Leaving school in an economic downturn: Long-run effects on marriage and fertility

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Abstract

In this study we assess the long-run impact of leaving school in an economic downturn on marriage and fertility outcomes. We draw data from the National Longitudinal Survey of Youth 1979. Our sample left school between 1976 and 1996, and we utilize variation in the state unemployment rate at the time of school-leaving to identify marriage and fertility effects. We find that men who left school in an economic downturn are less likely to be married and have children at age 40 than otherwise similar men while women are more likely to be divorced and to have children. Our results suggest that the marriage and fertility effects we observe operate through both divorce and failure to enter marriage. In an extension, we explore heterogeneity by worker characteristics and document the strongest effects for low skill and minority men.

Keywords: marriage; fertility; school-leaving; economic downturns.

JEL classification: J1; J2

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1. Introduction

For many adults, marriage aspirations are postponed until they complete their education and have established themselves in the workplace. Thus, labor market conditions at school leaving could impact, and impact persistently, marriage and fertility decisions. Understanding the long term implications for marriage and fertility of leaving school in an economic downturn is timely as the United States is slowly recovering from the 2007 to 2009 recession, the largest economic downturn in the postwar era. During this downturn and recovery period, administrative data show that both marriage and fertility rates declined, and the divorce rate increased (Centers for Disease Control and Prevention, 2013; Martin, Hamilton, Ventura, Osterman, & Mathews, 2013). For example, the fertility rate declined each year between 2007 and 2011 (after generally increasing 1998 through 2007) and stood at 63.5 births per 1,000 women ages 15 to 44 years in 2011, the lowest rate recorded in U.S history.

This study examines the persistent impact of leaving school in an economic downturn on marriage and fertility among men and women utilizing longitudinal data drawn from the National Longitudinal Survey of Youth 1979 Cohort (NLSY79). A considerable amount of economic and demographic research documents the importance of contemporaneous labor market conditions for these outcomes (Amato & Beattie, 2011; Blau, Kahn, & Waldfogel, 2000; Chowdhury, 2013; Dehejia & Lleras-Muney, 2004; Hellerstein & Morrill, 2011; Lichter, Leclere, & Mclaughlin, 1991; Mocan, 1990; Schaller, 2013; Schultz, 1994; Wood, 1995). Although a full consensus has not yet been reached, on net the most recent literature seems to suggest that marriage and birth rates decline during downturns, while divorce rates increase. Possible mechanisms include job loss, wages and employment uncertainty, wealth shocks, and changes in home values and time costs.

Little is known about the persistent impact of experiencing an economic downturn

during important life transitions, such as the transition from school-to-work and initial job placement, however. Indeed, to the best of our knowledge only one study (Hershbein, 2012) examines the effect of leaving school in an economic downturn. Hershbein (2012) focuses exclusively on high school graduates and considers marriage only as an extension to his core analysis. Theories of the labor market, and previous research, suggest that findings for high school graduates may not translate to workers of different skill levels or characteristics such as race or ethnicity. Thus, we lack a broad understanding of how, and for whom, leaving school in an economic downturn impacts marriage and fertility outcomes.

Moreover, although the larger line of research on contemporaneous downturns is both important and suggestive, it is not clear how well it can inform us regarding the importance of entering the labor market, and forming an initial job match, during an economic downturn. In addition, transitory and permanent changes in income and time costs may impact marriage and fertility differentially. Labor economic research shows that that leaving school in an economic downturn persistently depresses labor market outcomes (e.g., wages, earnings, occupational prestige). Given the importance of labor market success for marriage market opportunities, and the costs and benefits of children in standard economic models of the family (Becker, 1973; Becker, 1981) previous studies on the effects of contemporaneous downturns hint that leaving school in a downturn may persistently influence both marriage and fertility outcomes.

Understanding determinants of marriage and fertility among individuals, and across cohorts, is critical for explaining trends in marriage, divorce, and fertility rates. Identifying these determinants is timely as the U.S. has experienced both declining marriage and fertility rates over the past several decades (Cohn, Passel, Wang, & Livingston, 2010; Martin, Hamilton, Ventura, Osterman, Wilson, & Mathew, 2012). These trends have important implications for the quantity and quality of children, family stability, population growth, tax revenues, expenditures

on social welfare programs, and the domestic workforce.

Our findings show that leaving school in an economic downturn has persistent impacts on marriage and fertility. The marriage and fertility effects we observe appear to operate through both divorce and failure to enter marriage. Moreover, the direction, magnitude, and statistical significance of the relationship varies by sex, skill level, and minority status. For example, we find that men who leave school in an economic downturn are less likely to be married and have children at age 40 than otherwise similar men, and the findings are particularly strong for low skill level (defined as less than a college degree) and non-white men. Although we find less heterogeneity among women than among men, we show that women overall who leave school in an economic downturn are more likely to be divorced and have children at age 40 than otherwise similar women. Our findings are robust to the use of instrumental variables to account for endogenous sorting at school-leaving.

2. Related work and theory

Leaving school in an economic downturn may influence both marriage and fertility outcomes by altering a worker's marriage market opportunities, and the opportunity costs to entering into these arrangements. We first review labor economic literature that suggests persistent effects of leaving school in an economic downturn, and second examine how these findings can inform standard economic models of marriage and fertility.

2.1 Related work

A growing line of research documents that workers who leave school in an economic downturn have persistently worse career outcomes than otherwise similar workers (Genda, Kondo, & Ohta, 2010; Hershbein, 2012; Kahn, 2010; Kondo, 2007; Kwon, Milgrom, & Hwang, 2010; Neumark, 2002; Oreopoulos, von Wachter, & Heisz, 2012; Oyer, 2006, 2008). Workers who leave school in an economic downturn may be directed towards low wage and otherwise

less desirable jobs in the short run as there are fewer open jobs and the quality of open jobs declines in economic downturns (McLaughlin & Bils, 2001; Okun, 1973; Reder, 1955). Frictions in the labor market prevent these workers from shifting into a higher wage or otherwise more desirable job when the economy rebounds. For example, Kahn (2010) finds that a 1 percentage point increase in the state unemployment rate at school-leaving leads to an annual wage loss of 2.5% to 9% 15 years later among white male college graduates. Further, Bowlus (1995) shows that jobs that start during a downturn tend to end sooner in the U.S. that those that start in stronger economic conditions.[1]

The career effects of leaving school in an economic downturn are not equally born across workers, however. Indeed, women's labor market outcomes may be insulated from economic conditions at school-leaving perhaps because they care more easily substitute into household production when faced with poor labor market opportunities (Hershbein, 2012; Kondo, 2007). When examining the effects of an economic downturn on men's labor market outcomes, Kondo (2007) shows heterogeneity in career effects by race: African American men face larger initial wage penalties as a result of leaving school in an economic downturn than white men, but the negative wage effects are more persistent for white men. Genda, et al. (2010) document larger and more persistent earnings effects for college educated men than high school graduates,[2] although the immediate effects are stronger for high school graduates.

Of particular importance for our research are studies by Kondo (2011) and Hershbein (2012). Kondo (2011) examines the persistent effect of economic conditions faced at marriage market entrance (defined as ages 18 to 20 years) among women. A higher state unemployment rate at marriage market entrance lowers the median age at which a woman marries, but does not

[1] See Baker, Gibbs, and Holmstrom (1994), Kahn (2010), or Oyer (2006) for reviews of relevant labor market theories.
[2] These findings are for a sample of American workers. The authors document a different relationship in the Japanese labor market.

impact the probability of marriage entrance by age 30.[3] Moreover, measures of marriage quality, the probability of divorce, or number of children by age 30 are not substantially influenced by the economic conditions women face at entrance to the marriage market. Kondo (2011) interprets the findings to imply that unemployment rates at marriage market entrance primarily accelerate marriage timing among couples who would have married regardless of experiencing a downturn at entrance to the marriage market. Hershbein (2012) shows that male high school graduates who leave school in an economic downturn are less likely to marry shortly after school-leaving than otherwise similar men.

Although these studies are important and interesting, critical questions remain unanswered. Kondo (2011) primarily focuses on women and examines the impact of experiencing an economic downturn when a woman begins searching for a marriage partner, not when she begins searching for a job. In our empirical models we address this latter question by isolating the period of school-leaving (detailed in Section 3.5), and thus examine how initial job matches formed in an economic downturn may persistently impact marriage and fertility outcomes. Although Kondo's work suggests that the marriage market may not display frictions, previous labor economic research documents that the labor market does display substantial frictions and entering in a downturn has both persistent and negative impacts on a wide range of career outcomes for men. Hershbein (2012) focuses on high school graduates, and therefore we know little about workers of other skill levels. Because previous labor research (detailed earlier in this section) documents different labor market penalties -- and timing of when penalties are experienced -- attributable to leaving school in an economic downturn by skill level, findings for high school graduates need not apply to workers with different skill levels. In addition, we know little about how effects may vary by other worker characteristics (e.g., race/ethnicity).

[3] In sensitivity analyses Kondo (2011) utilizes economic conditions from alternative age ranges and examines outcomes at age 35 years, and findings are broadly robust.

2.2 Economic models of marriage and fertility

We next apply findings from previous empirical studies to standard economic models of marriage. To gain insight into the causal effect of leaving school in an economic downturn on marriage decisions, we view marriage formation through the lens of a search process. The value of a particular marriage depends, among other things, on the expected income of the partner. Marriage value also depends on the division of household income between the partners, with this division determined through a bargaining process. Assuming there is some sharing within marriage, it seems likely that a lower income partner will yield a worse outcome within the partnership all else equal.[4] The assumption of at least partial income pooling implies that low income individuals (in particular men) will be undesirable partners, and will thus have a lower chance of receiving marriage offers (Burgess, Propper, & Aassve, 2003).

However, there is some evidence that the association between desirability and income differs by sex. For example, Wilson (1987), Oppenheimer, Kalmijn, and Lim (1997), and Brown and Kesselring (2003) argue that male "marriageability" is contingent on steady employment or a minimum level of earnings. More recently, using data from a large sample of online dating service members to analyze how individual characteristics affect the likelihood of having a personal profile browsed, being contacted, and exchanging information via e-mail, Hitsch, Hortacsu, and Ariely (2010) find that women put more weight on a partner's income.[5]

Leaving school during an economic downturn could affect marriage quality. An individual's reservation marriage quality depends on his marriage offer probability where individuals with higher earnings potential have higher offer probabilities. Lower earnings potential leads to a lower reservation marriage quality for men in particular. Moreover, in an

[4] In his seminal work, Becker (1973) posited marriage output is maximized when high income individuals marry low income individuals.

[5] For decades, the social psychological literature has shown a greater male (relative to female) desire for romantic partners who are physically attractive and a greater female (relative to male) desire for romantic partners who have strong earnings potential.

economic downturn, couples who enter marriage may be less likely to invest in marriage-specific capital as the rents they extract from the marriage are smaller than otherwise similar unions. Thus, the reduction in marriage-specific capital could increase the probability of divorce -- particularly if the husband left school during a downturn.

Although standard economic theory does not provide clear predictions on whether children are normal or inferior goods, there is recent evidence that the causal effect of income on fertility is positive and that a reduction in permanent income reduces total fertility (Black, Kolesnikova, Sanders, & Taylor, 2013; Lindo, 2010; Lovenheim & Mumford, 2013). Thus, leaving school in an economic downturn is predicted to reduce the incidence of fertility and the number of children for men. The effect on women is muted as women are more likely to receive marriage offers from older men (Bergstrom & Bagnoli, 1993) who are more firmly attached to the labor market as they did not leave school in an economic downturn.

To summarize, standard economic models of marriage and fertility yield the following predictions on the impact of leaving school in an economic downturn on marriage and fertility outcomes: (1) men who leave school in an economic downturn are less likely to marry than otherwise similar men; (2) marriage quality will be lower for those men and women who leave school in an economic downturn due to a lower reservation quality of the first marriage; and (3) men who leave school in an economic downturn will be less likely to have children than otherwise similar men. The impact of leaving school in an economic downturn on women's marriage and fertility is *ex ante* ambiguous.

3. Data, variables, and methods

3.1 Data

We obtain data from the geocoded NLSY79. The original sample consists of 12,686 youth ages 14 to 22 in 1979. The survey was administered annually by the Bureau of Labor

Statistics (BLS) between 1979 and 1993, and bi-annually between 1994 and 2010. We exclude subsamples dropped by the NLSY79 for financial reasons (military and low income white samples). We delete respondents who left school before 1976 as state-level unemployment rates from the BLS Local Area Statistics are available from 1976 onwards. Our findings are highly robust to alternative sample selection rules, however.

After excluding observations with additional missing information (detailed in later sections), our analysis sample includes 3,477 men and 3,757 women. Thus, our analysis sample size is in line with previous studies that utilize the NLSY79 to test the persistent effects of leaving school in an economic downturn on labor market and health outcomes (Hershbein, 2012; Kahn, 2010; Kondo, 2007; Maclean, 2013; Maclean, 2014).

Although much of the labor literature that examines the lasting career effects of leaving school in an economic downturn focuses on specific subsamples of the population (Genda, et al., 2010; Hershbein, 2012; Kahn, 2010; Oreopoulos, et al., 2012; Oyer, 2006, 2008), we examine the general population in our core analyses to preserve sample size and avoid sample selection bias. In extensions we assess heterogeneity by both skill level and race/ethnicity.

3.2 Marriage and fertility by age 40

The outcome variables in our study are measures of marriage and fertility at age 40. Studying these outcomes at age 40, in particular our fertility outcomes, allows us to view individuals after much of their marriage and fertility is complete, particularly in an older cohort such as the NLSY79. This focus provides us with a long-run perspective on how experiencing a labor market shock during the school-to-work transition, when attachment to the labor market is formed, can persistently alter marriage and fertility outcomes. However, in an extension to the core analysis we study marriage and fertility effects across the life course to understand dynamics of these relationships.

NLSY79 administrators record marriage and fertility outcomes in each round of the survey in which the respondent participates. However, for at least two reasons we may not observe the respondent at age 40. First, the NLSY79 respondents turned 40 between 1998 and 2006, after the survey became bi-annual in 1994. Thus the respondent may not complete the survey in his 40th year. Second, if a respondent attrites from the sample at age 40 we do not observe outcomes in this year. If a respondent does not provide marriage and fertility information at 40 for any reason, we impute the outcomes sequentially from ages 41, 39, 42, 38, 43, and finally 37. If the respondent does not provide valid information in these years he is coded as missing and excluded from the sample.

We examine four marriage and fertility outcomes at age 40. Specifically, we construct indicator variables for married (married or living as married), divorced (divorced or separated), never married,[6] and any biological children at age 40. We code respondents one if they report the outcome, and zero otherwise.

3.3 Economic conditions at school-leaving

The key predictor variable in our study is economic conditions at school-leaving. Since the National Bureau of Economic Research Business Cycle Dating Committee utilizes several metrics of economic activity to date recessions (National Bureau of Economic Research, 2010a), we follow the majority of studies that examine the impact of leaving school in an economic downturn and proxy economic conditions with the seasonally adjusted annual state unemployment rate in our core analysis (use of the adjusted rate removes typical variation that takes within a calendar year). In unreported analysis available on request we find that our results are robust to utilizing alternative proxies (e.g., employment-to-population ratios, per capita income, deviations from period trend in unemployment rates).

[6] Currently widowed respondents at age 40 are coded as zero for all three marital status outcomes.

We focus on the first period of school-leaving and, by definition, this event occurs once per observation. In our definition of school-leaving we include respondents who graduated with a degree from any educational institution (e.g., high school, community college, four year college, graduate school) and those who dropped out prior to degree or diploma completion. Thus our sample includes both dropouts and completers.[7] We utilize responses to education history questions fielded between 1979 and 1998 to identify the year each respondent left school. We require that respondents report being out of school for a period of two years after school-leaving to avoid classifying short departures from educational attainment as true school-leaving (e.g., leaving school for a year to travel abroad). We exclude respondents who left school after 1996 as cohort (defined as the number of respondents who leave school in a particular year) size becomes small after this year and respondents who report through the education history questions that they did not complete any schooling by 1996. [8]

Next, we determine the state of residence in the school-leaving period using the NLSY79 geocodes. Respondents who left school between 1976 and 1978 are assigned the 1979 interview state in the year of school-leaving. This imputation assumes that individuals do not move across state lines between school-leaving and 1979. The interview state is assigned to respondents who left school in 1979 and onwards.

Table 1 shows annual school leaving cohort sizes, where a school-leaving cohort includes respondents who left school in the same year. During the time period in which our sample left school the U.S. experienced three recessions (January 1980 to July 1980, July 1981 to November 1982, July 1990 to March 1991) and periods of economic growth in the mid-1980s and 1990s (National Bureau of Economic Research, 2010b).

3.4 Other control variables

[7] We do not exclude any respondents based on their highest level of educational attainment at school-leaving, with the exception of those who report no formal education.
[8] These observations are listed as having completed no years of formal education in the education history questions.

In all regressions we control for school-leaving state characteristics that may influence marriage and fertility outcomes at age 40. Specifically, we include the male-to-female sex ratio (Charles & Luoh, 2010; Lichter, et al., 1991) and an indicator for a unilateral divorce law (Gruber, 2004; Peters, 1986). We include these variables to proxy for the supply of marriage partners and preferences for marriage in the school-leaving state. We further include the number of the property crimes from the Bureau of Justice Statistics to proxy the size of the illegal labor market in the school-leaving state. If an individual's legal labor market opportunities decline, he may decide to substitute illegal labor market activities which may in turn impact marriage market outcomes (in particular engaging in criminal activities may further worsen a school-leaver's marriage market opportunities). This substitution may be particularly important for our sample as the later cohorts left school during the crack cocaine epidemic, and associated crime, that occurred in the U.S. between the mid-1980s and early 1990s. Lastly, we include the Aid to Families with Dependent Children (AFDC) maximum benefit for a family of four to proxy for non-labor market income opportunities.[9] We convert this variable to 2010 dollars using the BLS Consumer Price Index.

We also include personal characteristics related to age 40 marriage and fertility outcomes in our regression models: age in years at school-leaving, years of completed education at school-leaving (entered linearly), years since school-leaving, race/ethnicity indicators (African American and Hispanic, with white as the omitted group), a proxy for ability (age-standardized AFQT[10]), birth year fixed effects, an indicator for Catholic religion at age 14, and an indicator for leaving with both biological parents at age 14. As we document in a robustness check (Section 5.3), results are highly robust to the use of alternative covariate sets.

[9] This variable was provided by Dr. Elizabeth Peters and was generated through private data collection.
[10] Respondents were administered the AFQT in 1981 at 16 to 24 years. We follow Kahn (2010) and age-standardize the AFQT score for individual *i* in age group *g* (16 to 24 years):$(AFQT_{ig} - \overline{AFQT_g})/Standard\ Deviation_g$. To preserve sample size, we include an indicator for missing AFQT and assign missing observations the sample mean.

3.5 Empirical model

We model marriage and fertility outcomes at age 40 as a function of the school-leaving state unemployment rate and other covariates as outlined in Equation (1):

$$(1) \qquad MF_{ist} = \alpha_0 + \alpha_1 U_{st} + \alpha_2' P_{st} + \alpha_3' X_{ist} + \alpha_4' S_s + \alpha_5' D_t + \varepsilon_{ist}$$

MF_{ist} is a measure of marriage or fertility at age 40 for individual *i* in school-leaving state *s* and school-leaving year *t*. U_{st} is the seasonally adjusted annual state unemployment rate in school-leaving state *s* and school-leaving year *t*. P_{st} is a vector of school-leaving state-level variables and X_{ist} is a vector of personal characteristics. S_s and D_t are vectors of school-leaving state and year fixed effects. Inclusion of the school-leaving state fixed effects implies that we utilize within school-leaving state variation in unemployment rates to identify persistent marriage and fertility effects. Including these fixed effects allows us to control for time invariant difficult-to-observe between school-leaving state differences (e.g., cultural norms towards marriage and fertility not captured by the unilateral divorce law indicator and other state-level variables). Results are robust to the inclusion of school-leaving state-specific linear time trends, however. Lastly, ε_{ist} is the random error term.

We estimate linear probability models [11] and equations are estimated separately by sex given the different labor market participation patterns of men and women (United States Bureau of Labor Statistics, 2013). We apply NLSY79 sample weights that account for survey design and attrition in all regressions, and cluster standard errors around the school-leaving state.

Equation (1) assumes that the state unemployment rate at school-leaving is uncorrelated with the error term in the marriage and fertility equations after conditioning on personal characteristics, school-leaving state level variables, and fixed effects. An obvious concern is

[11] We attempted to estimate probit models, which are more appropriate for our binary outcomes, but many of our specifications did not achieve convergence. In regressions that did achieve convergence the results are highly consistent with those reported here. We note this as a limitation of the paper.

that the time or location of school-leaving is endogenous to the state unemployment rate. School-leavers may engage in endogenous timing (enrolling in additional schooling, dropping out) or migration (moving to a stronger labor market) to avoid leaving school in an economic downturn (Kahn, 2010). We refer to these activities collectively as endogenous sorting.

Relatedly, recall that we rely on retrospective reports of school-leaving and these variables may be measured with some error. Measurement error in the school-leaving variables can limit the precision with which we estimate treatment effects if it is random and can lead to bias if it is non-random (Bound, Brown, & Mathiowetz, 2001; Wooldridge, 2010).

To circumvent both of these empirical concerns we estimate instrumental variable models. Following Kahn (2010), we instrument the school-leaving state unemployment rate with the "on time" state unemployment rate. We create on time state unemployment rates using birth date, state of residence at age 14 (respondents who resided outside the U.S. at age 14 are excluded from the sample), and education at school-leaving. We utilize historical compulsory schooling laws to calculate school starting age (Acemoglu, Angrist, Bils, & Rouse, 2001). Respondents are assigned the state unemployment rate they would face if they left school on time. For example, we assign a college graduate the unemployment rate in the year he turned 22 in the state of residence at age 14. State of residence at age 14 is used as it is arguably exogenous to the school-leaver while the school-leaving state is more suspect to endogeneity concerns. We make comparable assignments for all educational levels.

We next utilize a second instrumental variable (Maclean, 2013): the "respondent expected" school-leaving state unemployment rate. We construct this variable using birth date and historical school start dates detailed above, reported educational expectations in 1979, and state of residence at age 14. In 1979 respondents were asked "What level of education do you

expect to attain?"[12] The respondent expected state unemployment rate is the state unemployment rate the respondent would have faced had he left school at his expected time. For example, we assign a respondent who reported that he expected to complete high school the unemployment rate in the year he turns 18 in state of residence at age 14. We make similar assignments for all levels of expected education. This second instrument thereby allows only *ex ante* expectations of educational attainment to dictate the school-leaving period.

We replace the school-leaving state and year fixed effects with age 14 state of residence fixed effects, and on time and respondent expected year fixed effects. We cluster the standard errors in instrumental variable models by the age 14 state of residence.

4. Results

4.1 Sample characteristics

Table 2 reports summary statistics for men and women separately. At age 40 64%, 17%, 18%, and 73% of men in our sample are married (or living as married), divorced, never married, and have any children. Among women, 66%, 22%, 12%, and 81% are married (or living as married), divorced, never married, and have any children. The average state unemployment rate at school-leaving is 7.48% among both men and women. The school-leaving male-to-female sex ratio is 0.96 among both men and women, and over 50% of the school-leaving states have a unilateral divorce law. The maximum AFDC benefit for a family of four is $466 among men and $434 among women. Lastly, the number of property crimes in the school-leaving state is 458,346 (466,368) among men (women).

The mean year of school-leaving was 1981 in our sample, thus just ahead of the early 1980s recession. On average, respondents left school at age 19 with 13 years of completed schooling. The remaining personal characteristics are broadly consistent with the U.S.

[12] NLSY79 respondents are also asked this question in 1981 and 1982. If a respondent does not provide a valid answer to this question in 1979, we sequentially utilize the 1981 and 1982 values.

population at age 40 although slightly less advantaged (authors' comparison with the 1998 to 2006, the years in which respondents turned 40, Annual Social and Economic Supplement to the Current Population Survey). That the NLSY79 sample is somewhat disadvantaged is not surprising as the survey oversamples minorities and low income groups.

Table 3 reports an unadjusted analysis of our marriage and fertility outcomes at age 40 among men and women. In this analysis we compare the marriage and fertility outcomes at age 40 between respondents who leave school when the state unemployment rate was either at or above the sample mean school-leaving state unemployment rate, or below this rate. We test whether differences are statistically significant with χ^2 tests.

Among men, those who leave school when the state unemployment rate was at or above the sample mean are less likely to be married, less likely to be divorced, more likely to be never married, and less likely to have children than men who left school when the state unemployment rate was below the sample mean: 63% vs. 65%, 17% vs. 18%, 20% vs. 17%, and 71% vs. 75% respectively. The differences are statistically significant ($p < 0.05$) in three of the four outcomes (the difference for married is not statistically different from zero). The unadjusted analysis suggests smaller differences between women's outcomes at age 40 based on the school-leaving state unemployment rate, and these differences are never statistically different from zero.

4.2 Regression results

Table 4 reports selected results from regressions of our marriage and fertility outcomes at age 40 as a function of the school-leaving state unemployment rate and other covariates included in Equation (1). The top panel pertains to men and the bottom panel pertains to women. These models do not address the potential endogeneity of the school-leaving state unemployment rate and we refer to these models as "naïve" models to distinguish them from instrumental variable models presented later in the study.

The regression results are consistent with the unadjusted analyses among men: those who leave school when the state unemployment rate is high are less likely to be married and have children at age 40. Specifically, a 1 percentage point increase in the school-leaving state unemployment rate leads to a 2.3 and 2.2 percentage point (3.5% and 3.0%) decrease in the probability of being married of having children at age 40. The results further suggest that men who leave school when the state unemployment rate is higher are more likely to be divorced and never married at age 40, but the coefficient estimates are statistically indistinguishable from zero in these regressions. Interestingly, we find no strong evidence that women's marriage or fertility outcomes at age 40 are impacted by leaving school in an economic downturn. The coefficient estimates are small in magnitude and statistically indistinguishable from zero.

4.3 Instrumental variable regression results

The key empirical challenge in this study is bias from endogenous sorting and measurement error in the school-leaving variables. To address these potential sources of bias, we estimate instrumental variables models. We view the results generated in the IV models as more reliable than those generated in the naïve models for two reasons.[13] First, IV models will produce consistent coefficient estimates regardless of whether or not the economic conditions faced at school-leaving are exogenous. The naïve models will only produce consistent estimates in the case of exogenous economic conditions at school-laving. Second, IV estimates are robust to measurement error in the school-leaving variables while naïve estimates are not. Before we present our IV results, we first provide some evidence that the variables we have selected to instrument the school-leaving state unemployment rate are suitable instruments.

IVs must predict the endogenous regressor to consistently estimate a local average treatment effect (LATE) for the IV compliers. It is worthwhile considering what type of

[13] These statements assume that our instrumental variables are both strong and excludable from Equation (1).

individuals comply with the selected instruments, and thus what LATE we are able to estimate in our analysis. Conceptually, compliers do not alter their education profile in response to economic conditions at the time of school-leaving as determined by date and location of birth or planned educational attainment. Compliers may not change their educational plans because they have strong preferences (these preferences may by internally determined or externally determined for example by parents) towards obtaining a specific level of education (e.g., college degree). Alternatively compliers may be particularly able and hardworking, and these abilities will secure them a good job regardless of the economic conditions under which they leave school. Compliers may lack the resources to optimally respond to poor economic conditions at school-leaving. For example, compliers may not have the financial resources to pursue an additional degree if they complete college in an economic downturn or they may not understand how downturns will impact their careers. Moreover, the selected instruments should exclude individuals who decide to continue studying when faced with an economic downturn (perhaps because of the lower opportunity cost of education) or who migrant to a stronger labor market when faced with an economic downturn at school-leaving. Lastly, the selected instruments should exclude myopic individuals, or those with hyperbolic discounting, who decide to drop out of school before completing their planned education in response to economic upturns.

Table 5 presents selected results from first stage regressions: the school-leaving state unemployment rate is regressed on the IVs and other covariates included in Equation (1) with weighted least squares. The IVs are strong predictors of the school-leaving state unemployment rate for both men and women: the *F*-statistic is 91 among men and 208 among women, well above the minimum recommended value of 10 (Stock, Wright, & Yogo, 2002). Moreover, a 1 percentage point increase in the on time (respondent expected) state unemployment rate is associated with a 0.58 (0.13) percentage point increase in the school-leaving state

unemployment rate among men ($p < 0.01$), and results are consistent among women although the estimated coefficient on the respondent-expected school-leaving state unemployment rate is smaller in magnitude and less precisely estimated ($p < 0.10$).[14]

A second assumption in an instrumental variables framework is that the selected IVs are valid, that is they are correctly excluded from the structural equation, Equation (1) in this study. Unfortunately, the researcher cannot definitively prove that a selected IV is valid. To shed light on the potential excludability of our instruments, in separate models we regress each instrument on all other variables included in Equation (1) and test the joint significance of the school-leaving state and personal characteristics. If the IVs are not strongly correlated with observable school-leaving state and personal characteristics perhaps they are uncorrelated with the error term of Equation (1) and thus correctly excluded.

Selected results from this analysis are reported in Table 6. The personal and school-leaving state characteristics included in Equation (1) are generally not strong predictors of the IVs. One exception is AFDC benefits. Specifically, the maximum AFDC benefit for a family of four at school-leaving is negatively associated with the respondent expected school-leaving state unemployment rate in three of four regressions, but the association is only marginally statistically significant ($p < 0.10$) and the coefficients are small in magnitude (for example, a $100 increase in the benefit is associated with a 0.08 percentage point reduction in the respondent-expected school-leaving state unemployment rate among men). Moreover, the *F*-statistics of joint significance of the school-leaving state and personal characteristics are low: less than 2 in all 4 regressions (although the *F*-statistics are statistically distinguishable from zero in the male regressions at the 10% confidence level).

[14] In unreported analyses we estimated first stage regressions on gender-specific sub-samples based on skill level (less than a college degree at school-leaving, a college degree or higher at school-leaving) and race/ethnicity (whites, non-whites). The IVs are strongly and positively correlated with the school-leaving state unemployment rate in all samples. Thus, this test provides suggestive evidence that our IVs pass the monotonicity assumption.

In unreported analyses, we conduct Sargan (1958) overidentifiation tests. The null hypothesis in this test is that the IVs are correctly excluded from Equation (1), and these tests suggest that our IVs are excludable (i.e., we cannot reject the null hypothesis). Specifically, the *F*-statistics are small (< 4) and statistically indistinguishable from zero in all regressions.

Table 7 reports selected results from our IV models. The top panel pertains to men and the bottom panel pertains to women. We report selected results generated in the naïve models for comparison purposes. Recall that we estimate the IV models to address potential endogeneity and measurement error in the school-leaving variables, and we view the IV results as more reliable than the naïve results. Among men the results generated in the IV models are highly consistent with the naïve results in terms of direction, magnitude, and statistical significance: men who leave school in an economic downturn are less likely to be married and have children at age 40 than otherwise similar men. A 1 percentage point increase in the school-leaving state unemployment rate leads to a 1.8 and 2.2 percentage point (2.8% and 3.0%) decrease in the probability of marriage and any children at age 40. Likewise, the results suggest that men who leave school in an economic downturn are more likely to be divorced and never married at age 40 than otherwise similar men but the coefficients are imprecisely estimated.

Turning next to women, we observe that a 1 percentage point increase in the school-leaving state unemployment rate leads to a 1.4 and 1.9 percentage point (6.3 and 2.4%) increase in the probability of being divorced and of having children at age 40 after we account for endogenous sorting. Relative to the naïve models, the coefficient estimates are larger and more precisely estimated for these outcomes. Results generated in the married and never married IV regressions are similar to those generated in the naïve models in that they are small and imprecise (although the coefficient in the married regression does change sign).[15]

[15] In unreported analyses we estimated just-identified models (i.e., in separate regressions we rely on the on time and the respondent expected IVs for identification) and the results were highly robust. This sensitivity check

4.3 Analysis of heterogeneity in the marriage and fertility effects

Our core analysis we examine the full sample of men and women. However, the labor literature that examines the persistent impact of leaving school in an economic downturn has identified differential effects (in terms of both timing and persistence) by skill level and race (Genda, et al., 2010; Kondo, 2007). Moreover, marriage and fertility patterns vary across these characteristics. For example, fertility rates are higher among minorities (Martin, et al., 2012) while marriage rates are lower among those with lower levels of education (Lundberg & Pollack, 2013). In this section we examine heterogeneity by skill level and race/ethnicity. We define skill level based on educational attainment at school-leaving and race/ethnicity as white vs. non-white.

Table 8 reports results by skill level for men and women. The top panel pertains to men and the bottom panel pertains to women. Specifically, we stratify the sample into low (less than a college degree at school-leaving) and high (a college degree or more at school-leaving) skill workers. This analysis deserves a caveat: the level of education at school-leaving (our proxy for skill) is arguably endogenous to the contemporaneous economic conditions. Put differently, if economic conditions induce individuals to acquire additional schooling or to drop out of school before completing the intended level of education, then the level of education at school-leaving is endogenous in Equation (1). Moreover, previous work supports this hypothesis: individuals do remain in school during economic downturns (Betts & McFarland, 1995). Stratifying the sample on an endogenous variable can lead to sample selection bias. However, we view the insight gained from this analysis to outweigh any potential bias but we encourage readers to use some caution when interpreting these findings.

Among men, the findings suggest that the marriage and fertility effects of leaving school

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suggests that our results are not sensitive to a particular IV.

in an economic downturn are stronger for low skill men than high skill men. For example, in the IV model a 1 percentage point increase in the school-leaving state unemployment rate leads to a 2.8 percentage point or 4.6% (2.2 percentage point or 3.0%) reduction in the probability of marriage (any children) at age 40 among low skill men. Although imprecisely estimated, the results suggest that low skill men who leave school in an economic downturn are also more likely to report being divorced and never married at age 40 relative to their counterparts who leave school in stronger economic times. Among high skill men, the coefficients are very small in magnitude, imprecisely estimated, and change signs across specifications.

Turning to women, and consistent with the full sample results, we find little evidence that leaving school in a downturn influences marriage and fertility outcomes at age 40. In general, the coefficients are small in magnitude and imprecisely estimated. There are two important exceptions to this pattern of results. First, low skill women who leave school in an economic downturn are more likely to be divorced at age 40 that otherwise similar women: in the IV model a 1 percentage point increase in the school-leaving state unemployment rate leads to a 1.7 percentage point (6.9%) increase in the probability of being divorced at age 40. Second, high skill women (those with a college degree or higher at school-leaving) who leave school in an economic downturn are more likely to report children at age 40 than otherwise similar women. Moreover, the coefficient estimate in the IV model is very large in magnitude and precisely estimated in the IV model (the coefficient in the naïve model is roughly 1/8 the magnitude and imprecisely estimated, however).

Table 9 reports results stratified by race and ethnicity: whites vs. non-whites.[16] The top panel pertains to men and the bottom panel pertains to women. Although Table 9 shows that leaving school in an economic downturn leads to declines in the probability of being married

[16] In unreported analyses, we separate African Americans and Hispanics and re-estimate our models on these samples. The results are consistent in these samples, but fertility effects are particularly strong for Hispanic men. We choose not to report these analyses as the sub-groups become very small.

and having children at age 40, our findings are much stronger in terms of magnitude (when considered relative to the baseline proportions) and statistical significance for non-white men than white men. Specifically, non-white men who leave school in an economic downturn are less likely to be married and have children, and more likely to be never married, by age 40 than otherwise similar men. We find some evidence that white women who leave school in an economic downturn are more likely to be divorced at age 40 after accounting for endogenous sorting but this relationship is only marginally statistically significant ($p < 0.10$).

5. Robustness checks and extensions

In this section we consider dynamics of the relationship between leaving school in an economic downturn and fertility/marriage outcomes, and examine the robustness of our findings to several possible sources of bias and alternative model specifications.

5.1 Dynamics of the relationship

In our core analyses we focus on the persistent effect of leaving school in an economic downturn on marriage and fertility outcomes. In this section we study the evolution of these relationships across the life course (e.g., when do we begin to observe disparities in marriage and fertility outcomes?). Understanding the dynamics of these relationships is important as they represent the cumulative outcome of a series of decisions across the life course. To explore the dynamics of the relationship between leaving school in an economic downturn and marriage and fertility, we construct measures of marriage and any children at ages 25, 30, 35, 40, and 45 (the last year at which we can observe the full NLSY79 Cohort) utilizing a comparable procedure as outlined in Section 3.2. We focus on these two outcomes for brevity, we believe they are of most interest as these are the outcomes for which we observe the strongest effects from leaving school in an economic downturn, but other outcomes are available on request. We report findings from this analysis in Figure 1. The findings suggest that among men the marriage

effects gradually fan out across time but the fertility effects do not emerge until roughly age 35. Turning to women, although the coefficients are generally imprecise, the effects emerge at roughly the same age: 35 years.

5.2 Intent-to-treat model

We next estimate reduced form models; that is we regress the marriage and fertility outcomes measured at age 40 directly on the instrumental variables. Results are reported in Appendix Table A. We estimate separate models for the on time and respondent-expected IVs. These models have an intent-to-treat interpretation (rather than the local average treatment effect that is estimated in the IV models). That is, they estimate an average of the effect on the compliers (whose economic conditions at school-leaving are influenced by the instruments) and the non-compliers (whose economic conditions are not influenced by the instruments). Reduced form models require fewer assumptions than instrumental variables models (Angrist & Pischke, 2009). In particular, the reduced form models do not require the instrumental variable excludability assumption, which as noted in Section 4.3 of this manuscript is difficult to prove statistically. Findings that are robust to the use of reduced form models can shed some light on whether our findings are driven by invalid instruments. Estimates are highly consistent with the estimates generated in both the naïve and IV models. For example, in regressions that control for the on time instruments a 1 percentage point increase in the on time school-leaving state unemployment rate leads to a 1.3 percentage point (2.0%) reduction in the probability of marriage at age 40.

5.3. Alternative controls for individual heterogeneity

We next estimate what we term "long" versions of Equation (1), and results are reported in Appendix Table B. Put differently, we include additional background characteristics in the X_{ist} vector. Including such variables may better control for individual heterogeneity which may

be correlated with marriage and fertility outcomes at age 40, and leaving school in an economic downturn. Thus, the long version of Equation (1) may better address bias from omitted variables than our core models. Specifically, we augment X_{ist} with an indicator for living in a rural vs. urban area at age 14, parental education (mother's and father's years of completed schooling entered linearly, with indicators for missing information[17]), an indicator for speaking a language other than English in the home at age 14, and indicators for access to cultural materials at age 14 (i.e., having a library card, magazines, and newspapers in the home).

We also report "short" versions of Equation (1), in these models we include only school-leaving state and year fixed effects as control variables. Some of the covariates included in Equation (1) may themselves be influenced by economic conditions (e.g., age at school-leaving, years of education at school-leaving). Thus, our core findings may be vulnerable to over-controlling bias and estimating the short model can shed light on how coefficient estimates change when we exclude potentially endogenous variables from the regression model. Stable results across different covariate sets may provide support that our findings represent true relationships rather than an artifact of selection or over-controlling bias.

Results generated in the various versions of Equations (1) are highly consistent to our core findings in terms of sign, magnitude, and statistical significance. We interpret these findings as evidence that our findings are not driven by selection into leaving school in an economic downturn or bias from over-controlling.

5.4 Marriages formed after school-leaving

In unreported analyses we delete all observations for which the initial marriage occurred before school-leaving to focus on only those marriages that we might expect to be most influenced by leaving school in an economic downturn. A caveat to this analysis is that if

[17] Respondents with missing mother's or father's education are assigned the sample mean for these variables.

leaving school in an economic downturn impacts the probability or timing of marriage, then our findings from this analysis may be subject to sample selection concerns. However, our findings are robust to this sample restriction, although less precisely estimated likely because we lose a substantial portion of our sample, and are available on request.

5.5 Cohabitation as a substitute for marriage

Cohabitation, because if offers may of the advantages of traditional marriage but with lower exit costs (Lundberg & Pollack, 2013), may serve as a substitute for marriage for school-leavers. We combine these two groups in our main analyses, however. We next unpack traditional marriage from cohabitation to test whether we observe different findings for these two types of relationships.[18] In unreported analyses, we separate cohabitation from traditional marriage and re-estimate our regression models. Our findings appear to be driven by traditional marriage: leaving school in an economic downturn predicts the probability of traditional marriage at age 40, but not cohabitation. Perhaps in an older cohort such as the NLSY79 social stigma towards cohabitation may offset any potential benefits for school-leavers who left school in an economic downturn.

5.6 Number of children

In our core analyses we examine the impact of leaving school in an economic downturn on the extensive margin of fertility: whether the respondent does, or does not, have children. However, we might expect that economic conditions at school-leaving could also impact the intensive fertility margin, in other words the number of children. Specifically we regress the number of children on the school-leaving state unemployment rate in Equation (1) using weighted least squares. We utilize the same survey question we use to generate the any children indicator, but instead we access the information on the number of biological children rather than

[18] Specifically, we construct a separate indicator for married and living as married.

simply whether the respondent reports any biological children at the time of the survey. The coefficients are generally imprecisely estimated but suggest that men who left school in an economic downturn have fewer children at age 40 than otherwise similar men.

6. Discussion

In this study we provide new evidence on the persistent impact of leaving school in an economic downturn as we study an understudied set of outcomes, age 40 marriage and fertility, among the general population of workers. We document that men who leave school in an economic downturn are less likely to be married and have children at age 40 than otherwise similar men, and these findings are particularly strong for low skill and minority men. We find evidence, albeit generally imprecise, that this effect operates through increases in the probability of both divorce and failure to enter into marriage. Thus, men who leave school in an economic downturn, and as a result have lower success in the labor market, may enter into lower quality matches or fail to enter into any match. We do not find evidence that men who leave school in an economic downturn are more likely to substitute from traditional marriage to cohabitation. Among women we find some evidence that leaving school in an economic downturn increases the probability of divorce and any children at age 40. As such, our findings contribute to understanding the full consequences of leaving school in an economic downturn. Specifically, our findings suggest that the impacts may extend beyond the labor market, and into other important social domains.

That our findings for men are driven mainly by low skill workers and minorities is perhaps somewhat surprising and worthy of discussion. To interpret these findings, it is important to consider previous findings on *when* workers with different characteristics experience the career penalties attributable to leaving school in an economic downturn. First, Genda, et al. (2010) examine career effects attributable to leaving school in an economic

downturn for male high school and college graduates in the U.S. The authors show that the immediate earnings effects are more pronounced for high school graduates than college graduates (although earnings effects are more persistent for college graduates). Second, Kondo (2007) shows that African American men face larger initial wage penalties from leaving school in an economic downturn than white men, but the wage effects are more persistent for white men (to the best of our knowledge no study has examined career effects separately for Hispanics). Taken together, these findings lend credence to the strong findings we identify for lower skill workers and minorities. Moreover, the empirical evidence suggests that lower skill and minority groups are more adversely affected in terms of their employment outcomes during contemporaneous economic downturns (Bitler & Hoynes, 2010; Cutler, Katz, Card, & Hall, 1991; Hines, Hoynes, & Krueger, 2001; Hoynes, 1999; Hoynes, Miller, & Schaller, 2012). Perhaps low skill and minority men "miss out" on their prime marrying years more so than high skill and white men, and these low skill and minority men are unable to catch up over time as newer cohorts of men enter the market and match with available marriage partners.

Adding to this, perhaps low skill and minority men are on a marriage threshold; that is even if they did not experience an economic downturn at school-leaving they did not have strong marriage market opportunities. Indeed marriage rates are lower for these groups relative to higher skill and white groups (Lundberg & Pollack, 2013). Leaving school in an economic downturn may push them across this threshold into an equilibrium in which their marriage market options are particularly poor, and their expected utility from non-marriage exceeds that from marriage. Once these men recover from this initial adversity in the labor market they are no longer in the marriage market (that is they have passed through the marriage partner search period of their lives). Thus, they remain unmarried and without children. Work by Hershbein (2012) supports this concept: he shows that male high school graduates who leave school in an

economic downturn are less likely to marry in the short-run.

We find that women who leave school in an economic downturn are more likely to be divorced, but more likely to have children, at age 40 than otherwise similar women. Economic models of marriage suggest that women (relative to men) are more likely to marry older men (Bergstrom & Bagnoli, 1993) and this may be exacerbated for cohorts of women that leave school in economic downturn (e.g., if women are more likely to accept offers from out-of-cohort men with higher earnings potential). If discordance in partner age leads to marriage instability this may explain our findings. At the same time, if the older male partners display a disproportionate degree of bargaining power within the marriage (because women who leave school in an economic downturn have fewer in cohort options) and this power imbalance results in more children than considered optimal by the women this scenario may translate into divorce.

Our data do not allow us to unpack these alternative mechanisms. Future research could more rigorously assess these causal pathways to provide a deeper understanding of the relationship between leaving school in an economic downturn, and marriage and fertility.

The U.S. is slowly recovering from the 2007 to 2009 recession, the largest economic downturn since the Great Depression. It may be informative to apply our findings to the current cohort of school-leavers to predict the persistent effects of the 2007 to 2009 recession. A direct extrapolation may suggest persistently lower marriage and fertility rates among men in this cohort, and particularly so among middle skill and minority men, and higher rates of divorce and single motherhood for women. However, the external validity of our findings depends, in part, on the similarity between the NLSY79 cohort and current cohorts of school-leavers.

Our sample left school between 1976 and 1996, and the U.S. has experienced important economic and social changes since this time. However, Altonji, Bharadwaj, and Lange (2012) analyze changes in characteristics of American young adults ages 20 to 24 years using the

NLSY79 and the NLSY97 (a sample of youth aged 12 to 16 in 1997 administered by the BLS that is comparable in many ways to the NLSY79). The authors show that overall skill level among young adults increased by 5% between the NLSY79 and NLSY97 cohorts. Thus, our findings may be informative for future cohorts of school-leavers. However, current cohorts of women have higher labor force participation than the NLSY79 cohort. For example, in 1976 (the first year that members of our sample left school) the female labor force participation rate was 42.9% (Bureau of the Census, 1976) while in 2013 this rate increased to 58.8% (Bureau of Labor Statistics, 2013). When considered in this light, current cohorts of school-leaving women may experience marriage and fertility effects similar to men.

In summary, this study adds to the literature on the persistent consequences of leaving school in a downturn as it documents previously understudied outcomes: marriage and fertility.

Table 1. Annual School-leaving Cohort Size: NSLY79 Men and Women

School-leaving year	School-leaving cohort size
1976	416
1977	598
1978	899
1979	1,061
1980	860
1981	982
1982	849
1983	539
1984	353
1985	244
1986	180
1987	113
1988	66
1989	52
1990	30
1991	16
1992	27
1993	17
1994	13
1995	7
1996	10

Notes: A school-leaving cohort includes individuals who left school in the same year.

Table 2. Summary Statistics: NSLY79 Men and Women

	Men	Women
Marriage and fertility outcomes at age 40		
Married	0.64	0.66
Divorced	0.17	0.22
Never married	0.18	0.12
Any children	0.73	0.81
School-leaving state variables		
Unemployment rate	7.48	7.48
Male-to-female sex ratio	0.96	0.96
Unilateral divorce law	0.54	0.51
Maximum AFDC benefit for family of four	$446	$434
Property crimes	458,346	466,368
Personal characteristics		
School-leaving year	1981	1981
School-leaving age	19.2	19.0
Completed education at school-leaving	12.9	13.0
Years since school-leaving	21.8	22.0
White	0.82	0.81
African American	0.13	0.13
Hispanic	0.054	0.053
AFQT score	49.9	48.7
Age-adjusted AFQT score	0.36	0.32
Age-adjusted AFQT score missing	0.057	0.043
Catholic religion at age 14	0.33	0.32
Live with both biological parents at age 14	0.77	0.75
N	3,477	3,757

Notes: NLSY79 sample weights are applied.

Table 3. Unadjusted Analysis of Marriage and Fertility Outcomes at Age 40 by the School-leaving State Unemployment Rate: NSLY79 Men and Women

	≥ the sample mean school-leaving state unemployment rate	< the sample mean school-leaving state unemployment rate	*p*-value of difference between groups
Men			
Married	0.63	0.65	0.5372
Divorced	0.17	0.18	0.0401
Never married	0.20	0.17	0.0080
Any children	0.71	0.75	0.0045
N	1,348	2,129	
Women			
Married	0.66	0.66	0.3881
Divorced	0.23	0.22	0.6842
Never married	0.11	0.12	0.4998
Any children	0.82	0.80	0.6434
N	1,460	2,297	

Notes: NLSY79 sample weights applied. Differences between groups are assessed with a χ^2 test for binary outcomes and a *t*-test for continuous outcomes.

Table 4. Effect of the School-leaving State Unemployment Rate on Marriage and Fertility Outcomes at Age 40: Naïve Models

	Married	Divorced	Never married	Any children
Men				
Proportion	0.64	0.17	0.18	0.73
School-leaving state unemployment rate	-0.0227** (0.0090)	0.0103 (0.0065)	0.0124 (0.0100)	-0.0221*** (0.0079)
N	3,477	3,477	3,477	3,477
Women				
Proportion	0.66	0.22	0.12	0.81
School-leaving state unemployment rate	0.0006 (0.0065)	0.0057 (0.0059)	-0.0063 (0.0058)	0.0076 (0.0082)
N	3,757	3,757	3,757	3,757

Notes: All models estimated with a linear probability model. Standard errors are clustered around the school-leaving state and reported in parentheses. NLSY79 sample weights applied. All models control for school-leaving state male-to-female sex ratio, unilateral divorce law, maximum AFDC benefit for a family of four, and number of property crimes; age at school-leaving; completed education at school-leaving; time since school-leaving; race/ethnicity (African American and Hispanic, with white race as the omitted category); age-adjusted AFQT-score; and indicator for missing AFQT score; an indicator for Catholic religion at age 14; an indicator for living with both biological parents at age 14; birth year fixed effects; and school-leaving state and year fixed effects.
***; **; * = statistically different from zero at the 1%; 5%; 10% level.

Table 5. First Stage Regressions: Associations between Instrumental Variables and the School-leaving State Unemployment Rate

	Men	Women
Mean	7.48	7.48
Instrumental variables		
On time school-leaving UE rate	0.5822***	0.6635***
	(0.0439)	(0.0368)
Respondent-expected school-leaving UE rate	0.1348***	0.0759*
	(0.0390)	(0.0391)
F-test of instrumental variable joint significance	90.98	208.33
(*p*-value)	(0.0000)	(0.0000)
School-leaving state characteristics		
Male-to-female sex ratio	0.2981	0.5338
	(0.9791)	(1.2180)
Unilateral divorce law	-0.2045	-0.0869
	(0.2811)	(0.2719)
Maximum AFDC benefit for family of four	-0.0014	-0.0006
	(0.0010)	(0.0007)
Property crimes (1,000s)	0.0007**	0.0004
	(0.0003)	(0.0003)
Personal characteristics		
School-leaving age	-0.0417	-0.1061***
	(0.0272)	(0.0335)
Completed education at school-leaving	0.0422	0.1250**
	(0.0386)	(0.0524)
African American	0.0514	-0.0270
	(0.0913)	(0.0727)
Hispanic	-0.1237	0.0704
	(0.0803)	(0.0713)
Age-adjusted AFQT score	-0.0617*	-0.0900*
	(0.0344)	(0.0450)
Age-adjusted AFQT score missing	0.0744	0.1372
	(0.1159)	(0.1147)
Catholic age 14	0.0152	-0.0339
	(0.0555)	(0.0710)
Live with both biological parents age 14	0.0775	0.0213
	(0.0757)	(0.0658)
N	3,477	3,757

Notes: All models estimated with least squares. Standard errors are clustered around the school-leaving state and reported in parentheses. NLSY79 sample weights applied. All models control for birth year fixed effects, and school-leaving state and year fixed effects.
***; **; * = statistically different from zero at the 1%; 5%; 10% level.

Table 6. Instrumental Variable Excludability Test: Associations Between Personal and School-leaving State Characteristics and the Instrumental Variables

	Men		Women	
	On time school-leaving state unemployment rate	Respondent-expected school-leaving state unemployment rate	On time school-leaving state unemployment rate	Respondent-expected school-leaving state unemployment rate
Mean	7.58	7.71	7.62	7.80
School-leaving state characteristics				
Male-to-female sex ratio	-0.0372	0.3411	-0.4097	0.1244
	(0.6410)	(0.5077)	(0.7644)	(0.6308)
Unilateral divorce law	0.1160	0.0161	0.0051	0.1229
	(0.1737)	(0.1157)	(0.0907)	(0.1026)
Maximum AFDC benefit	-0.0010	-0.0008*	-0.0010*	-0.0006*
for family of four	(0.0008)	(0.0005)	(0.0005)	(0.0004)
Property crimes (1,000s)	0.0002	0.0003	0.0000	0.0002
	(0.0002)	(0.0002)	(0.0002)	(0.0001)
Personal characteristics				
School-leaving age	0.0219	-0.0117	0.0182	0.0026
	(0.0193)	(0.0109)	(0.0158)	(0.0101)
Completed education at	-0.0340	-0.0001	0.0182	0.0280
school-leaving	(0.0215)	(0.0166)	(0.0323)	(0.0260)
African American	0.0592	-0.0710	-0.0332	-0.1023
	(0.0491)	(0.0766)	(0.0590)	(0.0612)
Hispanic	0.1205	0.0163	-0.0208	-0.0737
	(0.1086)	(0.1026)	(0.0564)	(0.0605)
Age-adjusted AFQT	0.0311	-0.0229	-0.0329	-0.0175
	(0.0386)	(0.0420)	(0.0395)	(0.0294)
Age-adjusted AFQT	-0.0168	0.0602	0.1543	0.1068
missing	(0.1053)	(0.0895)	(0.1007)	(0.1021)
Catholic religion age 14	-0.0016	-0.0212	0.1179**	0.1021**
	(0.0548)	(0.0391)	(0.0560)	(0.0490)
Live with both biological	0.0137	0.0152	-0.0136	-0.0095
parents age 14	(0.0457)	(0.0407)	(0.0669)	(0.0532)
F-test of school-leaving state and personal characteristic joint significance	1.71	1.76	1.68	1.38
	(0.0946)	(0.0850)	(0.1027)	(0.2075)
N	3,477	3,477	3,757	3,757

Notes: All models estimated with least squares. Standard errors are clustered around the state of residence at age 14 and reported in parentheses. NLSY79 sample weights applied. All models control for birth year fixed effects; on time year fixed effects; respondent expected year fixed effects; and state of residence at age 14 fixed effects. ***; **; * = statistically different from zero at the 1%; 5%; 10% level.

Table 7. Effect of the School-leaving State Unemployment Rate on Marriage and Fertility Outcomes at Age 40: Instrumental Variable Models

	Married	Divorced	Never married	Any children
Men				
Proportion	0.64	0.17	0.18	0.73
Naïve model	-0.0227**	0.0103	0.0124	-0.0221***
	(0.0090)	(0.0065)	(0.0100)	(0.0079)
IV model	-0.0182**	0.0067	0.0146	-0.0216**
	(0.0091)	(0.0105)	(0.0107)	(0.0091)
N	3,477	3,477	3,477	3,477
Women				
Proportion	0.66	0.22	0.12	0.81
Naïve model	0.0006	0.0057	-0.0063	0.0076
	(0.0065)	(0.0059)	(0.0058)	(0.0082)
IV model	-0.0040	0.0139*	-0.0068	0.0194*
	(0.0081)	(0.0082)	(0.0059)	(0.0108)
N	3,757	3,757	3,757	3,757

Notes: All models estimated with a linear probability model in naïve models and with two-stage least squares in IV models. Standard errors are clustered around the school-leaving state in naïve models and state of residence at age 14 in IV models, and reported in parentheses. NLSY79 sample weights applied. All models control for school-leaving state male-to-female sex ratio, unilateral divorce law, maximum AFDC benefit for a family of four, and number of property crimes; age at school-leaving; completed education at school-leaving; time since school-leaving; race/ethnicity (African American and Hispanic, with white race as the omitted category); age-adjusted AFQT-score; and indicator for missing AFQT score; an indicator for Catholic religion at age 14; an indicator for living with both biological parents at age 14; and birth year fixed effects. Naïve models control for school-leaving state and year fixed effects. IV models control for on time and respondent expected year fixed effects, and state of residence at age 14 fixed effects.

***; **; * = statistically different from zero at the 1%; 5%; 10% level.

Table 8. Heterogeneity in the Effect of the School-leaving State Unemployment Rate on Marriage and Fertility Outcomes at Age 40 by Skill Groups defined by Educational Attainment at School-leaving

	Married	Divorced	Never married	Any children
Low skill men: Less than a college degree at school-leaving				
Proportion	0.61	0.20	0.19	0.73
Naïve model	-0.0258**	0.0098	0.0168	-0.0192**
	(0.0119)	(0.0078)	(0.0122)	(0.0093)
IV model	-0.0278***	0.0104	0.0187	-0.0220**
	(0.0104)	(0.0103)	(0.0114)	(0.0096)
N	2,898	2,898	2,898	2,898
High skill men: A college degree or higher at school-leaving				
Proportion	0.78	0.07	0.14	0.73
Naïve model	-0.0002	0.0201	-0.0092	-0.0171
	(0.0198)	(0.0156)	(0.0177)	(0.0290)
IV model	-0.0042	0.0105	0.0031	0.0335
	(0.0245)	(0.0184)	(0.0228)	(0.0339)
N	579	579	579	579
Low skill women: Less than a college degree at school-leaving				
Proportion	0.63	0.24	0.12	0.82
Naïve model	-0.0042	0.0136*	-0.0074	0.0050
	(0.0074)	(0.0072)	(0.0059)	(0.0102)
IV model	-0.0109	0.0166*	-0.0028	0.0130
	(0.0107)	(0.0094)	(0.0064)	(0.0139)
N	3,132	3,132	3,132	3,132
High skill women: A college degree or higher at school-leaving				
Proportion	0.79	0.10	0.10	0.75
Naïve model	-0.0021	-0.0211	0.0227	0.0111
	(0.0248)	(0.0248)	(0.0167)	(0.0278)
IV model	0.0148	0.0012	-0.0205	0.0840***
	(0.0316)	(0.0274)	(0.0174)	(0.0258)
N	625	625	625	625

Notes: All models estimated with a linear probability model in naïve models and with two-stage least squares in IV models. Standard errors are clustered around the school-leaving state in naïve models and state of residence at age 14 in IV models, and reported in parentheses. NLSY79 sample weights applied. All models control for school-leaving state male-to-female sex ratio, unilateral divorce law, maximum AFDC benefit for a family of four, and number of property crimes; age at school-leaving; completed education at school-leaving; time since school-leaving; race/ethnicity (African American and Hispanic, with white race as the omitted category); age-adjusted AFQT-score; and indicator for missing AFQT score; an indicator for Catholic religion at age 14; an indicator for living with both biological parents at age 14; and birth year fixed effects. Naïve models control for school-leaving state and year fixed effects. IV models control for on time and respondent expected year fixed effects, and state of residence at age 14 fixed effects.

***; **; * = statistically different from zero at the 1%; 5%; 10% level.

Table 9. Heterogeneity in the Effect of the School-leaving State Unemployment Rate on Marriage and Fertility Outcomes at Age 40 among Across Race and Ethnicity

	Married	Divorced	Never married	Any children
		White men		
Proportion	0.69	0.16	0.15	0.72
Naïve model	-0.0193*	0.0102	0.0091	-0.0202*
	(0.0109)	(0.0080)	(0.0113)	(0.0101)
IV model	-0.0138	0.0108	0.0060	-0.0174
	(0.0108)	(0.0120)	(0.0118)	(0.0117)
N	1,836	1,836	1,836	1,836
		Non-white men		
Proportion	0.46	0.22	0.32	0.77
Naïve model	-0.0333**	0.0084	0.0249**	-0.0239*
	(0.0124)	(0.0070)	(0.0109)	(0.0124)
IV model	-0.0575***	0.0132	0.0483**	-0.0388**
	(0.0186)	(0.0155)	(0.0220)	(0.0168)
N	1,641	1,641	1,641	1,641
		White women		
Proportion	0.71	0.21	0.08	0.80
Naïve model	-0.0016	0.0055	-0.0039	0.0077
	(0.0090)	(0.0063)	(0.0067)	(0.0097)
IV model	-0.0039	0.0143*	-0.0071	0.0176
	(0.0094)	(0.0079)	(0.0073)	(0.0131)
N	1,982	1,982	1,982	1,982
		Non-white women		
Proportion	0.44	0.30	0.26	0.83
Naïve model	0.0114	-0.0013	-0.0101	0.0040
	(0.0111)	(0.0112)	(0.0118)	(0.0124)
IV model	-0.0073	0.0094	0.0010	0.0174
	(0.0180)	(0.0180)	(0.0130)	(0.0149)
N	1,775	1,775	1,775	1,775

Notes: All models estimated with a linear probability model in naïve models and with two-stage least squares in IV models. Standard errors are clustered around the school-leaving state in naïve models and state of residence at age 14 in IV models, and reported in parentheses. NLSY79 sample weights applied. All models control for school-leaving state male-to-female sex ratio, unilateral divorce law, maximum AFDC benefit for a family of four, and number of property crimes; age at school-leaving; completed education at school-leaving; time since school-leaving; Hispanic ethnicity; age-adjusted AFQT-score; and indicator for missing AFQT score; an indicator for Catholic religion at age 14; an indicator for living with both biological parents at age 14; and birth year fixed effects. Naïve models control for school-leaving state and year fixed effects. IV models control for on time and respondent expected year fixed effects, and state of residence at age 14 fixed effects.
***; **; * = statistically different from zero at the 1%; 5%; 10% level.

Appendix Table A. Effect of the School-leaving State Unemployment Rate on Marriage and Fertility Outcomes at Age 40: Intent to Treat Models

	Married	Divorced	Never married	Any children
Men				
Proportion	0.64	0.17	0.18	0.73
IV model	-0.0182**	0.0067	0.0146	-0.0216**
	(0.0091)	(0.0105)	(0.0107)	(0.0091)
On time instrument	-0.0127**	0.0044	0.0083	-0.0152***
	(0.0058)	(0.0077)	(0.0059)	(0.0056)
Respondent expected	-0.0153**	0.0076	0.0077	-0.0158**
instrument	(0.0075)	(0.0070)	(0.0086)	(0.0074)
N	3,477	3,477	3,477	3,477
Women				
Proportion	0.66	0.22	0.12	0.81
IV model	-0.0040	0.0139*	-0.0068	0.0194*
	(0.0081)	(0.0082)	(0.0059)	(0.0108)
On time instrument	-0.0025	0.0069	-0.0044	0.0135
	(0.0063)	(0.0060)	(0.0044)	(0.0082)
Respondent expected	0.0054	-0.0044	-0.0011	0.0100
instrument	(0.0058)	(0.0062)	(0.0033)	(0.0064)
N	3,757	3,757	3,757	3,757

Notes: All models estimated with a linear probability model in naïve models and with two-stage least squares in IV models. Standard errors are clustered around the school-leaving state in naïve models and state of residence at age 14 in IV models, and reported in parentheses. NLSY79 sample weights applied. All models control for school-leaving state male-to-female sex ratio, unilateral divorce law, maximum AFDC benefit for a family of four, and number of property crimes; age at school-leaving; completed education at school-leaving; time since school-leaving; race/ethnicity (African American and Hispanic, with white race as the omitted category); age-adjusted AFQT-score; and indicator for missing AFQT score; an indicator for Catholic religion at age 14; an indicator for living with both biological parents at age 14; and birth year fixed effects. Naïve models control for school-leaving state and year fixed effects. IV models control for on time and respondent expected year fixed effects, and state of residence at age 14 fixed effects.

***; **; * = statistically different from zero at the 1%; 5%; 10% level.

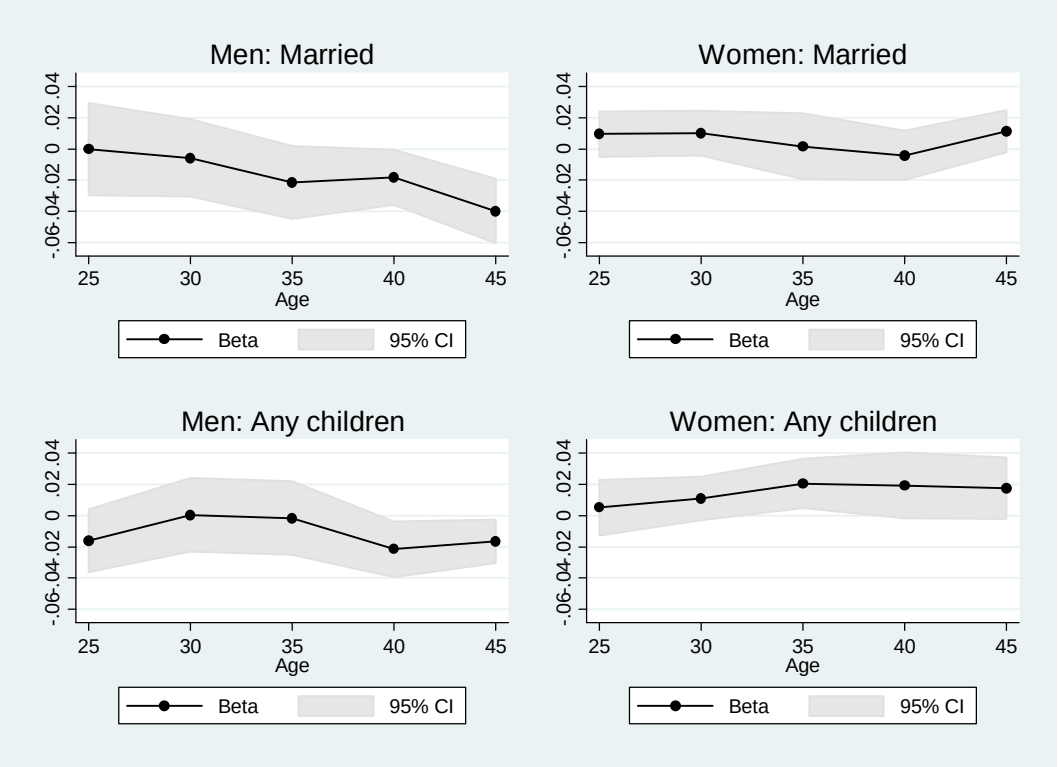
Appendix Table B. Effect of the School-leaving State Unemployment Rate on Marriage and Fertility Outcomes at Age 40: IV Models with Alternative Controls for Individual Heterogeneity

	Married	Divorced	Never married	Any children
Men				
Proportion	0.64	0.17	0.18	0.73
Core control set	-0.0182**	0.0067	0.0146	-0.0216**
	(0.0091)	(0.0105)	(0.0107)	(0.0091)
Short control set	-0.0233***	0.0093	0.0140	-0.0221**
	(0.0079)	(0.0104)	(0.0109)	(0.0087)
Long control set	-0.0213**	0.0090	0.0155	-0.0217**
	(0.0091)	(0.0106)	(0.0113)	(0.0092)
N	3,477	3,477	3,477	3,477
Women				
Proportion	0.66	0.22	0.12	0.81
Core control set	-0.0040	0.0139*	-0.0068	0.0194*
	(0.0081)	(0.0082)	(0.0059)	(0.0108)
Short control set	-0.0047	0.0114	-0.0067	0.0198*
	(0.0104)	(0.0093)	(0.0061)	(0.0108)
Long control set	-0.0037	0.0136	-0.0069	0.0180*
	(0.0080)	(0.0084)	(0.0057)	(0.0106)
N	3,757	3,757	3,757	3,757

Notes: All models estimated with two-stage least squares in IV models. Standard errors are clustered around the school-leaving state in naïve models and state of residence at age 14 in IV models, and reported in parentheses. NLSY79 sample weights applied. The core and long control models control for school-leaving state male-to-female sex ratio, unilateral divorce law, maximum AFDC benefit for a family of four, and number of property crimes; age at school-leaving; completed education at school-leaving; time since school-leaving; race/ethnicity (African American and Hispanic, with white race as the omitted category); age-adjusted AFQT-score; and indicator for missing AFQT score; an indicator for Catholic religion at age 14; an indicator for living with both biological parents at age 14; birth year fixed effects; on time and respondent expected year fixed effects; and state of residence at age 14 fixed effects. Long models also include indicators for living in a rural vs. urban area at age 14, parental education (mother's and father's years of completed schooling with indicators for missing information), speaking a language other than English in the home at age 14, and access to cultural materials at age 14 (i.e., indicators for having a library card, magazines, and newspapers in the home, and indicators for missing information). Short control set models include time since school-leaving; on time and respondent expected year fixed effects; and state of residence at age 14 fixed effects.

***; **; * = statistically different from zero at the 1%; 5%; 10% level.

Figure 1. Effect of leaving school in an economic downturn on marriage and fertility at age 25, 30, 35, 40, and 45 years: IV models



Notes: All models estimated with two-stage least squares. Standard errors are clustered the state of residence at age 14 in IV models, and reported in parentheses. NLSY79 sample weights applied. All models control for school-leaving state male-to-female sex ratio, unilateral divorce law, maximum AFDC benefit for a family of four, and number of property crimes; age at school-leaving; completed education at school-leaving; time since school-leaving; race/ethnicity (African American and Hispanic, with white race as the omitted category); age-adjusted AFQT-score; and indicator for missing AFQT score; an indicator for Catholic religion at age 14; an indicator for living with both biological parents at age 14; birth year fixed effects; and state of residence at age 14 fixed effects.

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