation						
0	-0.026***	*56,242*	-0.016***	*11,515*	0.008	*67,757*
	(0.003)		(0.006)		(0.007)	
5	-0.009***	*55,616*	-0.002	*11,328*	0.007	*66,944*
	(0.002)		(0.005)		(0.006)	
10	-0.002	*55,065*	-0.007	*11,262*	-0.004	*66,327*
	(0.002)		(0.005)		(0.005)	
15	-0.005**	*54,796*	-0.000	*11,204*	0.005	*66,000*
	(0.002)		(0.004)		(0.005)	
Track fixed effect					✓	
Cohort fixed effects	✓		✓		✓	
Municipality fixed effects	✓		✓		✓	
Individual background characteristics	✓		✓		✓	

Notes : (i) Marginal effects for Models (1)-(2) are computed using Equation (4) (ii) In Model (3), we test for the equality of regression coefficients using the fully interacted form of the model (iii) Standard errors (in parentheses) are clustered at the municipality*cohort ($j \times c$) level. (iv) *** Significant at 1% level. ** Significant at 5% level. * Significant at 10% level.

Table 5: First stage regressions.

	Dependent variable	
	Three year track dummy	Unemployment rate at graduation
	(1)	(2)
Predicted unemployment rate at graduation (ϕ_{cj})	0.010	0.510***
	(0.007)	(0.045)
Pilot intensity in municipality of residence (P_{cj})	0.451***	0.092
	(0.042)	(0.145)
Cohort fixed effects	✓	✓
Municipality fixed effects	✓	✓
Individual characteristics	✓	✓
Number of individuals	67,689	67,689
R^2	0.20	0.89
Kleibergen-Paap Wald rk F statistic	67.46	

Notes : (i) As we have two endogenous regressors and two IVs, we cannot simply look at the first stage F-statistics to test for weak instruments. We look instead at the Kleibergen-Paap Wald rk F statistic (which is cluster-robust). Here, the eigenvalue (for 10% maximal IV size) is equal to 7.03. (ii) We show first stage estimates for the sample of individuals in the year of (predicted) graduation (67,689 individuals). (iii) Marginal effects are presented. (iv) Standard errors (in parentheses) are clustered at the municipality*cohort ($j \times c$) level. (v) *** Significant at 1% level. ** Significant at 5% level. * Significant at 10% level.

Table 6: The impact of unemployment rate at graduation on labor-market outcomes in the year of (predicted) graduation – IV specification.

	Bottom quintile	Median quintile	Top quintile
Dependent variable:	(1)	(2)	(3)
Employment[(a)]			
Effect of unemployment rate at graduation	-0.052***	-0.010	-0.019
(instrumented)	(0.015)	(0.014)	(0.013)
Number of individuals	12,940	13,153	12,792
Mean of dependent variable	0.686	0.819	0.828
Annual earnings[(b)]			
Effect of unemployment rate at graduation	-0.035***	-0.010	-0.032**
(instrumented)	(0.010)	(0.011)	(0.010)
Number of individuals	12,940	13,153	12,792
Mean of dependent variable	0.416	0.547	0.553
Track FE (instrumented)	✓	✓	✓
Cohort FE	✓	✓	✓
Municipality FE	✓	✓	✓
Individual characteristics	✓	✓	✓

Notes: (i) Marginal effects are presented. (ii) Standard errors (in parentheses) are clustered at the municipality*cohort ($j \times c$) level. (iii) *** Significant at 1% level. ** Significant at 5% level. * Significant at 10% level. [(a)] We assume than an individual is employed (or to some extent active on the labour-market) if her earnings in the current year exceed one month full-time on the minimum wage (see Section 3 for details) [(b)] Annual earnings are scaled as months of full-time minimum wage (see Section 3 for details).

Table 7: The impact of unemployment rate at graduation on educational attainment – IV specification.

	Bottom quintile	Median quintile	Top quintile
Dependent variable:	(1)	(2)	(3)
Late graduation from upp. sec. school			
Effect of unemployment rate at graduation	0.003	-0.003	0.005
(instrumented)	(0.009)	(0.007)	(0.006)
Number of individuals	12,940	13,153	12,792
Mean of dependent variable	0.099	0.047	0.037
Accumulated years of schooling by age 38			
Effect of unemployment rate at graduation	-0.041*	-0.013	-0.039
(instrumented)	(0.023)	(0.033)	(0.030)
Number of individuals	12,614	12,748	12,383
Mean of dependent variable	3.802	4.206	4.813
Track FE (instrumented)	✓	✓	✓
Cohort FE	✓	✓	✓
Municipality FE	✓	✓	✓
Individual characteristics	✓	✓	✓

Notes: (i) Marginal effects are presented. (ii) Standard errors (in parentheses) are clustered at the municipality*cohort ($j \times c$) level. (iii) *** Significant at 1% level. ** Significant at 5% level. * Significant at 10% level.

Table 8: The impact of unemployment rate at graduation on family formation – IV specification.

Dependent variable:	Bottom quintile (1)	Median quintile (2)	Top quintile (3)
Panel A: Timing of family formation			
Still living at parents' home at age 19			
Effect of unemployment rate at graduation	-0.030*	0.029*	-0.016
(instrumented)	(0.017)	(0.016)	(0.013)
Number of individuals	12,940	13,153	12,792
Mean of dependent variable	0.578	0.630	0.659
Age at first stable partnership$^{(a)}$			
Effect of unemployment rate at graduation	-0.419**	0.065	0.062
(instrumented)	(0.173)	(0.128)	(0.113)
Number of individuals	8,761	8,486	9,201
Mean of dependent variable	26.140	27.103	27.261
Age at first birth			
Effect of unemployment rate at graduation	-0.402**	0.059	-0.003
(instrumented)	(0.178)	(0.141)	(0.118)
Number of individuals	10,721	11,084	10,981
Mean of dependent variable	25.789	27.094	27.751
Panel B: Completion of family formation$^{(b)}$			
Ever in a stable partnership			
Effect of unemployment rate at graduation	-0.001	0.003	0.010
(instrumented)	(0.012)	(0.011)	(0.008)
Number of individuals	10,586	9,930	10,508
Mean of dependent variable	0.828	0.855	0.876
Ever had a child			
Effect of unemployment rate at graduation	0.003	-0.002	-0.000
(instrumented)	(0.011)	(0.011)	(0.008)
Number of individuals	12,940	13,153	12,792
Mean of dependent variable	0.845	0.865	0.884
Total number of children (if ever had a child)			
Effect of unemployment rate at graduation	0.027	0.025	-0.005
(instrumented)	(0.034)	(0.028)	(0.023)
Number of individuals	10,605	10,976	10,893
Mean of dependent variable	2.192	2.115	2.171
Track FE (instrumented)	✓	✓	✓
Cohort FE	✓	✓	✓
Municipality FE	✓	✓	✓
Individual characteristics	✓	✓	✓

Notes: $^{(a)}$A stable partnership is defined as either being married or cohabitation with a partner and common child. $^{(b)}$Completed family formation refers to family outcomes at age 38. (i) Marginal effects are presented. (ii) Standard errors (in parentheses) are clustered at the municipality*cohort ($j \times c$) level. (iii) *** Significant at 1% level. ** Significant at 5% level. * Significant at 10% level.

Table 9: The impact of unemployment rate at graduation on partnership quality – IV specification.

Dependent variable:	Bottom quintile (1)	Median quintile (2)	Top quintile (3)
Panel A: Partner's characteristics[(a)]			
Partner with low GPA[(b)]			
Effect of (own) unemployment rate at graduation	0.063**	0.014	0.010
(instrumented)	(0.032)	(0.025)	(0.022)
Number of individuals	3,130	3,218	3,547
Mean of dependent variable	0.406	0.260	0.193
Partner's annual earnings			
Effect of (own) unemployment rate at graduation	-0.047*	-0.021	-0.042
(instrumented)	(0.024)	(0.027)	(0.027)
Number of individuals	5,419	5,543	5,636
Mean of dependent variable	1.132	1.213	1.242
Partner's age			
Effect of (own) unemployment rate at graduation	0.289	-0.339*	0.012
(instrumented)	(0.193)	(0.188)	(0.184)
Number of individuals	5,419	5,543	5,636
Mean of dependent variable	30.275	30.246	30.327
Partner with low education level[(c)]			
Effect of (own) unemployment rate at graduation	-0.001	0.009	-0.004
(instrumented)	(0.019)	(0.018)	(0.016)
Number of individuals	5402	5527	5628
Mean of dependent variable	0.897	0.849	0.752
Panel B: Partnership dissolution[(d)]			
Ever ended the first stable partnership			
Effect of unemployment rate at graduation	0.049**	-0.007	-0.001
(instrumented)	(0.020)	(0.015)	(0.013)
Number of individuals	8,761	8,486	9,201
Mean of dependent variable	0.428	0.288	0.223
Single mother			
Effect of unemployment rate at graduation	0.040**	0.002	-0.008
(instrumented)	(0.019)	(0.013)	(0.012)
Number of individuals	12617	12769	12384
Mean of dependent var.	0.323	0.218	0.164
Number of fathers			
Effect of unemployment rate at graduation	0.050**	0.031**	0.012
(instrumented)	(0.019)	(0.013)	(0.009)
Number of individuals	10,608	10,988	10,886
Mean of dependent variable	1.229	1.120	1.075
Track FE (instrumented)	✓	✓	✓
Cohort FE	✓	✓	✓
Municipality FE	✓	✓	✓
Individual characteristics	✓	✓	✓

Notes: (i) Marginal effects are presented. (ii) Standard errors (in parentheses) are clustered at the municipality*cohort ($j \times c$) level. (iii) *** Significant at 1% level. ** Significant at 5% level. * Significant at 10% level. [(a)]We measure partners' characteristics when females are aged 27 (which is the average age when forming the first stable partnership). [(b)]Partners with low GPA refer to partners whose grades in 9^{th} grade are in the lowest quartile of the GPA distribution. [(c)]Partners with low education level have at most completed upper secondary school. [(d)]Partnership dissolution is measured by the age of 38.

Table 10: The impact of unemployment rate at graduation on welfare receipt and related joint events – Bottom quintile – IV specification.

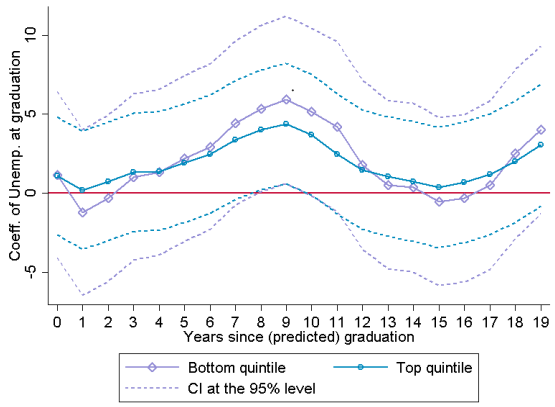
	Bottom quintile
Dependent variable (measured at age 38):[(a)]	(1)
Welfare receipt	
Effect of unemployment rate at graduation	0.020***
(instrumented)	(0.008)
Mean of dependent variable	0.043
Number of individuals	12,617
Welfare receipt*No child	
Effect of unemployment rate at graduation	0.000
(instrumented)	(0.005)
Mean of dependent variable	0.008
Number of individuals	12,617
Welfare receipt*In partnership with child	
Effect of unemployment rate at graduation	0.004
(instrumented)	(0.003)
Mean of dependent variable	0.008
Number of individuals	12,617
Welfare receipt*Single mother	
Effect of unemployment rate at graduation	0.019**
(instrumented)	(0.006)
Mean of dependent variable	0.026
Number of individuals	12,617
Welfare receipt*First partner had high GPA	
Effect of unemployment rate at graduation	-0.001
(instrumented)	(0.001)
Mean of dependent variable	0.001
Number of individuals	9,350
Welfare receipt*First partner had low GPA	
Effect of unemployment rate at graduation	0.007*
(instrumented)	(0.004)
Mean of dependent variable	0.011
Number of individuals	9,350
Track FE (instrumented)	✓
Cohort FE	✓
Municipality FE	✓
Individual characteristics	✓

Notes: [(a)] All dependent variables are measured at age 38. (i) Marginal effects are presented. (ii) Standard errors (in parentheses) are clustered at the municipality*cohort ($j \times c$) level. (iii) *** Significant at 1% level. ** Significant at 5% level. * Significant at 10% level.

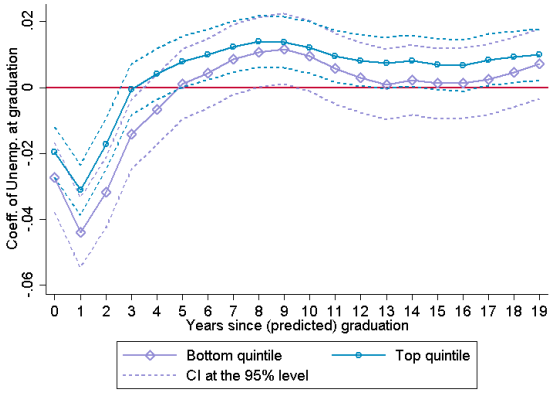
A Figures

Figure A1: The effect of unemployment rate at graduation on disability and sickness receipt for each year since (predicted) graduation – IV specification.

(a) Annual sickness benefits (in SEK)



(b) $\mathbb{P}$(At least one sickness spell $\geq$ 14 days)



(c) $\mathbb{P}$(Disability pension receipt)

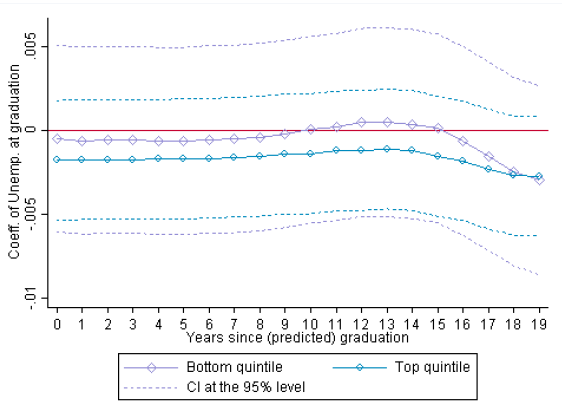
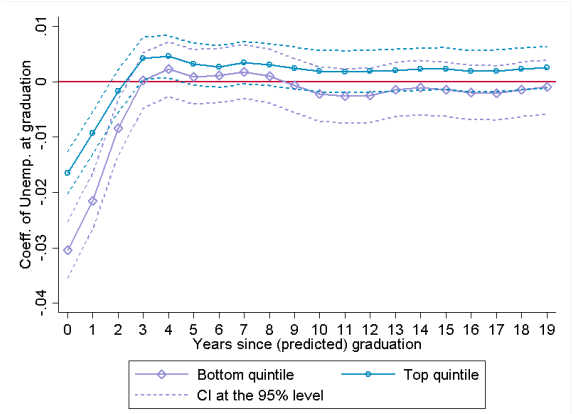
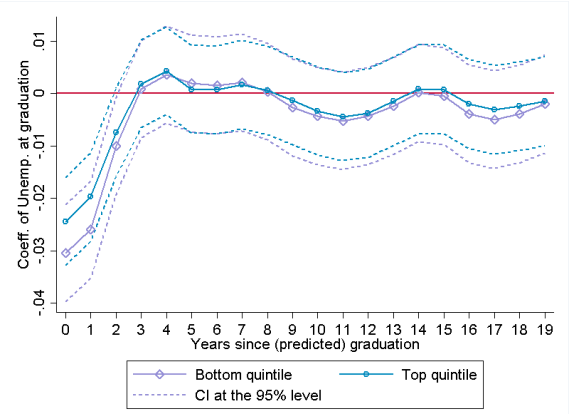


Figure A2: The effect of unemployment rate at graduation on **males'** labor-market outcomes and welfare receipt for each year since (predicted) graduation – IV specification.

(a) ℙ(Annual earnings≥monthly minimum wage)



(b) Annual earnings



(c) ℙ(Belongs to a household that received welfare benefits during that year)

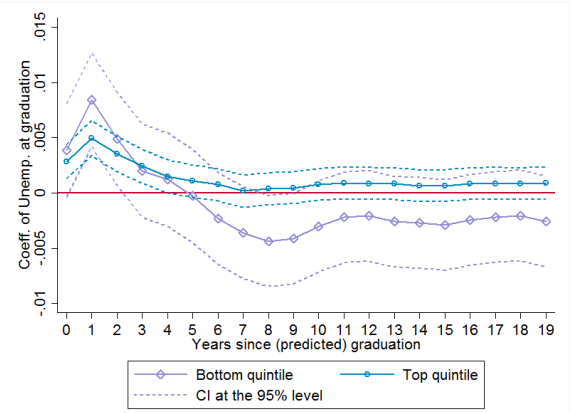
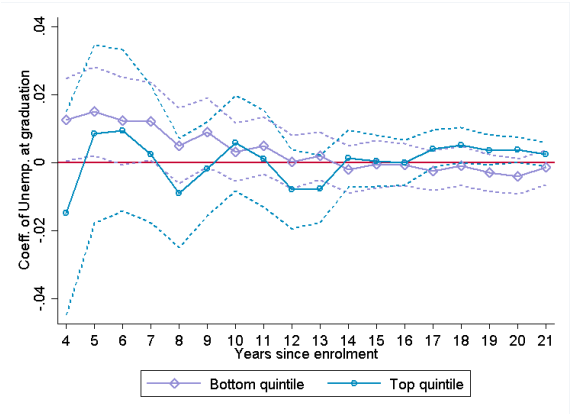


Figure A3: The effect of unemployment rate at graduation on **males'** probability to live at one parent's home for each year since (predicted) graduation – IV specification.

(a) ℙ(Lives at parent's home)



B Tables

Table B1: Number of available educational slots by program type and year.

Year of enrollment	1987	1988	1989	1990	1991[(a)]
Electrical engineering	48	528	656	776	n/a
Health care	46	2 182	2 918	3 072	n/a
Heating, ventilation and sanitation	64	64	72	104	n/a
Industry	352	1 608	1 952	1 968	n/a
Business and services		210	660	990	n/a
Caring services: children and youth		256	420	420	n/a
Construction		296	408	432	n/a
Textile and clothing manufacturing		136	208	224	n/a
Transport and vehicle engineering		752	992	1 056	n/a
Use of natural resources		352	640	720	n/a
Constructional metalwork			56	56	n/a
Food manufacturing			224	256	n/a
Handicraft			32	64	n/a
Painting			56	88	n/a
Process technology			176	208	n/a
Restaurant			336	416	n/a
Wood technology			144	168	n/a
Graphic				112	n/a
Total	510	6 384	9 950	11 130	12 818

Notes: Table adapted from Grönqvist and Hall (2011). [(a)] There is no available statistics on the number of slots per program type for 1991. The total number of students, however, is reported in a report from Skolverket (1992).

Table B2: Program types for the sample of female vocational students.

Program type	Share (%)
Business and services	30.00
Health care[(a)]	27.44
Caring services: children and youth	12.66
Consumer studies[(b)]	11.06
Food manufacturing and restaurant[(c)]	9.33
Use of natural resources[(d)]	2.94
Wood technology	2.73
Electrical engineering	1.01
Transport and vehicle engineering	0.72
Construction[(e)]	0.59
Process technology	0.23
Operation and maintenance engineering[(b)]	0.21
Textile and clothing manufacture	0.17
Industry	0.91
Nb. of individuals	77,977

(i) The sample includes female vocational students observed in the year of (predicted) graduation – including dropouts. (ii) Students in graphic/handicraft programs are excluded (no strict correspondence in two-year tracks). For a comparison with Table 1 note that: [(a)] The three-year pilot track Health Care corresponds to the two-year tracks Caring Services and Social Services. [(b)] This track does not directly correspond to any of the pilot tracks, but is included in the analysis as important elements appear to be present on one or more of the pilot tracks (see Hall (2009)).[(c)] The three-year pilot tracks Food Manufacturing and Restaurant correspond to the two-year track, Food Manufacturing. [(d)] The three-year pilot track Use of natural resources corresponds to the three separate two-year tracks, Agriculture, Forestry and Gardening. [(e)] The three-year pilot tracks Construction, Constructional metalwork, Heating, Ventilation and Sanitation correspond to one two-year track, construction.

Table B3: Evaluating the identifying assumptions – Bottom quintile[(a)]. The effect of predicted unemployment rate at graduation (ϕ_{cj}) and pilot intensity (P_{cj}) on the individual's choice of whether to enroll in upper secondary school (at all), whether to enroll in a vocational track (vs. an academic one), of delaying enrollment in vocational studies, of dropping out of vocational studies, and on the composition of dropouts.

	Dependent variable				
	$\mathbb{P}$(enrolls in upp. sec. school)	$\mathbb{P}$(enrolls in vocational track)	$\mathbb{P}$(delays enrollment in vocational track)	$\mathbb{P}$(drops out from voc. track)	GPA rank (for dropouts)
	(1)	(2)	(3)	(4)	(5)
Predicted unemp. grad. (ϕ_{cj})	-0.003	-0.007	-0.001	0.001	0.161
	(0.006)	(0.004)	(0.003)	(0.005)	(0.175)
Pilot intensity (P_{cj})	0.047	0.044	-0.005	0.013	-2.039
	(0.043)	(0.029)	(0.018)	(0.040)	(1.278)
GPA rank in 9^{th} grade	0.026***	-0.009***	-0.003***	-0.015***	-
	(0.001)	(0.001)	(0.000)	(0.001)	-
Born in Nordic country	-0.032***	0.021*	-0.151***	0.021	0.091
	(0.012)	(0.011)	(0.014)	(0.016)	(0.499)
Cohort fixed effects	✓	✓	✓	✓	✓
Municipality fixed effects	✓	✓	✓	✓	✓
Mean of dependant variable	0.62	0.92	0.05	0.26	8.93
Nb. of individuals	37,752	19,019	18,199	17,412	4,465

Notes : [(a)] Here, the bottom quintile refers to students whose GPA in 9^{th} grade was below 2.6 (which corresponds to the maximum grade obtained by vocational students in the bottom quintile in our main sample). (i) Marginal effects are presented. (ii) Standard errors (in parentheses) are clustered at the municipality*cohort ($j \times c$) level. (iii) Model (1) is estimated using the sample of students observed three years after graduation from compulsory school– including dropouts. Since not all students in compulsory school enrolled in upper secondary school, P_{cj} and ϕ_{cj} are measured at the municipality*cohort ($j \times c$) level, where j stands for municipality of residence at age 16 (as information on the municipality of residence during the last year of compulsory schooling is only available from the *Upper secondary application register*) and c stands for the year the individual finishes compulsory school. (iv) Model (2)-(5) are estimated using the sample of students observed in the year of (predicted) graduation – including dropouts. We estimate Model (2) conditional on enrolling in upper secondary school at age 16, Model (3) conditional on enrolling in vocational studies, Model (4) conditional on enrolling in vocational studies at age 16, and Model (5) conditional on enrolling in vocational studies at age 16 and dropping out. (v) *** Significant at 1% level. ** Significant at 5% level. * Significant at 10% level.

Table B4: Robustness checks on the model and the sample. The effect of unemployment rate at graduation on selected outcomes, IV specification – Bottom quintile.

Dependent variable:	Baseline (1)	(2)	(3)	(4)	(5)
Panel A: Single mother on welfare					
At age 38	0.019***	0.019***	-	0.018***	0.019***
	(0.006)	(0.006)	-	(0.006)	(0.007)
Nb. of individuals	12,617	12,617	-	11,360	10,704
Panel B: Employment					
Years since (predicted) graduation					
0	-0.044***	-0.044***	-0.052***	-0.044***	-0.043***
	(0.007)	(0.007)	(0.015)	(0.007)	(0.008)
1-2	-0.026***	-0.026***	-0.019****	-0.026***	-0.025***
	(0.007)	(0.007)	(0.007)	(0.007)	(0.008)
3-10	-0.006	-0.005	-0.009	-0.005	-0.005
	(0.007)	(0.007)	(0.007)	(0.007)	(0.008)
10-19	-0.008	-0.008	-0.006	-0.008	-0.007
	(0.007)	(0.007)	(0.007)	(0.007)	(0.008)
Nb. of observations	276,722	276,722	258,692	249,296	234,796
Program type		✓			
Current UR			✓		
No late graduates				✓	
No enrollment in university studies					✓
Track FE (instrumented)	✓	✓	✓	✓	✓
Cohort fixed effects	✓	✓	✓	✓	✓
Municipality fixed effects	✓	✓	✓	✓	✓
Individual characteristics	✓	✓	✓	✓	✓

Notes: (i) Marginal effects are presented. (ii) Standard errors (in parentheses) are clustered at the municipality*cohort ($j \times c$) level. (iii) In Panel A, each model is estimated on the sample of women observed at age 38. In Panel B, we estimate each model using the balanced panel of individuals. The coefficients shown in Panel B are on the interaction of the instrumented unemployment rate at graduation and selected experience groups. (iv) In Panel A, column (3), the effect of current unemployment rate cannot be identified, as we compare women at the same age (hence same year). (v) *** Significant at 1% level. ** Significant at 5% level. * Significant at 10% level.

Table B5: Reduced form of the model. The effect of ϕ_{jc} on selected outcomes – Bottom quintile.

Dependent variable	(1)	(2)
Panel A: Single mother on welfare		
At age 38	0.009***	0.006*
	(0.003)	(0.003)
Nb. of individuals	12,618	16,943
Panel B: Employment		
Years since (predicted) graduation		
0	-0.038***	-0.038***
	(0.003)	(0.003)
1-2	-0.020***	-0.022***
	(0.003)	(0.003)
3-10	0.000	0.001
	(0.003)	(0.003)
11-19	-0.002	-0.003
	(0.003)	(0.003)
Nb. of observations.	276,745	372,221
Including dropouts		✓
P_{cj}	✓	✓
Cohort fixed effects	✓	✓
Municipality fixed effects	✓	✓
Individual characteristics	✓	✓

Notes: (i) Marginal effects are presented. (ii) Standard errors (in parentheses) are clustered at the municipality*cohort ($j \times c$) level. (iii) In Panel A, each model is estimated on the sample of women observed at age 38. In Panel B, we estimate each model using the balanced panel of individuals. The coefficients shown in Panel B are on the interaction of the instrumented unemployment rate at graduation and selected experience groups. (iv) In column (1), we run the model for the bottom quintile of students, i.e. for students with GPA lower than 2.6 in 9^{th} grade. In column (2) the estimation sample includes drop outs with GPA lower than 2.6 in 9^{th} grade. (v) *** Significant at 1% level. ** Significant at 5% level. * Significant at 10% level.

Table B6: The impact of unemployment rate at graduation on **male** labor-market outcomes in the year of (predicted) graduation – IV specification.

	Bottom quintile	Median quintile	Top quintile
Dependent variable:	(1)	(2)	(3)
Employment[(a)]			
Effect of unemployment rate at graduation	-0.039***	-0.015**	-0.019***
(instrumented)	(0.007)	(0.007)	(0.006)
Number of individuals	19407	17577	18329
Mean of dependent variable	0.662	0.727	0.762
Annual earnings[(b)]			
Effect of unemployment rate at graduation	-0.025***	-0.018***	-0.019***
(instrumented)	(0.005)	(0.005)	(0.005)
Number of individuals	19407	17577	18329
Mean of dependent variable	0.480	0.516	0.536
Track FE (instrumented)	✓	✓	✓
Cohort FE	✓	✓	✓
Municipality FE	✓	✓	✓
Individual characteristics	✓	✓	✓

Notes: (i) Marginal effects are presented. (ii) Standard errors (in parentheses) are clustered at the municipality*cohort ($j \times c$) level. (iii) *** Significant at 1% level. ** Significant at 5% level. * Significant at 10% level. [(a)] We assume than an individual is employed (or to some extent active on the labour-market) if his earnings in the current year are higher than the monthly minimum wage (see Section 3 for details) [(b)] Annual earnings are scaled by the annual minimum wage level (see Section 3 for details).

Table B7: The impact of unemployment rate at graduation on **male** family formation – IV specification.

	Bottom quintile	Median quintile	Top quintile
Dependent variable:	(1)	(2)	(3)
Panel A: Timing of family formation			
Age at first stable partnership[(b)]			
Effect of unemployment rate at graduation	0.139**	0.050	0.098*
(instrumented)	(0.066)	(0.079)	(0.052)
Number of individuals	11,318	10,610	11,493
Mean of dependent variable	28.720	29.475	29.542
Age at first birth			
Effect of unemployment rate at graduation	0.154**	0.104	0.042
(instrumented)	(0.068)	(0.086)	(0.053)
Number of individuals	13,544	12,716	13,786
Mean of dependent variable	28.433	29.482	29.858
Panel B: Completion of family formation[(c)]			
Ever in a stable partnership			
Effect of unemployment rate at graduation	-0.004	0.007	0.005
(instrumented)	(0.005)	(0.006)	(0.004)
Number of individuals	15,986	14,258	14,659
Mean of dependent variable	0.708	0.744	0.784
Ever had a child			
Effect of unemployment rate at graduation	0.001	0.012*	0.007
(instrumented)	(0.005)	(0.007)	(0.005)
Number of individuals	19,408	17,577	18,329
Mean of dependent variable	0.720	0.745	0.774
Total number of children (if ever had a child)			
Effect of unemployment rate at graduation	-0.006	-0.009	-0.017
(instrumented)	(0.013)	(0.013)	(0.011)
Number of individuals	13,380	12,575	13,684
Mean of dependent variable	1.998	1.978	2.013
Panel D: Partnership dissolution[(d)]			
Ever ended the first stable partnership			
Effect of unemployment rate at graduation	-0.018**	-0.003	-0.000
(instrumented)	(0.007)	(0.007)	(0.005)
Number of individuals	11318	10610	11493
Mean of dependent variable	0.347	0.235	0.177
Track FE (instrumented)	✓	✓	✓
Cohort FE	✓	✓	✓
Municipality FE	✓	✓	✓
Individual characteristics	✓	✓	✓

Notes: [(a)]Age at enrollement in military service is missing for men who never served in the military (about 40%), as well as for the 1970 birth cohort. [(b)]A stable partnership is defined as either being married or cohabitation with a partner and common child. [(c)]Completed family formation refers to family outcomes at age 38. (i) Marginal effects are presented. (ii) Standard errors (in parentheses) are clustered at the municipality*cohort ($j \times c$) level. (iii) *** Significant at 1% level. ** Significant at 5% level. * Significant at 10% level. [(d)]Partnership dissolution is measured by the age of 38.

C Data Appendix

To capture potential health effects we use data on sickness and disability benefits. Sickness benefits are paid out to those that are temporarily absent from work more than 14 days because of illness. Disability benefits are compensations for those who are permanently unable to work due to illness, injury or impairment. They include 'Activity compensation' and 'Sickness compensation'. 'Activity compensation' is a compensation for those who have not reached the age of 30 and are not able to work due to illness, injury or impairment. 'Sickness compensation' is a reimbursement for those who have reached the age of 30 and probably will never be able to work again.[34] From these data we construct three outcome measures: (i) annual sickness benefits (in SEK), (ii) a dummy set one if an individual has been ill for more than 14 days during a calendar year, and (iii) a dummy set one if an individual either received activity compensation or sickness compensation during a calendar year. All "health" measures are available from 1990 and onwards.

[34] In 2003, activity and sickness compensation replaced the earlier benefit scheme called early retirement or sickness pension.