Labor Market Conditions at School-Leaving: Long-run Effects on Marriage and Fertility

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Abstract: In this study, we assess the long-run impact of labor market conditions at the time of school-leaving on marriage and fertility outcomes. We draw data from the National Longitudinal Survey of Youth 1979. Our sample left school between 1976 and 1989, and we use variation in the state unemployment rate at the time of school-leaving to identify persistent effects. We find that men who left school when the state unemployment rate was high are less likely to be married and have children at age 45, but are more likely to be divorced. Women, however, are more likely to have children. (J1; J2)

Keywords: marriage; fertility; school-leaving; business cycles

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I. Introduction

Many adults postpone marriage and fertility aspirations until they complete their education and establish themselves in the workplace. Thus, labor market conditions at the time of school-leaving could affect—indeed, could persistently affect—marriage and fertility decisions. Understanding the long-term implications for marriage and fertility of labor market conditions at school-leaving is timely as the United States slowly recovers from the 2007–2009 recession, the largest economic downturn in the postwar era. Administrative data show that, during the downturn and recovery period, both marriage and fertility rates declined while the divorce rate increased (Centers for Disease Control and Prevention 2013; Martin, Hamilton et al. 2013). For example, the fertility rate declined each year between 2007 and 2011 and stood at 63.2 births per 1,000 (relative to 69.3 per 1,000 in 2007) women age 15 to 44 years in 2011.

In this study, we use longitudinal data drawn from the National Longitudinal Survey of Youth 1979 Cohort (NLSY79) to examine the persistent impact of labor market conditions at the time of school-leaving on marriage and fertility outcomes among men and women. A considerable amount of research documents the importance of contemporaneous labor market conditions for these marriage and fertility outcomes (Mocan 1990; Lichter, Leclere et al. 1991; Schultz 1994; Wood 1995; Blau, Kahn et al. 2000; Dehejia and Lleras-Muney 2004; Amato and Beattie 2011; Hellerstein and Morrill 2011; Chowdhury 2013; Schaller 2013; Arkes and Shen 2014). Even though researchers have not yet reached a full consensus, the literature seems to suggest, on balance, that marriage and birth rates decline when labor market conditions weaken and that divorce rates increase. Potential mechanisms include job loss, wage and employment uncertainty, wealth shocks, reductions in home values, and changes in time costs. However, it is not clear how well research on the contemporaneous relationship between labor market conditions and marriage/fertility outcomes explains the importance of such conditions for entry

into the labor market and the formation of an initial job match.

At the same time a, robust line of labor economic research shows that school-leaving during periods of weak labor market conditions persistently depresses career outcomes (e.g., wages, earnings, occupational prestige). However, the research has devoted relatively little attention to the impact of labor market conditions at the time of school-leaving on nonlabor market outcomes, such as marriage and fertility. Standard economic models of the family suggest that career profiles are important determinants of marriage market opportunities and the costs and benefits of children. We might therefore expect that factors affecting career profiles—such as labor market conditions at the time of school-leaving—may persistently affect marriage and fertility outcomes. Our findings suggest that men who left school when the state unemployment rate was high are less likely to be married and have children at age 45, but are more likely to be divorced. Women, however, are more likely to have children.

II. Related Work and Theoretical Predictions

Labor market conditions at the time of school-leaving may influence marriage and fertility outcomes by altering a worker's marriage market opportunities and the opportunity costs of child rearing. In this section, we review studies pointing to persistent effects of labor market conditions at the time of school-leaving on career outcomes. Next, we examine how the study findings can guide predictions for marriage and fertility outcomes.

Related Work

Workers who leave school when the unemployment rate is high have persistently worse career outcomes than otherwise similar workers (Neumark 2002; Oyer 2006; Kondo 2007; Oyer 2008; Brunner and Kuhn 2009; Genda, Kondo et al. 2010; Kahn 2010; Kwon, Milgrom et al. 2010; Hershbein 2012; Oreopoulos, von Wachter et al. 2012; Altonji, Kahn et al. 2013; Maclean 2014). Such workers may be directed to low-wage and otherwise less desirable jobs in the short

run because of the limited availability of open jobs and a decline in the quality of such jobs (Reder 1955; Okun 1973; McLaughlin and Bils 2001). When the economy rebounds, frictions in the labor market may prevent these workers from shifting into higher-wage or otherwise more desirable jobs. For example, Kahn (2010) finds that a 1 percentage point increase in the state unemployment rate at the time of school-leaving leads to an annual wage loss of 2.5 to 9 percent 15 years later among white male college graduates who left school in the 1980s.

The career-persistent effects of labor market conditions faced at the time of school-leaving are not homogeneous across workers; the available evidence suggests that effects differ across race, skill, and sex. Kondo (2007) demonstrates that African American men face larger initial wage penalties than white men as a result of leaving school in an economic downturn, but the negative wage effects are more persistent for white men than for African American men. Genda, Kondo et al. (2010) document larger and more persistent earnings effects for college-educated men than for men with a high school diploma,[1] although the immediate effects are larger for high school graduates.

Labor market conditions faced by women at the time of school-leaving have less of an effect on women's career outcomes than on men's career outcomes (Kondo 2007; Hashimoto and Kondo 2012; Hershbein 2012). Several reasons explain the differential effects by sex. First, given that women experience, on average, more career interruptions than men (e.g., time out of the labor market to raise children), the wage penalty attributable to any jobless spell is lower among women than among men (Light and Ureta 1995). Second, as noted, the persistent effects of school-leaving during an economic downturn appear to be concentrated among highly educated (or skilled) workers. Historically, U.S. women have attained lower education levels than men (Goldin 2006). For these reasons, women who decide to enter the job market may

[1] These findings pertain to a sample of American workers. The authors document a different relationship in the Japanese labor market.

work in jobs that, relative to men, do not confer large penalties for those leaving school during periods of high unemployment. Finally, women have a more elastic labor supply than men (Blau and Kahn 2007) and, for myriad reasons (e.g., preferences), may engage in other activities when labor market conditions, including those faced at the time of school-leaving, decline.

Of particular importance for our research are studies by Kondo (2011), Hashimoto and Kondo (2012), Hershbein (2012), Hofmann and Hohmeyer (2014), and Currie and Schwandt (2014). Kondo (2011) examines the persistent effect of labor market conditions faced by women at entry into the marriage market (age 18 to 20). This study finds that a higher state unemployment rate at the time of a woman's entry into the marriage market lowers the median age at which a woman marries, but it does not affect the probability of marriage, marriage quality, number of children, or probability of divorce by age 35. In a sample of Japanese workers, Hashimoto and Kondo (2012) show that leaving school when the state unemployment is high reduces (increases) fertility among low- (high-) skill women. Hershbein (2012) demonstrates that male high school graduates who leave school when labor market conditions are poor are less likely to marry than otherwise similar men, although the effect is not persistent. Using data on German college graduates, Hofmann and Hohmeyer (2014) find that school-leaving at times of high unemployment affects women's, but not men's, fertility. Currie and Schwandt (2014) use birth records to examine the effect of unemployment in early adulthood on birth rates among cohorts of U.S. women. The authors find that women face high unemployment rates in their early 20s have fewer children at age 40 than otherwise similar women.

Although the above studies are important, critical questions remain unanswered. Kondo (2011) focuses primarily on women and examines the impact of an economic downturn when a woman begins searching for a marriage partner, but not when she begins searching for a job. Hershbein (2012) considers marriage outcomes for high school graduates, but not the effects

among workers at other skill levels. Previous research documents differences in the persistent career penalties attributable to leaving school when labor market conditions are across worker skill levels (e.g., Genda, Kondo et al. (2010)). For this reason, findings for high school graduates need not apply to all workers. Moreover, in view of the differences among the Japanese, German, and U.S. labor markets (e.g., social security net, union penetration, job referral networks, earnings distribution), it is not clear how well the work of Hashimoto and Kondo (2012) or Hofmann and Hohmeyer (2014) can provide insights into U.S. school-leavers. Finally, Currie and Schwandt (2014) focus solely on fertility outcomes among women and do not explicitly examine the school-leaving period. Our aim in this study is to address some of these research gaps by examining the impact of labor market conditions at school-leaving on marriage and fertility outcomes for men and women in the US, across various skill levels.

Theoretical Predictions for Marriage and Fertility Effects

Economists assume that individuals enter a marriage when the expected gains derived from the marriage exceed the expected gains from continuing to search for a partner. The expected gains from a marriage depend on, among other factors, a partner's expected earnings. Ceteris paribus, persistently lower earnings attributable to school-leaving in a period of high unemployment will reduce the expected gains from marriage as well as the probability that marriage will occur (Burgess, Propper et al. 2003). Thus, we predict that weak labor market conditions at the time of school-leaving will reduce the probability of marriage among both sexes. However, effects may be muted for women as they can invest in children, one form of marriage-specific capital, as the opportunity cost of children has declined.

Relative income is important for determining how the gains from marriage will be shared (Neumark and Postlewaite 1998).[2] For example, a partner's lower earnings will reduce his or her

[2] Unitary models of the family assume that partners maximize a joint household utility function such that lower incomes for either partner will reduce the level of expected gains from the marriage. In such models, the source of

bargaining power within the marriage by reducing his or expected utility outside the marriage (i.e., his or her "threat point") and thus his or her share of the marriage gains. Lower earnings attributable to school-leaving in a period of high unemployment will reduce the overall expected gains from the marriage as well as the share of gains that the partner can expect to receive within the marriage. Thus, it is plausible that weak labor market conditions at the time of school-leaving will reduce the male's share of the marriage gain, as men are historically the principal earners. Moreover, evidence suggests that the association between desirability and expected earnings differs by sex. In particular, earnings are more important for men's marriage market opportunities. For example, Wilson (1987), Oppenheimer, Kalmijn et al. (1997), and Brown and Kesselring (2003) argue that male marriageability is contingent on steady employment or a minimum level of earnings. It is plausible that women who enter into a marriage with a male partner who left school in a period of high unemployment rate and thus has persistently lower earnings may be able to extract relatively more of the (albeit reduced) marriage gains. Together, these mechanisms suggest that leaving school when labor market conditions are weak may reduce the probability that men marry; since women's marriageability is less contingent on employment outcomes, the effects are less clear for women.

Conditional on finding a marriage partner, labor market conditions at the time of school-leaving could also affect investment in marriage-specific capital. Married individuals who left school when the unemployment rate was high may be less likely to invest in marriage-specific capital because the gains they extract from the marriage are smaller. Such a reduction in marriage-specific capital could increase the likelihood that the marriage dissolves (i.e., results in divorce/separation).

The impact of labor market conditions at the time of school-leaving on the probability of

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income does not, however, affect the share of marriage gains that a partner will extract. More recently, the division of resources within a marriage may be described as a bargaining process.

cohabitation (living as married) is ex ante unclear. If the arguments noted above for marriage also apply to cohabitation, we might expect the probability of cohabitation likewise to decline. However, if individuals contemplating marriage elect cohabitation, perhaps as a means of reducing the exit costs of a relatively low quality union (i.e., one with low marriage gains), then the probability of cohabitation will increase.

In addition to affecting marriage and cohabitation, labor market conditions at school-leaving may also affect fertility through income and substitution effects. Although economic theory does not provide clear predictions on whether children are normal or inferior goods, recent evidence suggests that the causal effect of income on fertility is positive and that a reduction in permanent income reduces total fertility (Lindo 2010; Black, Kolesnikova et al. 2013; Lovenheim and Mumford 2013). Thus, through an income effect, it is likely that school-leaving during a period of high unemployment will reduce the incidence of fertility. The income effect for women may be muted as women are more likely to receive marriage offers from older men (Bergstrom and Bagnoli 1993) who are more firmly attached to the labor market, assuming that such men did not leave school in an economic downturn.

On the other hand, lower earnings in the labor market reduce the opportunity cost of children through a substitution effect. Opportunity costs may be particularly important for women. On average, women have historically earned lower wages (and thus face lower opportunity costs when leaving the labor market to rear children) than men. Thus, women who leave school in an economic downturn and, in turn, receive lower wage offers may substitute into childrearing. As outlined by Hashimoto and Kondo (2012) and Hofmann and Hohmeyer (2014), theory is ex ante ambiguous as to whether economic conditions at the time of school-leaving will increase or decrease fertility for women (i.e., whether the income or substitution effect will dominate). Recognizing men's traditional roles in child rearing, however, we might

expect income effects to dominate among men in an older cohort such as the NLSY79.

Our literature review suggests two predictions for our study: (1) men who leave school when labor market conditions are weak will be less likely to marry, and (2) marriage quality (divorce/separation probability) will be lower (higher) for those individuals who leave school amid weak labor market conditions because of lower investment in marriage-specific capital. However, it is ex ante ambiguous as to how labor market conditions at the time of school-leaving will affect women's probability of marriage/divorce as well as cohabitation and fertility probabilities among both sexes.[3]

III. Data, Variables, and Methods

Data

We obtained data from the geocoded NLSY79. The original sample consisted of 12,686 youth age 14 to 22 in 1979. The Bureau of Labor Statistics (BLS) administered the survey annually between 1979 and 1993 and then biannually between 1994 and 2012. We exclude subsamples (military and low-income white samples) dropped by the NLSY79 administrators due to budgetary reasons within the BLS. We deleted respondents who left school before 1976 because state unemployment rates from the BLS Local Area Statistics (our primary labor market conditions data set, detailed later) are available from 1976 onward.

Our analysis sample includes 3,355 men and 3,544 women, after excluding observations with additional missing information (discussed later). Our sample size is in line with earlier studies that use the NLSY79 to test the persistent effects of labor market conditions at the time of school-leaving on career and health outcomes (Kondo 2007; Kahn 2010; Hershbein 2012; Maclean 2013; Maclean 2014; Maclean 2015).

Marriage and Fertility Outcomes at Age 45

[3] Understanding nonmarital childbirth is beyond the scope of this study, we defer this topic to future research.

The outcome variables in our study are measures of marriage and fertility at age 45. Studying these outcomes later in life is important to understand the full effects of leaving school when the unemployment rate is high. For example, marriage and fertility outcomes measured 5 to 10 years after school-leaving may be affected by the unemployment rate at the time of school-leaving, but long-term outcomes may be unaffected. If, for example, women delayed their first births but went on to have the same number of children, we would observe a temporary decline in fertility that would not affect completed fertility (Currie and Schwandt 2014). Instead of focusing on the "tempo" of fertility or marriage, we focus on the long-term ("quantum") effects of the unemployment rate at the time of school-leaving on long-term marriage and fertility outcomes by following cohorts through age 45. Ideally, we would like to evaluate the effects of labor market conditions at the time of school-leaving through mortality to assess effects across the life course. However, the oldest age at which we can observe all members of our cohort is age 45. Even though a study of outcomes at age 45 likely captures the majority of fertility for women, we may not be able to capture the full span of both male fertility and marriage outcomes. We note such a limit as a constraint of our study.

NLSY79 administrators record marriage and fertility outcomes in each round of the survey in which the respondent participates.[4] However, for at least two reasons, we may not observe the respondent at precisely age 45. First, if a respondent drops out of the sample by age 45, we cannot observe outcomes in the individual's 45th year. Second, the NLSY79 respondents turned 45 between 2002 and 2010, after the survey became biannual (1994). Thus, a respondent may not complete the survey in his or her 45th year. If, for any reason, a respondent does not provide marriage and fertility information at age 45, we impute the outcomes by using the next-closest year in which we observe outcomes for that respondent. Specifically, if information on

[4] In a question separate from marital status, NLSY79 administrators query partnered respondents as to whether their union is a marriage or cohabitation. We use information in both questions to classify respondents as married, living as married, separated/divorced, or never married.

an outcome variable is not available for a respondent in the year in which he or she turns 45, we impute the variable by using the outcome measured at age 46. If information is not available at that age, we use information on the outcome variable measured at age 44. We proceed sequentially by using information on the outcome variable collected at age 47, then at age 43, then at age 48, and, finally, at age 42. If the respondent does not provide valid information in any of these years, he or she is coded as missing.

We examine five marriage and fertility outcomes at age 45: indicator variables for married, cohabitation, divorced (divorced or separated), never married, and any biological children at age 45. We code respondents 1 if they report the outcome and otherwise 0. Widowed respondents at age 45 are coded as 0 for all 3 marital status outcomes. Thus, our outcome categories are mutually exclusive, but not collectively exhaustive.[5]

Labor Market Conditions at School-Leaving

The main predictor variable in our study is labor market conditions at the time of school-leaving. We follow the majority of studies that examine the persistent impact of labor market conditions at the time of school-leaving and, in our core analysis, proxy economic conditions with the state unemployment rate (Kondo 2007; Genda, Kondo et al. 2010; Kahn 2010; Oreopoulos, von Wachter et al. 2012; Maclean 2014; Maclean 2015). Specifically, we draw data on the seasonally adjusted state employment rate from the BLS Local Area Unemployment Database. In unreported analysis, we find that our results are robust to using alternative proxies for labor market conditions (e.g., employment-to-population ratios).

We focus on the first period of school-leaving, which, by definition, is an event that occurs once per observation. In our definition of school-leaving, we include respondents who

[5] Because our marital status outcomes are not mutually exclusive and collectively exhaustive, our findings are not vulnerable to mechanical relationships. For example, in the case of mutually exclusive and collectively exhaustive outcomes, if we observed a null relationship for the probability of never-married then we would observe a mechanical relationship for the probabilities of married and divorced.

graduated with a degree from any educational institution (e.g., high school, community college, four-year college, graduate school) and those who dropped out before degree or diploma completion. As a result, our sample includes both dropouts and completers.[6] We use responses to education history questions fielded between 1979 and 1998 to identify the year in which each respondent left school. We require respondents to report that they were out of school for two years after school-leaving in order to distinguish between short departures from educational attainment (e.g., leaving school for a year to travel) and true school-leaving. We exclude individuals who left school after age 25 as well as respondents who report through the education history questions that they did not complete any formal schooling.[7] The result is that we have (at most) one observation per respondent.

Next, using the NLSY79 geocodes, we determine the state of residence in the school-leaving period (for observations with a valid school-leaving year). 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 state of residence at the time of the interview is assigned to respondents who left school in 1979 and thereafter.

In Table 1A, we present annual school-leaving cohort sizes for our sample (i.e., the period 1976–1989). Annual cohort sizes range from a high of 1,028 in 1979 to a low of 27 in 1989. In Table 1B, we report the average, minimum, and maximum school-leaving state unemployment rates in each year in which members of the sample left school. During the period in which our sample members left school, the United States experienced two recessions (January 1980–July 1980; July 1981–November 1982), a period of high inflation in the late 1970s and a period of economic growth in the mid-1980s. The business cycle over those years is consistent

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

with unemployment rates in our sample. The highest mean unemployment rate occurred in 1982 (10.12 percent), and the lowest mean unemployment rate occurred in 1989 (5.32 percent).

Other Control Variables

In all regressions, we control for time-varying state characteristics at the time of school-leaving that may influence marriage and fertility outcomes at age 45. Specifically, we include the male-to-female sex ratio (Lichter, Leclere et al. 1991; Charles and Luoh 2010) and an indicator for a unilateral divorce law (Peters 1986; Gruber 2004). We define the male-to-female sex ratio by using U.S. Census population data for individuals most likely to be actively seeking a (first) marriage partner (age 20 to 30). We include the sex ratio and status of divorce law in our regressions to proxy for the supply of marriage partners and preferences for marriage in the school-leaving state. We further include the Aid to Families with Dependent Children (AFDC) maximum benefit for a family of four to proxy for nonlabor market income opportunities.[8] We convert the proxy to 2012 dollars by using the BLS Consumer Price Index.

If an individual's legal labor market opportunities decline, he or she may decide to substitute illegal labor market activities that, in turn, may affect marriage market outcomes (in particular, engaging in criminal activities may worsen a school-leaver's marriage market opportunities). To control for illegal labor market opportunities, we include the number of the property crimes per capita from the Bureau of Justice Statistics Uniform Crime Reports to proxy the size of the illegal labor market in the school-leaving state.[9] We include property crimes to proxy for economic crime opportunities (i.e., crime most likely to yield income).

We also include in our regression models a set of personal characteristics potentially

[8] Dr. H. Elizabeth Peters kindly provided this variable, which was generated through private data collection.
[9] We include the number of property crimes per capita to proxy for illegal labor market opportunities. However, the level of crime in a state/year could induce changes in the size of the police force and other criminal justice institutions, which could, in turn, influence the size of the legal labor market. Moreover, it may be that states with larger illegal labor markets could also have high male incarceration rates, which could, in turn, influence marriage and fertility outcomes. To address these issues, in unreported analyses, we have re-estimated our core models without the property crime variable and find that the results are highly robust.

related to marriage at age 45 and fertility outcomes: years since school-leaving (a proxy for labor market experience), years of completed education at the time of school-leaving (entered linearly), fixed effects in the year of school-leaving, and race/ethnicity indicators (African American and Hispanic, with white as the omitted group).

Given that the NLSY79 is a rich data set, we are able to include ability and family background variables that are not typically included in social science surveys. In particular, we include a proxy for ability (age-standardized Armed Forces Qualification Test [AFQT][10]), parental education (mother's and father's years of completed schooling entered separately and linearly), and a set of indicators for family characteristics at age 14: Catholic religion, living with both biological parents, living in a rural area, speaking a language other than English, and access to cultural materials (i.e., having a library card, magazines, and newspapers).[11] Finally, we control for birth year fixed effects.

Empirical Model

We model marriage and fertility outcomes at age 45 as a function of the state unemployment rate at the time of school-leaving and other covariates as outlined in Equation 1:

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

(MF_{ist}) is a measure of marriage or fertility at age 45 for individual (i) in school-leaving state (s) and school-leaving year (t). (U_{st}) is the annual seasonally-adjusted state unemployment rate in school-leaving state (s) and school-leaving year (t). (P_{st}) is a vector of school-leaving state variables, and (X_{ist}) is a vector of personal characteristics. (S_s) is a vector of school-leaving state fixed effects. The inclusion of school-leaving state fixed effects implies that we use variation in the state unemployment rates within school-leaving states to identify persistent

[10] Respondents were administered the AFQT in 1980 at age 15 to 23. We follow Kahn (2010) and age-standardize the AFQT score for individual (i) in age group (g) (15 to 23 years): $(AFQT_{ig} - \overline{AFQT_g})/Standard\ Deviation_g$.

[11] We assign the mean (continuous variable) or mode (binary variable) for observations with missing information to preserve sample size. We include indicators for missingness in our regression models.

marriage and fertility effects. Inclusion of these fixed effects allows us to control for time-invariant difficult-to-observe differences between school-leaving states (e.g., norms toward marriage or fertility not captured by included variables). (D_t) is vector of school-leaving year fixed effects. These fixed effects capture secular trends in our outcome variables that affect the entire nation (e.g., declining fertility rates). Finally, (ε_{ist}) is the random error term.

Given the different labor market participation rates of men and women (Blau and Kahn 2007), we estimate equations separately by sex. We estimate linear probability models[12] and cluster standard errors around the school-leaving state. NLSY79 administrators make custom survey weights available to researchers interested in exploiting the longitudinal nature of the NLSY79. The weights account for survey oversampling, clustering, and attrition within the NLSY79 data. We use the weights in all analyses reported here (i.e., summary statistics, regression analyses) unless otherwise noted.

Equation 1 assumes that the state unemployment rate at the time of school-leaving is uncorrelated with the error term in the marriage and fertility equations after conditioning on the following: school-leaving variables at the state level, personal characteristics, school-leaving state fixed effects, and school-leaving year fixed effects. An obvious concern is that the time or location of school-leaving is endogenous to the state unemployment rate. School-leavers may engage in activities to avoid leaving school when labor market conditions are weak (e.g., enrolling in additional schooling, moving to a stronger labor market) (Betts and McFarland 1995; Kahn 2010; Wozniak 2010; Maclean 2014). We refer to such behaviors collectively as endogenous sorting. Moreover, we rely on retrospective reports of school-leaving information (state and year), which may include errors. Reporting error in the school-leaving variables may limit our ability to estimate treatment effects precisely if error is random. Reporting error,

[12] 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 the convergence issue as a limitation.

whether random or nonrandom, can lead to bias in our estimates (Bound, Brown et al. 2001).

To circumvent both empirical concerns, we estimate instrumental variable models, specifically two-stage least squares (2SLS). We select instrumental variables that have found application in several earlier economic studies of the persistent effects of labor market conditions at the time of school-leaving (Oyer 2006; Oyer 2008; Kahn 2010; Oreopoulos, von Wachter et al. 2012; Maclean 2013; Maclean 2014; Maclean 2015).[13]

We instrument the state unemployment rate at the time of school-leaving with the "on-time" state unemployment rate. We create on-time state unemployment rates by using birth date, state of residence at age 14 (the sample excludes respondents who resided outside the United States at age 14), and education at the time of school-leaving. We use historical compulsory schooling laws to calculate school starting age (Acemoglu, Angrist et al. 2001).[14] 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 in which he or she turned 22 in the state in which he or she resided at age 14. State of residence at age 14 is arguably exogenous to the school-leaver while the school-leaving state gives rise to concerns about endogeneity. We make comparable assignments for all educational levels.

For the state unemployment rate to be a valid instrumental variable, we must assume that individuals do not alter their educational profile or location of residence in response to labor market conditions at the time of school-leaving. Some evidence suggests that, for reasons closely related to the endogenous sorting behaviors detailed earlier, our assumption may not hold, at least for some individuals. Recent work by Maclean (2014) directly investigates these endogenous sorting behaviors in the NLSY79 cohort. First, the author examines the

[13] Several studies in this literature do not use instrumental variables to address the potential endogeneity of labor market conditions at the time school-leaving and instead rely on alternative identification strategies (e.g., control strategies, structural econometric approaches).

[14] We match respondents to birth state and year. We assign the modal school-starting age (7 years) to respondents for whom we do not have a valid birth state and who were born outside the United States.

relationships between the state unemployment rate and the size of the school-leaving cohort (i.e., number of school-levers) in each year between 1976 and 1996 (the period encompassing the school-leaving years in our sample). If school-levers avoid school-leaving in an economic downturn by enrolling in additional schooling,[15] we would expect a negative relationship between the state unemployment rate and cohort size. Maclean finds no evidence to support such a hypothesis. Next, the author tests the possibility that school-leavers may migrate to a stronger labor market if they leave school during a period of high state unemployment. To that end, the author regresses the probability of a cross-state move in the previous year on a lag in the state unemployment rate among respondents age 30 and younger (the age range that approximates school-leaving ages, although the results are not sensitive to the use of different age ceilings). Findings suggest that NLSY79 respondents of school-leaving age are *less* likely to move when the unemployment rate is high, an outcome that runs counter to the hypothesis that school-leavers migrate to stronger labor markets when the state unemployment rate is high. Although not conclusive, the results suggest that, on average, members of the NLSY79 cohort do not engage in several forms of behaviors that may invalidate our instrument. Moreover, Maclean and Hill (2013) and Kondo (2007) examine the impact of the state unemployment rate at the time of school-leaving and completed schooling (as measured by years of education and probability of leaving school with a college degree) in the NLSY79 cohort. The authors find no statistically significant evidence that the state unemployment rate predicts these outcomes.

We next use a second instrumental variable (Maclean 2013; Maclean 2015): the "respondent expected" state unemployment rate at the time of school-leaving. We construct the variable by using the birth date and historical school start dates detailed above, educational expectations reported in 1979, and state of residence at age 14. In 1979, respondents were asked,

[15] We would expect the same pattern in the data if school-leavers were dropping out of school in response to strong labor market conditions.

"What level of education do you expect to attain?"[16] The respondent-expected state unemployment rate is the state unemployment rate the respondent would have faced had he or she left school at his or her (reported) expected time. For example, for a respondent reporting that he or she expected to complete high school, we assigned the unemployment rate in the year he or she turned 18 in the state in which he or she resided at age 14. We make similar assignments for all levels of expected education. This second instrumental variable thereby allows only ex ante expectations of educational attainment to dictate the school-leaving period. A limitation of this instrumental variable is that roughly one-quarter of respondents left school before 1979, that is, before the question was asked. For these respondents, we use the 1979 value and assume that respondents formed their expectation of educational attainment before school-leaving. This assumption is unlikely to hold if respondents update their reported educational expectations after school-leaving. To address such a limitation, in unreported analyses, we re-estimated our core 2SLS regressions on respondents who left school after 1979. The results are robust (although less precise because we lose a substantial share of our sample). Also, as described later in the manuscript, our findings are largely unchanged if we estimate just-identified models (i.e., using one instrument to identify treatment effects).

Our selected instrumental variables, though widely applied within the literature on the persistent effects of labor market conditions at the time of school-leaving, depart from policy evaluation–based instrumental variables. When a policy is used as an instrumental variable, compliers to the policy drive the identification of treatment effects; compliers to the policy are individuals who "switch" their behavior and are treated when induced by a policy. In the language of instrumental variables, the "always-takers" and the "never-takers" do not alter their behavior in response to a policy such that the treatment effect is not identified for these

[16] NLSY79 respondents are also asked this question in 1981 and 1982. If a respondent does not provide a valid answer to the question in 1979, we sequentially use the 1981 and 1982 values. Over 98% of respondents in our sample report a valid response to this question in 1979.

individuals. On the other hand, "defiers," individuals who do not take treatment when a policy is implemented and do take treatment when a policy is not implemented, are ruled out by assumption. The causal effect estimated by the instrumental variable model is the causal effect for compliers only, the local average treatment effect (LATE).

In our study, compliers are individuals who do not alter their education profile or state of residence in response to labor market conditions. It is thus conceivable that all individuals in our sample comply with the instrumental variables. For example, in the case of the respondent-expected instrumental variable, all respondents could leave school at a time consistent with their educational expectations reported in 1979 and refrain from across-state moves between age 14 and school-leaving. In this case, our LATE would be equivalent to the average treatment effect (ATE). However, our first-stage regressions (reported later) suggest that we do not have full compliance (i.e., the coefficients on our instrumental variables in the first-stage regressions are less than 1). Thus, we suspect that our selected instrumental variables operate in a comparable manner to a standard policy evaluation instrumental variable. Moreover, our estimated treatment effects are for the sample of compliers; in other words, we estimate a LATE as we would with a standard policy-based instrumental variable.

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

IV. Results

Sample Characteristics

In Table 2A, we report weighted summary statistics for men; in Table 2B, we report the same statistics for women. In each table, we present proportions or means, minimum and

maximum values, and the standard deviation for each variable. At age 45, 63.3, 5.7, 16.7, 13.8, and 75.2 percent of men in our sample are, respectively, married, living as married, divorced, never married, and have any children. At age 45, 63.7, 5.4, 20.2, 9.4, and 81.9 percent of women in our sample are, respectively, married, living as married, divorced, never married, and have any children. The average state unemployment rate at the time of school-leaving is 7.49 percent among men and 7.50 percent among women. For the school-leaving marriage age, the male-to-female sex ratio is approximately 1.0 among both men and women, and 54.1 percent (51.2 percent) of men (women) in the school-leaving states reside in a state with a unilateral divorce law. The maximum AFDC benefit for a family of four is $401 among men and $391 among women. The number of property crimes per capita in the school-leaving states is roughly 0.05 among both men and women. The mean year of school-leaving is 1980 among both sexes, just ahead of the early 1980s recession. On average, respondents are out of school for 27 years at age 45 and leave school with 13 years of education. Although not included in our regression models,[17] the distribution of school-leaving ages in our sample appears in Figure 1. The range is 10 to 25 years, with ages 17, 18, and 19 the most common ages of school-leaving.

Regression Results

In Table 3, we report selected results from regressions of our marriage and fertility outcomes at age 45 as a function of the state unemployment rate at the time of school-leaving and other covariates included in Equation 1. The top panel in the table pertains to men, and the bottom panel pertains to women. The models do not address the potential endogeneity of the state unemployment rate at the time of school-leaving. Therefore, we refer to the models as "uncorrected" models to distinguish them from 2SLS models. We present two versions of our regression models: (1) a parsimonious model that includes only school-leaving state-level

[17] We chose not to include age at the time of school-leaving because it is highly collinear with the years of education at the time of school-leaving, time elapsed since school-leaving, and birth year fixed effects.

controls, exogenous personal characteristics (i.e., race/ethnicity, birth year fixed effects), and school-leaving state and year fixed effects, and (2) a full model that includes all variables in the parsimonious model plus all other personal characteristics described in the discussion of our empirical model (i.e., AFQT score, mother's and father's education, and family background measures). We report on both models to examine the robustness of our findings to including additional personal controls.[18]

Men who leave school when the state unemployment rate is high are less likely to be married and have children at age 45, and they may be more likely to be divorced. Specifically, in the parsimonious model, a 1 percentage point increase in the state unemployment rate at the time of school-leaving leads to 2.8 and 1.8 percentage point (4.4 and 2.4 percent) decreases in the probability of, respectively, being married or having children at age 45. The estimates for cohabitation, divorced, and never married suggest that men who leave school when the state unemployment rate is high are more likely to report these outcomes at age 45, although the coefficients are statistically indistinguishable from 0. As for the full models, the coefficient estimates are nearly identical in terms of sign, magnitude, and statistical significance.

In general, we find no strong evidence that labor market conditions at the time of school leaving affect a women's marriage or fertility outcomes at age 45; coefficient estimates are small in magnitude and statistically indistinguishable from 0. Moreover, the estimates generated in the parsimonious and full models are practically identical.

Instrumental Variable Regression Results

The main empirical challenges in the study are bias from endogenous sorting and reporting error in the school-leaving variables. To address these potential sources of bias, we

[18] Moreover, as noted earlier, to preserve sample size, we impute missing values for many of our personal characteristics. The parsimonious models include only variables for which no imputation is required (i.e., we have complete information for all observations in our sample). The full models include variables for which we impute values (e.g., Catholic religion at age 14). Thus, a comparison across the models allows us to explore the sensitivity of our findings to imputation.

estimate 2SLS models. For two reasons, we view the results generated in 2SLS as more reliable than those generated in the uncorrected models.[19] First, 2SLS models produce consistent coefficient estimates regardless of whether the labor market conditions at the time of school-leaving are exogenous. The uncorrected models will produce consistent estimates only in the case of exogenous economic conditions at the time of school-leaving. Second, 2SLS estimates are robust to reporting error in the school-leaving variables, but uncorrected estimates are not. Before presenting our 2SLS results, we provide some evidence suggesting the suitability of the variables we have selected to IV the state unemployment rate at the time of school-leaving.

In Table 4, we present selected results from first-stage regressions. We regress the state unemployment rate at the time of school-leaving on the instrumental variables and other covariates included in Equation 1 with weighted least squares (where the weights are NLSY79 sample weights). The instrumental variables are strong predictors of the state unemployment rate at the time school-leaving for both men and women; the *F*-statistic is 21.78 among men and 22.01among women ($p \leq 0.01$), well above the minimum recommended value of 10 (Stock, Wright et al. 2002). Moreover, a 1 percentage point increase in the on-time (respondent-expected) state unemployment rate is associated with a 0.25 (0.06) percentage point increase in the state unemployment rate at the time of school-leaving among men ($p \leq 0.01$). First-stage results are comparable among women.[20] As noted earlier, our first stage results suggest that we have less than full compliance in our sample. Full compliance in our sample would be observed if we had a one-to-one relationship between our IVs and the school-leaving state unemployment rate. Thus, if we had full compliance to the IVs we would expect that the coefficients on both

[19] These statements assume that our instrumental variables meet the necessary assumptions for 2SLS.
[20] In unreported analyses, we estimated first-stage regressions on gender-specific subsamples based on skill level (less than a college degree at the time of school-leaving, a college degree or higher at the time of school-leaving) and race/ethnicity (whites, nonwhites). In all samples, the instrumental variables are strongly and positively correlated with the state unemployment rate at the time of school-leaving. Thus, the test provides suggestive evidence that our instrumental variables pass the monotonicity assumption.

IVs in the first stage regressions would be equal to 1, implying that a 1 percentage point increase in the IVs lead to a 1 percentage point increase in the school-leaving state unemployment rate.

Instrumental variables are able to estimate a LATE consistently for the instrumental variable compliers only. It is therefore worthwhile to consider what type of individuals who comply with the selected instruments and thus what LATE we estimate in our analysis. There are several potential, non-mutually exclusive, types of compliers to our IVs. Compliers do not alter their education profile in response to labor market conditions at the time of school-leaving as determined by date and location of birth or expected educational attainment. These compliers have strong preferences for obtaining a specific level of education. Such preferences may be internally determined or externally determined by, for example, parents. Alternatively, compliers may benefit from hard work and innate abilities, which will secure them a good job regardless of the labor market conditions under which they leave school. Finally, compliers may lack resources to respond optimally to poor labor market conditions at the time of school-leaving.

In Table 5, we report selected results from our weighted 2SLS models. The top panel pertains to men, and the bottom panel pertains to women. Again, we report results generated in (1) parsimonious models and (2) full models as described earlier.

Among men, the marriage and fertility results generated in the instrumental variable models are comparable to the uncorrected results; that is, men who leave school when the state unemployment rate is high are less likely to be married and have children at age 45 than otherwise similar men. Moreover, the 2SLS estimates reveal a positive and precisely estimated relationship between the state unemployment rate at the time of school-leaving and the probability of divorce at age 45. In the parsimonious model, a 1 percentage point increase in the state unemployment rate at the time of school-leaving leads to 4.4 and 2.0 percentage point (7.0 and 2.7 percent) decreases, respectively, in the probability of marriage and any children at age

45 and a 2.4 percentage point (14.0 percent) increase in the probability of divorce. Likewise, the results suggest that men who leave school when the state unemployment rate is high are more likely to be cohabitating and never married at age 45 than otherwise similar men (coefficients are imprecisely estimated). The coefficients are nearly the same in the full model, although the coefficient in the never married regression is statistically distinguishable from 0 at the 10 percent level: a 1 percentage point increase in the state unemployment rate at the time of school-leaving leads to a 1.5 percentage point (10.9 percent) increase in the risk of this outcome.

As for women and consistent with the uncorrected results reported in Table 3, we find no statistically significant evidence that labor market conditions at the time of school-leaving influence marriage or fertility outcomes at age 45 in either model. All other coefficients are small in magnitude and statistically indistinguishable from 0. One exception is the probability of any children; we find some evidence (although statistically distinguishable from 0 only at the 10 percent level) that women who leave school when the state unemployment rate is high are more likely to report children at age 45. However, after we control for personal characteristics in the full model, the relationship between a high unemployment rate and children is no longer statistically distinguishable from 0.

Given that coefficient estimates generated in the parsimonious and full models do not differ appreciably, we decided, for brevity, to report henceforth only those results generated in the full model. However, results based on the parsimonious model are available on request.

We next estimate just-identified models (that is, we use either the on-time or the respondent-expected school-leaving variables for identification) to determine how stable our results are across the two sets of instrumental variables. We estimate weighted 2SLS and report the results in Appendix 1. For men, the results are similar to the core findings (Table 5). We find that, across the two IVs, the magnitude and statistical significance of the estimated coefficients

varies to some extent. However, estimates generated using both IVs strongly suggest that men who leave school when the state unemployment rate is high are less likely to be married and have children at age 45, and these findings operate through increases in the probability in cohabitation, divorce, and remaining single.

Among women, we find no evidence that labor market conditions at the time of school-leaving influence the outcomes examined in this study regardless of which instrumental variable we use. One exception—the model that uses the respondent-expected state unemployment rate as an instrumental variable—suggests that women who leave school when the state unemployment rate is high are more likely to marry and have children than otherwise similar women. However, the coefficients are only marginally statistically different from 0 ($p \leq 0.10$). In unreported analyses available on request, we estimate Sargan (1958) overidentification tests, and the results suggest that our instrumental variables are excludable.

V. Extensions and Robustness checks

We consider heterogeneity, differential exposure to labor market conditions at the time of school-leaving, and dynamics in the persistent relationship between labor market conditions at the time of school-leaving and marriage/fertility outcomes. We also consider potential mechanisms and examine the robustness of our findings to alternative model specifications. For the sake of brevity, we report results generated in our weighted 2SLS models.

Heterogeneity by Skill and Race/Ethnicity

In our core analysis, we examine the full sample of men and women. However, the literature that examines the persistent impact of labor market conditions at the time of school-leaving identifies differential effects (in terms of both timing and persistence) by skill level and race (Kondo 2007; Genda, Kondo et al. 2010). Moreover, marriage and fertility patterns vary across the same characteristics. For example, fertility rates are higher among minorities (Martin,

Hamilton et al. 2012) while marriage rates are lower among those with lower levels of education (Lundberg and Pollak 2013). We next examine heterogeneity by skill level based on educational attainment at the time of school-leaving and by race/ethnicity (white versus nonwhite).

In Appendix 2, we report results by skill level. The top panel pertains to men, and the bottom panel pertains to women. Specifically, we stratify the sample into high- (a college degree or more at the time of school-leaving) and low- (less than a college degree at the time of school-leaving) skill workers. A caveat is in order, however; the level of education at the time of school-leaving (our proxy for skill) is arguably endogenous to the contemporaneous labor market conditions for some individuals. Stated differently, if labor market 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 the time of school-leaving is endogenous in Equation 1. Stratifying the sample on an endogenous variable can lead to sample selection bias. As noted earlier, research by Kondo (2007), Maclean and Hill (2013), and Maclean (2014) does not support this hypothesis. Readers should use some caution in interpreting the results, however.

Among men, the findings suggest that the marriage and fertility effects of leaving school in an economic downturn are stronger for low-skill men than for high-skill men. For example, a 1 percentage point increase in the state unemployment rate at the time of school-leaving leads to a 5.4 percentage point or 9.1 percent (1.5 percentage point or 2.0 percent) reduction in the probability of marriage (any children) at age 45 among low-skill men. Moreover, we find that a 1 percentage increase in the state unemployment rate at the time of school-leaving leads to a 2.7 and 1.9 percentage point (14.1 and 13.3 percent) increase in the probability of divorce and never married, respectively, at age 45 among low-skill men. The comparable coefficients among high-skill men are statistically insignificant.

As for women of all skill levels, we find little evidence that leaving school during an

economic downturn influences marriage and fertility outcomes at age 45. One exception is the probability of reporting children among high-skill women. High-skill women who leave school when the state unemployment rate is high are more likely to report children at age 45 than otherwise similar women. Moreover, the magnitude of the effect is large; a 1 percentage point increase in the state unemployment rate at the time of school-leaving leads to a 7.8 percentage point (10.3 percent) increase in the probability of having any children at age 45.

In Appendix 3, we report results stratified by race/ethnicity— whites versus nonwhites.[21] Our findings are comparable to the findings for the full male sample, but marriage and divorce effects are stronger in terms of statistical significance/magnitude for whites while divorce and never married effects are stronger for nonwhites. We find no statistically significant evidence that marriage and fertility outcomes among women, regardless of race/ethnicity, are influenced by labor market conditions at the time of school-leaving.

Differential Exposure

We examine marriage and fertility outcomes at specific ages (i.e., age 45) in order to facilitate comparison with other studies that examine the effect of leaving school or entering the marriage market when labor market conditions are weak, and marriage and fertility outcomes measured at specific ages (Kondo 2011; Currie and Schwandt 2014; Hofmann and Hohmeyer 2014). One limitation of such an approach is that individuals who leave school at later ages have less time to enter marriage, have children, divorce, and so forth as compared to individuals who leave school at younger ages. For example, at age 45, a high school graduate who left school at the modal age in our sample (18 years) will have exposure of 27 years while a college graduate who left school at the modal age (22 years) will have exposure of 23 years.

To address this limitation, we measure our outcome variables 25 years after school-

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

leaving and re-estimate our core models.[22] Such an approach permits the same "exposure" window for each observation in the sample, regardless of the age at which an individual leaves school. We report the results in Appendix 4, demonstrating that our findings are robust to the change in outcome variable definition. When we allow for differential exposure, the estimated effects are largely unchanged among men and women.

Dynamics

Thus far, we have examined the effect of labor market conditions at the time of school-leaving on marriage and fertility outcomes measured at age 45 (i.e., quantum effects). That is, we have taken a long-term perspective (or as long a perspective as our data permit). It is also informative to examine how these effects develop over the life course (i.e., to examine tempo effects). To assess relationship dynamics, we re-estimate our core models and replace outcomes measured at age 45 with outcomes measured at ages 25, 30, 35, and 40. For example, we estimate the effects of the state unemployment rate at the time of school-leaving on the probability of marriage at ages 25, 30, 35, and 40. As is the case with the outcomes measured at age 45, we do not always observe a respondent at age 25, 30, 35, or 45 (because of attrition, item non-response, the biannual nature of the NLSY79 after 1994, and so forth). We apply a comparable imputation method as outlined in Section V and report results in Appendix 5.

Our analysis of dynamics suggests that the effects we observe at age 45 emerge over time. That is, the effects for men are not evident until age 35 (probability of marriage) or 40 (probability of divorce and probability of any children). The magnitude of the coefficient on the state unemployment rate at the time of school-leaving is smaller at younger ages (i.e., ages 25

[22] We use an imputation procedure comparable to that we used to construct our age-45 outcome measures. If we do not observe a respondent 25 years after school-leaving, we sequentially impute the information at 26, 24, 27, 23, 28, and 22 years after school-leaving. We use the closest available period to 25 years after school-leaving for which we have valid information on the outcome variable. To facilitate comparison with our core findings (i.e., outcomes measured at age 45) we use the same sample of individuals. Otherwise, compositional changes in the samples could impede comparison of treatment effects.

and 30 for the marriage outcome and ages 25, 30, and 35 for the any-children outcome). For the divorce outcome, we see some evidence (although only statistically different from 0 at the 10 percent level) at age 30. This pattern of results is consistent with men entering into lower quality marriages and subsequently experiencing the dissolution of those marriages over time. Among women, we find little evidence that labor market conditions at the time of school-leaving influence our outcomes. Only one of 25 coefficients is statistically distinguishable from 0.

Mechanisms

Earlier economic research suggests that earnings may be an important causal pathway through which labor market conditions at the time of school-leaving may persistently influence marriage and fertility outcomes. To provide suggestive evidence on the importance of this pathway for our sample, we regress the logarithm of wages measured at age 45 in our core model and report the results in Appendix 6. Our findings suggest that men, but not women, who leave school when the unemployment rate is high earn lower wages than otherwise similar men. Specifically, a 1 percentage point increase in the state unemployment rate at the time of school-leaving leads to a 4.8 percent reduction in wages.

Incorporating Individuals Who Leave School Before 1976

In our core analyses, we exclude respondents who leave school before 1976. Our measure of labor market conditions at the time of school-leaving (the state unemployment rate obtained from the BLS Local Area Unemployment Database) is not available before 1976. As pointed out by Kondo (2007), the omission of respondents who leave school before 1976 can potentially create an imbalance in the sample composition as older cohorts of school-leavers are, on average, more highly educated. Kondo (2007) therefore supplements the BLS state unemployment data series with unemployment insurance–based state unemployment rates. In line with Kondo, we supplement our BLS data with unemployment insurance–based state

unemployment rates[23] and, to be consistent with Kondo, use state unemployment rates through 1973. Results from the robustness check (Appendix 7) are highly comparable to those generated in our core models. Coefficient estimates in the probability of divorce and any children regressions among women are more precisely estimated, perhaps due to the increase in sample size. The findings suggest that sample imbalance does not substantially bias our findings. We use the BLS Local Area Unemployment Database that dates to 1976 for the remainder of the analyses in the study (unless otherwise noted).

Group-Specific State Unemployment Rates

In the analysis presented thus far, we have used the overall state unemployment rate at the time of school-leaving to proxy labor market conditions. However, for our sample, an overall measure of unemployment may be a poor proxy for the effective labor market conditions at the time of school-leaving. On average, school-leavers are younger and have less labor market experience than a general sample of workers. Thus, they may complete for different job (e.g., entry level jobs). Moreover, the unemployment rates faced by men and women may differ because men and women are often employed in different occupations. To develop a more precise measurement of labor market conditions faced by members of our sample, we follow Schaller (2013) and generate sex- and age-specific state unemployment rates.[24] The results, reported in Appendix 8, are highly comparable to the results generated with use of the overall rate.

Differential Effects Across the Business Cycle

Our analysis thus far has examined how labor market conditions at the time of school-leaving persistently affect marriage and fertility outcomes. That is, we have not explicitly studied how leaving school in an economic downturn (i.e., a recession) persistently affects

[23] We thank Professor Akayo Kondo for kindly sharing with us her unemployment insurance–supplemented state unemployment rate data.

[24] Specifically, following Schaller (2013) we merge state unemployment rate data on single-year age and sex into the NLSY79 data set. Each observation is matched to the age– and sex–state unemployment rate that he or she would have faced at the time of school-leaving.

marriage and fertility outcomes. We next consider whether leaving school during an economic downturn has a differential effect on these outcomes. To this end, we use state Gross Domestic Product (GDP) from the Bureau of Economic Analysis and construct an indicator variable coded 1 if the respondent leaves school in a period of negative GDP growth and otherwise 0. Negative GDP growth is defined as a decline in the level of GDP between (*t*) and (*t-1*).[25] We report the results from the analysis in Appendix 9. The estimates suggest that leaving school during an economic downturn, as defined here, leads to lower probability of marriage and fertility at age 45. Other outcomes are not substantially affected. One interpretation of these findings is that the experience of an economic downturn at the time of school-leaving is particularly deleterious for the outcomes studied here.

Matching Marriage Policies to Modal Marriage Ages

In our regression models, we match our marriage policies (male-female population ratio, maximum AFDC benefit for a family of four, and unilateral divorce law) to the school-leaving period and thus implicitly assume that individuals search for marriage partners in the state/year in which they leave school. Such an assumption may not hold for some individuals who experience a lag between the age at which they leave school and the time of marriage. To align more precisely the timing between our marriage policies and actual marriage ages, we match the policies on ages of modal first marriage in the NLSY79—25 years for men and 23 years for women (Aughinbaugh, Robles et al. 2013). The results we report in Appendix 10 are highly comparable to those generated in our core models. In unreported analyses, we defined all control variables at the modal marriage ages and find that the results are robust.

Alternative Controls for State Characteristics at School-Leaving

Our core models control for state-level fixed effects at the time of school-leaving and

[25] It is worth noting that there is no official definition of a recession. The National Bureau of Economic Research, however, uses several economic indicators, including GDP and the unemployment rate, to date recessions. Thus, our measure of an economic downturn is somewhat arbitrary.

thus adjust for time-invariant state characteristics at the time of school-leaving. However, our sample members left school between 1976 and 1989, and we might expect that the time-variant characteristics related to our key predictor variable (labor market conditions at school-leaving) as well as our outcomes may have changed over the period. To address this source of bias, we next include school-leaving, state-specific linear time trends in our regression models. We report our results in Appendix 11. The coefficient estimates are broadly unchanged.

VI. Discussion

Focusing on the general population of workers, we provide new evidence on the persistent impact of labor market conditions at the time of school-leaving on an understudied set of outcomes: marriage and fertility. We document that men who leave school when the state unemployment rate is high are less likely to be married and have children at age 45 than otherwise similar men; the findings are particularly strong for low-skill men. We also find evidence that these effects potentially operate through increases in the probability of marriages that end in divorce and evidence (albeit imprecise) of substitution of cohabitation for traditional marriage and failure to enter into marriage/cohabitation. The findings are less clear for women, although one important finding emerges. Consistent with recent work on Japanese and German college graduates by Hashimoto and Kondo (2012) and Hofmann and Hohmeyer (2014) and on U.S. birth rates by Currie and Schwandt (2014), we show that women, particularly high-skill women, who leave school when labor market conditions are weak are more likely to have children at age 45 than otherwise similar women.

That our findings for men are particularly strong for low-skill workers is perhaps somewhat surprising and worthy of discussion. To interpret the findings, it is important to consider previous findings on *when* male workers with different skill levels experience the career penalties attributable to school-leaving during periods of high state unemployment.

Genda, Kondo et al. (2010) examine career effects attributable to leaving school in an economic downturn for male high school and college graduates in the United States. The authors show that the immediate earnings effects are more pronounced for high school graduates than for college graduates (although earnings effects are more persistent for college graduates). Moreover, the empirical evidence suggests that lower-skill groups are more adversely affected in terms of employment outcomes during contemporaneous economic downturns (Cutler, Katz et al. 1991; Hoynes 1999; Hines, Hoynes et al. 2001; Bitler and Hoynes 2010; Hoynes, Miller et al. 2012). Perhaps low-skill men "miss out" on their prime marrying years more so than high-skill men and then are unable to catch up as newer cohorts of men enter the market and match with available marriage partners. Once these men recover from the 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. Our findings diverge somewhat from work by Hershbein (2012), who shows that male high school graduates who leave school during an economic downturn are less likely to marry in the short run. However, our findings suggest a more persistent effect. We consider a broader set of educational levels (less than high school, some college) that may explain the differences.

We find that women who leave school in an economic downturn are more likely to have children at age 45 than otherwise similar women. Unless they marry out-of- cohort partners who do not experience persistently lower earnings due to leaving school when the state unemployment rate is high, women will have fewer children because of income effects. This prediction is not supported in our data and thus we assume the substitution effect must dominate: owing to lower wages in the labor market, and in turn lower opportunity costs, women elect to have children.

The United States is recovering from the 2007–2009 recession. It may be informative to

apply our findings to predict the persistent effects of this recession. A direct extrapolation may suggest persistently lower marriage and fertility rates, and higher rates of divorce, among men in the current cohort. Additionally, we might expect higher fertility among women. However, the external validity of our findings depends, amongst other things, on the similarity between the NLSY79 cohort and current cohorts of school-leavers.

TABLE 1A.
Annual School-Leaving Cohort Size and State Unemployment Rates: NSLY79 Men and Women

Year	Cohort Size
1976	440
1977	631
1978	917
1979	1,028
1980	826
1981	848
1982	820
1983	521
1984	335
1985	211
1986	162
1987	90
1988	43
1989	27
N	6,899

Note: A school-leaving cohort includes individuals who left school in the same year. Cohort size is unweighted.

TABLE 1B.
Weighted Annual School-Leaving Cohort Sizes and State Unemployment Rates: NSLY79 Men and Women

Year	Mean State Unemployment Rate	Minimum State Unemployment Rate	Maximum State Unemployment Rate
1976	7.42	3.41	10.47
1977	6.89	3.45	9.68
1978	6.00	2.97	10.59
1979	5.85	2.82	9.05
1980	7.54	3.87	12.13
1981	7.91	3.72	12.50
1982	10.12	5.49	15.58
1983	10.07	5.30	17.37
1984	7.48	4.43	14.70
1985	7.19	4.07	13.43
1986	7.02	3.79	12.43
1987	6.56	3.25	11.78
1988	5.62	2.89	9.70
1989	5.32	2.86	7.22

Note: NLSY79 sample weights applied to calculate mean, minimum, and maximum state unemployment rates.

TABLE 2A.
Weighted Summary Statistics: NSLY79 Men

Variable	Proportion /Mean	Minimum Value	Maximum Value	Standard Deviation
Marriage and fertility outcomes at age 45				
Married	0.633	0	1	0.482
Cohabitation	0.0572	0	1	0.232
Divorced	0.167	0	1	0.373
Never married	0.138	0	1	0.344
Any children	0.752	0	1	0.432
School-leaving state variables				
Unemployment rate	7.488	2.858	17.37	2.322
Male-to-female sex ratio	0.997	0.865	1.184	0.0362
Unilateral divorce law	0.541	0	1	0.498
Maximum AFDC benefit for family of four	400.8	68.33	878.7	154.1
Property crimes per capita	0.0483	0.0204	0.0839	0.0114
Personal characteristics				
Years since school-leaving	27.20	20	33	2.359
School-leaving year	1980.4	1976	1989	2.806
Years of education at school-leaving	12.80	5	20	2.134
White	0.804	0	1	0.397
African American	0.137	0	1	0.344
Hispanic	0.0589	0	1	0.235
AFQT score	49.15	1	99	28.83
Age-adjusted AFQT score	-0.0775	-1.702	1.635	0.966
Mother's years of education	11.75	0	20	2.566
Father's years of education	12.00	0	20	3.319
Catholic religion at age 14	0.323	0	1	0.468
Live with both biological parents at age 14	0.763	0	1	0.425
Live in rural area at age 14	0.221	0	1	0.415
Speak non-English language in home at age 14	0.127	0	1	0.333
Library card in home at age 14	0.748	0	1	0.434
Magazines in home at age 14	0.688	0	1	0.463
Newspapers in home at age 14	0.848	0	1	0.359
Birth year	1960.7	1957	1964	2.173
N	3,355			

Note: NLSY79 sample weights are applied.

TABLE 2B.
Weighted Summary Statistics: NSLY79 Women

Variable	Proportion /Mean	Minimum Value	Maximum Value	Standard Deviation
Marriage and fertility outcomes at age 45				
Married	0.637	0	1	0.481
Cohabitation	0.0538	0	1	0.226
Divorced	0.202	0	1	0.402
Never married	0.0935	0	1	0.291
Any children	0.819	0	1	0.385
School-leaving state variables				
Unemployment rate	7.503	2.817	17.37	2.278
Male-to-female sex ratio	0.996	0.865	1.165	0.0353
Unilateral divorce law	0.512	0	1	0.500
Maximum AFDC benefit for family of four	390.8	68.33	881.8	153.7
Property crimes per capita	0.0481	0.0204	0.0839	0.0116
Personal characteristics				
Years since school-leaving	27.42	20	33	2.263
School-leaving year	1980.2	1976	1989	2.819
Years of education at school-leaving	12.91	5	20	2.049
White	0.814	0	1	0.389
African American	0.133	0	1	0.340
Hispanic	0.0527	0	1	0.223
AFQT score	48.78	1	99	27.03
Age-adjusted AFQT score	-0.0905	-1.702	1.635	0.905
Mother's years of education	11.67	0	20	2.617
Father's years of education	11.84	0	20	3.343
Catholic religion at age 14	0.316	0	1	0.465
Live with both biological parents at age 14	0.746	0	1	0.436
Live in rural area at age 14	0.223	0	1	0.416
Speak non-English language in home at age 14	0.123	0	1	0.328
Library card in home at age 14	0.786	0	1	0.410
Magazines in home at age 14	0.677	0	1	0.468
Newspapers in home at age 14	0.834	0	1	0.372
Birth year	1960.7	1957	1964	2.174
N	3,544			

Note: NLSY79 sample weights are applied.

TABLE 3.
Effect of the School-Leaving State Unemployment Rate on Marriage and Fertility Outcomes at Age 45: Weighted Uncorrected Models

	Married	Cohabitation	Divorced	Never Married	Any Children
Men					
Proportion	0.633	0.057	0.167	0.138	0.752
Parsimonious model	-0.028***	0.006	0.014	0.010	-0.018**
	(0.009)	(0.005)	(0.009)	(0.008)	(0.007)
Full model	-0.028***	0.005	0.013	0.012	-0.018***
	(0.009)	(0.005)	(0.009)	(0.007)	(0.006)
N	3,355	3,355	3,355	3,355	3,355
Women					
Proportion	0.637	0.054	0.202	0.093	0.819
Parsimonious model	0.001	-0.003	0.007	-0.006	0.010
	(0.008)	(0.005)	(0.006)	(0.007)	(0.009)
Full model	0.000	-0.004	0.006	-0.004	0.008
	(0.008)	(0.005)	(0.006)	(0.007)	(0.009)
N	3,544	3,544	3,544	3,544	3,544

Note: All models are estimated with a linear probability model. Standard errors are clustered around the state in which school-leaving took place and reported in parentheses. NLSY79 sample weights applied. Parsimonious models control for the characteristics of the states in which school-leaving occurred; race/ethnicity; birth-year fixed effects; and fixed effects for the state and year in which school-leaving occurred. Full models control for the characteristics of the states in which school-leaving occurred; personal characteristics; and state and year in which school-leaving occurred fixed effects.
***; **; * = statistically different from 0 at the 1, 5, and 10 percent levels.

TABLE 4.
Weighted First-Stage Regressions: Associations Between Instrumental Variables and the School-Leaving State Unemployment Rate

	Men	Women
Mean		
Instrumental variables	7.488	7.503
On-time school-leaving state unemployment rate	0.248***	0.242***
	(0.039)	(0.054)
Respondent-expected school-leaving state unemployment rate	0.058***	0.047**
	(0.016)	(0.021)
F-test of instrumental variable joint significance	21.78	22.01
(*p*-value)	(0.0000)	(0.0000)
School-leaving state characteristics		
Male-to-female sex ratio	-2.049	-8.615
	(12.199)	(16.649)
Unilateral divorce law	-3.316***	-2.395**
	(0.656)	(0.929)
Maximum AFDC benefit for family of four	-0.004*	-0.004
	(0.002)	(0.002)
Property crimes per capita	105.576***	111.911***
	(38.299)	(39.756)
Personal characteristics		
Years since school-leaving	-0.105***	-0.061
	(0.038)	(0.043)
Years of education at school-leaving	-0.029	0.036
	(0.025)	(0.029)
African American	0.005	-0.010
	(0.049)	(0.043)
Hispanic	0.034	-0.079
	(0.077)	(0.096)
Age-adjusted AFQT	-0.023	0.019
	(0.027)	(0.032)
Mother's education	0.002	-0.008
	(0.009)	(0.008)
Father's education	-0.010*	-0.007
	(0.005)	(0.009)
Catholic religion at age 14	0.018	0.009
	(0.045)	(0.049)
Live with biological parents at age 14	0.031	0.030
	(0.050)	(0.045)
Rural residence at age 14	-0.070*	-0.026
	(0.040)	(0.045)
Speak non-English language in home at age 14	-0.094	0.068
	(0.085)	(0.062)
Library card in home at age 14	0.009	-0.015
	(0.035)	(0.039)
Magazines in home at age 14	0.135***	-0.026
	(0.039)	(0.036)
Newspapers in home at age 14	0.025	-0.031
	(0.050)	(0.041)
Observations	3,355	3,544

Note: All models are estimated with least squares. Standard errors are clustered around the state in which school-leaving occurred and reported in parentheses. NLSY79 sample weights applied. All models control for birth year fixed effects; indicators for missingness; and fixed effects for the state and year in which school-leaving occurred. ***; **; * = statistically different from 0 at the 1, 5, and 10 percent levels.

TABLE 5.
Effect of the School-Leaving State Unemployment Rate on Marriage and Fertility Outcomes at Age 45: Weighted Instrumental Variable Models

	Married	Cohabitation	Divorced	Never Married	Any Children
Men					
Proportion	0.633	0.057	0.167	0.138	0.752
Parsimonious model	-0.044***	0.009	0.024***	0.012	-0.020***
	(0.010)	(0.008)	(0.009)	(0.008)	(0.007)
Full model	-0.046***	0.009	0.024***	0.015*	-0.022***
	(0.010)	(0.008)	(0.009)	(0.008)	(0.007)
N	3,355	3,355	3,355	3,355	3,355
Women					
Proportion	0.637	0.054	0.202	0.093	0.819
Parsimonious model	0.008	-0.004	0.007	-0.006	0.018*
	(0.008)	(0.006)	(0.007)	(0.006)	(0.010)
Full model	0.010	-0.005	0.003	-0.004	0.015
	(0.008)	(0.006)	(0.007)	(0.007)	(0.009)
N	3,544	3,544	3,544	3,544	3,544

Note: All models are estimated with two-stage least squares. Standard errors are clustered around the state of residence at age 14 and reported in parentheses. NLSY79 sample weights applied. Parsimonious models control for the characteristics of the state in which school-leaving occurred; race/ethnicity; the birth year fixed effects; and fixed effects for the state and year in which school-leaving occurred. Full models control for the characteristics of the state in which school-leaving occurred; personal characteristics; respondent's on-time and expected-year school-leaving fixed effects; and state of residence at age 14 fixed effects.
***; **; * = statistically different from 0 at the 1, 5, and 10 percent levels.

APPENDIX 1.
Effect of the School-Leaving State Unemployment Rate on Marriage and Fertility Outcomes at Age 45: Weighted Just-Identified Instrumental Variable Models

	Married	Cohabitation	Divorced	Never Married	Any Children
Men					
Proportion	0.633	0.057	0.167	0.138	0.752
On-time instrumental variable	-0.045***	0.007	0.025***	0.016**	-0.021***
	(0.010)	(0.008)	(0.009)	(0.008)	(0.007)
Respondent-expected instrumental variable	-0.047**	0.021**	0.018	0.009	-0.031***
	(0.019)	(0.011)	(0.012)	(0.016)	(0.010)
N	3,355	3,355	3,355	3,355	3,355
Women					
Proportion	0.637	0.054	0.202	0.093	0.819
On-time instrumental variable	0.009	-0.004	0.004	-0.004	0.014
	(0.009)	(0.006)	(0.007)	(0.007)	(0.010)
Respondent-expected instrumental variable	0.025*	-0.012	-0.013	0.000	0.020*
	(0.013)	(0.009)	(0.012)	(0.008)	(0.012)
N	3,544	3,544	3,544	3,544	3,544

Note: All models are estimated with two-stage 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 state characteristics at the time of school-leaving; personal characteristics; respondent's on-time and expected-year school-leaving fixed effects; and state of residence at age 14 fixed effects.
***; **; * = statistically different from 0 at the 1, 5, and 10 percent levels.

APPENDIX 2.
Heterogeneity in the Effect of the School-Leaving State Unemployment Rate on Marriage and Fertility Outcomes at Age 45 by Skill Groups Defined by Educational Attainment at School-Leaving: Weighted Instrumental Variable Models

	Married	Cohabitation	Divorced	Never Married	Any Children
High-skill men: College degree or higher					
Proportion	0.795	0.019	0.0663	0.114	0.756
School-leaving state unemployment rate	-0.025	-0.003	0.019	0.013	-0.009
	(0.026)	(0.011)	(0.014)	(0.019)	(0.025)
N	503	503	503	503	503
Low-skill men: Less than a college degree					
Proportion	0.593	0.067	0.192	0.143	0.751
School-leaving state unemployment rate	-0.054***	0.010	0.027***	0.019*	-0.015**
	(0.011)	(0.010)	(0.009)	(0.010)	(0.008)
N	2,852	2,852	2,852	2,852	2,852
High-skill women: College degree or higher					
Proportion	0.755	0.011	0.131	0.098	0.757
School-leaving state unemployment rate	-0.001	-0.009	0.027	-0.021	0.078**
	(0.033)	(0.008)	(0.027)	(0.020)	(0.035)
N	564	564	564	564	564
Low-skill women: Less than a college degree					
Proportion	0.608	0.064	0.220	0.092	0.834
School-leaving state unemployment rate	0.007	-0.008	0.008	0.001	0.004
	(0.011)	(0.007)	(0.006)	(0.006)	(0.010)
N	2,980	2,980	2,980	2,980	2,980

Note: All models are estimated with two-stage 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 state characteristics at the time of school-leaving; personal characteristics; respondent's on-time and expected-year school-leaving fixed effects; and state of residence at age 14 fixed effects.
***; **; * = statistically different from 0 at the 1, 5, and 10 percent levels.

APPENDIX 3.
Heterogeneity in the Effect of the School-Leaving State Unemployment Rate on Marriage and Fertility Outcomes at Age 45 Across Race and Ethnicity: Weighted Instrumental Variable Models

	Married	Cohabitation	Divorced	Never Married	Any Children
White men					
Proportion	0.675	0.047	0.158	0.117	0.743
School-leaving state unemployment rate	-0.048***	0.008	0.029***	0.011	-0.019**
	(0.012)	(0.009)	(0.010)	(0.010)	(0.009)
N	1,737	1,737	1,737	1,737	1,737
Nonwhite men					
Proportion	0.459	0.098	0.208	0.223	0.790
School-leaving state unemployment rate	-0.028	0.001	0.000	0.033**	-0.031**
	(0.020)	(0.010)	(0.016)	(0.016)	(0.012)
N	1,618	1,618	1,618	1,618	1,618
White women					
Proportion	0.686	0.055	0.184	0.064	0.813
School-leaving state unemployment rate	0.011	-0.003	0.006	-0.007	0.012
	(0.010)	(0.007)	(0.008)	(0.008)	(0.011)
N	1,872	1,872	1,872	1,872	1,872
Nonwhite women					
Proportion	0.424	0.050	0.281	0.221	0.846
School-leaving state unemployment rate	0.016	-0.006	-0.017	-0.004	0.012
	(0.017)	(0.008)	(0.018)	(0.011)	(0.014)
N	1,672	1,672	1,672	1,672	1,672

Note: All models are estimated with two-stage 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 state characteristics at the time of school-leaving; personal characteristics; respondent's on-time and expected-year school-leaving fixed effects; and state of residence at age 14 fixed effects.
***; **; * = statistically different from 0 at the 1, 5, and 10 percent levels.

APPENDIX 4.
Effect of the School-Leaving State Unemployment Rate on Marriage and Fertility Outcomes at 25 Years After School-Leaving: Weighted Instrumental Variable Models

	Married	Cohabitation	Divorced	Never Married	Any Children
Men					
Proportion	0.642	0.059	0.154	0.140	0.747
School-leaving state unemployment rate	-0.036*** (0.010)	0.009 (0.006)	0.013 (0.010)	0.016** (0.008)	-0.020*** (0.007)
N	3,355	3,355	3,355	3,355	3,355
Women					
Proportion	0.649	0.055	0.190	0.096	0.817
School-leaving state unemployment rate	0.010 (0.007)	-0.003 (0.004)	-0.002 (0.008)	-0.002 (0.007)	0.014 (0.009)
N	3,544	3,544	3,544	3,544	3,544

Note: All models are estimated with two-stage 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 state characteristics at the time of school-leaving; personal characteristics; respondent's on-time and expected-year school-leaving fixed effects; and state of residence at age 14 fixed effects.
***; **; * = statistically different from 0 at the 1, 5, and 10 percent levels.

APPENDIX 5.
Dynamics in the Effect of the School-Leaving State Unemployment Rate on Marriage and Fertility Outcomes: Weighted Instrumental Variable Models

	Married	Cohabitation	Divorced	Never Married	Any Children
Men					
Proportion	0.396	0.080	0.058	0.465	0.313
Outcome measured at age 25	-0.000 (0.015)	0.008 (0.009)	-0.002 (0.006)	-0.006 (0.012)	-0.015 (0.010)
Proportion	0.561	0.081	0.097	0.259	0.542
Outcome measured at age 30	-0.015 (0.013)	-0.004 (0.005)	0.011* (0.006)	0.006 (0.009)	-0.004 (0.013)
Proportion	0.615	0.074	0.126	0.184	0.677
Outcome measured at age 35	-0.032*** (0.012)	0.012** (0.005)	0.007 (0.006)	0.012 (0.011)	-0.011 (0.010)
Proportion	0.637	0.058	0.149	0.153	0.733
Outcome measured at age 40	-0.032*** (0.007)	0.004 (0.005)	0.016* (0.009)	0.013 (0.010)	-0.028*** (0.008)
Proportion	0.633	0.057	0.167	0.138	0.752
Outcome measured at age 45	-0.046*** (0.010)	0.009 (0.008)	0.024*** (0.009)	0.015* (0.008)	-0.022*** (0.007)
N	3,355	3,355	3,355	3,355	3,355
Women					
Proportion	0.501	0.082	0.100	0.313	0.463
Outcome measured at age 25	0.003 (0.010)	-0.001 (0.006)	-0.004 (0.007)	0.003 (0.008)	-0.003 (0.010)
Proportion	0.609	0.082	0.125	0.180	0.664
Outcome measured at age 30	-0.002 (0.007)	0.004 (0.006)	0.003 (0.006)	-0.007 (0.006)	0.003 (0.007)
Proportion	0.648	0.065	0.158	0.125	0.777
Outcome measured at age 35	-0.006 (0.013)	-0.001 (0.005)	0.013 (0.011)	-0.007 (0.007)	0.015** (0.008)
Proportion	0.651	0.060	0.175	0.105	0.808
Outcome measured at age 40	-0.006 (0.011)	0.000 (0.005)	0.011 (0.009)	-0.006 (0.006)	0.017 (0.011)
Proportion	0.637	0.054	0.202	0.093	0.819
Outcome measured at age 45	0.010 (0.008)	-0.005 (0.006)	0.003 (0.007)	-0.004 (0.007)	0.015 (0.009)
N	3,544	3,544	3,544	3,544	3,544

Note: All models are estimated with two-stage 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 state characteristics at the time of school-leaving; personal characteristics; respondent's on-time and expected-year school-leaving fixed effects; and state of residence at age 14 fixed effects.
***; **; * = statistically different from 0 at the 1, 5, and 10 percent levels.

APPENDIX 6.
Effect of the School-Leaving State Unemployment Rate on the Logarithm of Wages at Age 45: Weighted Instrumental Variable Models

	Men	Women
Mean	$29.29	$20.82
School-leaving state unemployment rate	-0.048***	0.012
	(0.016)	(0.017)
N	2,509	2,463

Note: All models estimated with two-stage 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 state characteristics at the time of school-leaving; personal characteristics; respondent's on-time and expected-year school-leaving fixed effects; and state of residence at age 14 fixed effects.
***; **; * = statistically different from 0 at the 1, 5, and 10 percent levels.

APPENDIX 7.

Effect of the School-Leaving State Unemployment Rate on Marriage and Fertility Outcomes at Age 45 Using Unemployment Benefits Supplemented State Unemployment Rate: Weighted Instrumental Variable Models

	Married	Cohabitation	Divorced	Never Married	Any Children
Men					
Proportion	0.633	0.059	0.168	0.135	0.758
School-leaving state unemployment rate	-0.030*** (0.009)	0.003 (0.007)	0.015* (0.008)	0.014* (0.008)	-0.023** (0.009)
N	3,670	3,670	3,670	3,670	3,670
Women					
Proportion	0.629	0.058	0.207	0.091	0.829
School-leaving state unemployment rate	0.000 (0.008)	-0.004 (0.006)	0.011* (0.006)	-0.002 (0.006)	0.015* (0.008)
N	3,891	3,891	3,891	3,891	3,891

Note: All models estimated with two-stage 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 state characteristics at the time of school-leaving; personal characteristics; respondent's on-time and expected-year school-leaving fixed effects; and state of residence at age 14 fixed effects. We use state unemployment rates based on unemployment benefits data provided by Professor Ayako Kondo.

***; **; * = statistically different from 0 at the 1, 5,, and 10 percent levels.

APPENDIX 8.

Effect of the School-Leaving State Unemployment Rate on Marriage and Fertility Outcomes at Age 45 Using Group-Specific State Unemployment Rates: Weighted Instrumental Variable Models

	Married	Cohabitation	Divorced	Never Married	Any Children
Men					
Proportion	0.633	0.057	0.167	0.138	0.752
School-leaving state unemployment rate	-0.021*** (0.006)	0.004 (0.004)	0.011*** (0.004)	0.007* (0.004)	-0.010*** (0.004)
N	3,355	3,355	3,355	3,355	3,355
Women					
Proportion	0.637	0.054	0.202	0.093	0.819
School-leaving state unemployment rate	0.007 (0.010)	-0.003 (0.006)	0.008 (0.011)	-0.006 (0.010)	0.015 (0.020)
N	3,544	3,544	3,544	3,544	3,544

Note: All models estimated with two-stage 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 state characteristics at the time of school-leaving; personal characteristics; respondent's on-time and expected-year school-leaving fixed effects; and state of residence at age 14 fixed effects. Groups are based on sex and age following Schaller (2013).
***; **; * = statistically different from 0 at the 1, 5, and 10 percent levels.

APPENDIX 9.

Effect of Leaving School During a Period of Negative State Gross Domestic Product (GDP) Growth on Marriage and Fertility Outcomes at 25 Years After School-Leaving: Weighted Instrumental Variable Models

	Married	Cohabitation	Divorced	Never Married	Any Children
Men					
Proportion	0.633	0.057	0.167	0.138	0.752
Negative state GDP growth rate	-0.614*** (0.231)	0.153 (0.096)	0.301 (0.202)	0.179* (0.103)	-0.319** (0.130)
N	3,355	3,355	3,355	3,355	3,355
Women					
Proportion	0.637	0.054	0.202	0.093	0.819
Negative state GDP growth rate	0.167 (0.119)	-0.076 (0.086)	-0.023 (0.084)	-0.030 (0.077)	0.191* (0.116)
N	3,544	3,544	3,544	3,544	3,544

Note: All models estimated with two-stage 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 state characteristics at the time of school-leaving; personal characteristics; respondent's on-time and expected-year school-leaving fixed effects; and state of residence at age 14 fixed effects. A period of negative state GDP growth rate is when the real state GDP declined between (*t-1*) and (*t*).

***; **; * = statistically different from 0 at the 1, 5, and 10 percent levels.

APPENDIX 10.
Effect of the State Unemployment Rate at the Time of School-Leaving on Marriage and Fertility Outcomes at Age 45 with State-Level Marriage Controls Matched to Modal Marriage Ages: Weighted Instrumental Variable Models

	Married	Cohabitation	Divorced	Never Married	Any Children
Men					
Proportion	0.633	0.057	0.167	0.138	0.752
School-leaving state unemployment rate	-0.046*** (0.010)	0.008 (0.008)	0.026*** (0.009)	0.014* (0.008)	-0.021*** (0.007)
N	3,355	3,355	3,355	3,355	3,355
Women					
Proportion	0.637	0.054	0.202	0.093	0.819
School-leaving state unemployment rate	0.008 (0.008)	-0.004 (0.006)	0.002 (0.007)	-0.003 (0.006)	0.015* (0.009)
N	3,544	3,544	3,544	3,544	3,544

Note: All models estimated with two-stage 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 state characteristics at the time of school-leaving; personal characteristics; respondent's on-time and expected-year school-leaving fixed effects; and state of residence at age 14 fixed effects. State-level marriage controls (male-to-female ratio, unilateral divorce law, and maximum AFDC benefit for a family of four) are matched to modal marriage ages for men (25 years) and women (23 years).
***; **; * = statistically different from 0 at the 1, 5, and 10 percent levels.

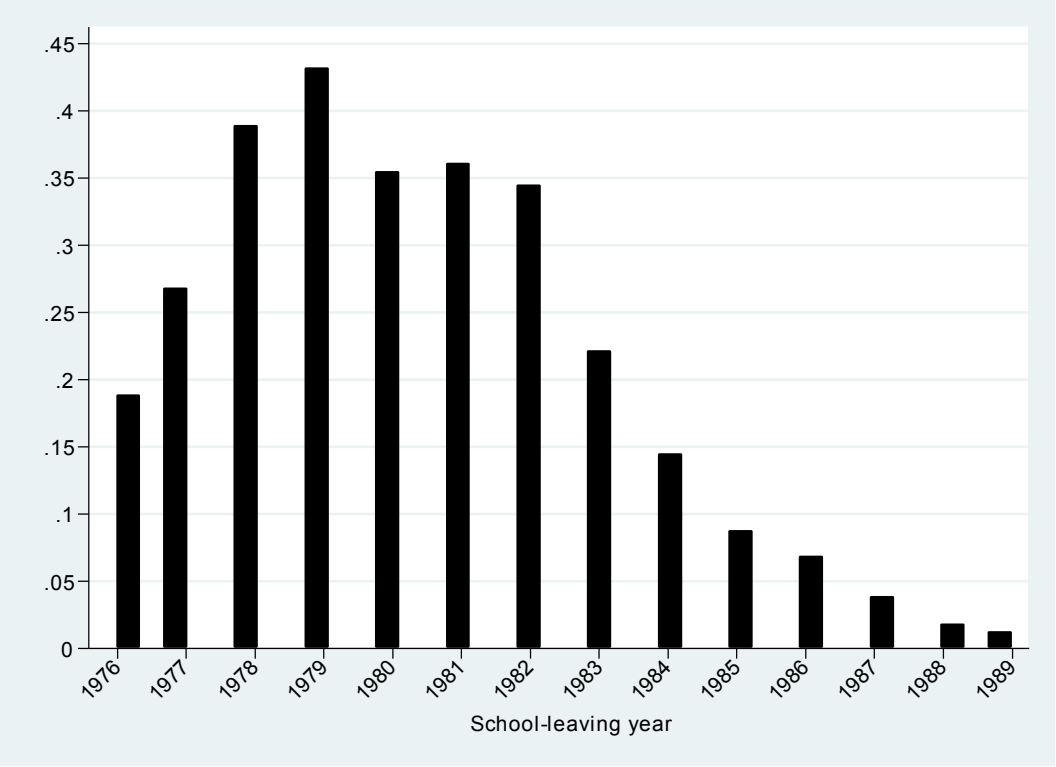
APPENDIX 11.

Effect of the State Unemployment Rate at the Time of School-Leaving on Marriage and Fertility Outcomes at Age 45: Weighted Instrumental Variable Models with School-leaving State-Specific Linear Time Trends

	Married	Cohabitation	Divorced	Never Married	Any Children
Men					
Proportion	0.633	0.057	0.167	0.138	0.752
School-leaving state unemployment rate	-0.025*** (0.006)	-0.005 (0.005)	0.017** (0.007)	0.012* (0.006)	-0.012* (0.007)
N	3,355	3,355	3,355	3,355	3,355
Women					
Proportion	0.637	0.054	0.202	0.093	0.819
School-leaving state unemployment rate	-0.014 (0.011)	-0.004 (0.005)	0.022** (0.009)	-0.003 (0.004)	0.009 (0.012)
N	3,544	3,544	3,544	3,544	3,544

Note: All models estimated with two-stage 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 state characteristics at the time of school-leaving; personal characteristics; respondent's on-time and expected-year school-leaving fixed effects; state of residence at age 14 fixed effects; and an age-14–specific state-of-residence linear time trend.
***; **; * = statistically different from 0 at the 1, 5, and 10 percent levels.

Figure 1. Unweighted Distribution of School-Leaving Ages



Note: Unweighted.

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