Producing Adulthood:
Effects of Adolescent Employment on the Transition to Adulthood

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Abstract

Long-running debates about effects of adolescent employment have failed to reach consensus, possibly because studies frequently rely on local samples and fail to adequately address selection bias. Namely, the same characteristics that promote adolescent employment may also affect adolescent behavior and outcomes. Using the 2006 American Community Survey and state-level youth employment laws as an instrumental variable, this analysis estimates the effect of employment on adolescent fertility net of self-selection. Results indicate substantial self selection into work and a net positive effect of employment on adolescent fertility – particularly for low-income white women. Even in models addressing possible time-order problems, findings contradict self-selection, social capital, and opportunity cost explanations for effects of work. Complicating employment by occupation and earnings shows support for precocious development hypothesis, with implications for the transition to adulthood and social policy. Findings suggest employment speeds the transition to adulthood.

Introduction

Social scientists and politicians typically associate employment with positive attributes and outcomes – responsibility, self-reliance, contribution to society, and reduced crime are just a few. The 1996 welfare reform emerged from similar pro-work beliefs – encouraging employment through "welfare-to-work" policies was supposed to reduce adolescent fertility and dependence on the government (e.g., Murray, 1984). Desistance research associates employment with reduced criminal behavior (Laub and Sampson, 2003). But employment is an adult role; how does it affect adolescents?

Early employment may promote adult behavior, but which ones? Certain adult behaviors are discouraged among teens. One of the most problematic adult behaviors among teens is adolescent fertility. The US adolescent fertility rate is more than twice the average rate among European Union and other developed countries (UN, 2008). Youth employment is also 25% higher (ILO, 2006; BLS, 2008). Is there a relationship between employment and fertility among adolescent women?

Issues relating to the transition to adulthood are a matter of growing policy concern. The transition to adulthood is taking longer in the US and other developed countries (Furstenberg, 2008). Arnett (2004) and Kimmel (2008) even suggest this extension of adolescence represents a separate life stage. Adolescence is associated with deviance, crime, suicide, and accidents and extending it could have negative consequences. Why are youth growing up more slowly? Does working as a teenager affect the speed of transitioning to adulthood?

This paper explores these questions by examining the effect of adolescent employment on one critically important "adult" behavior: fertility. Working may encourage youth to grow up, but it may also encourage less desired adult behavior, such as fertility and substance use. These questions are not new. Concern over youth employment in the US dates to the early 1800s;

unions pushed for minimum age laws and Massachusetts passed the first state child labor law in 1836. Adolescent employment may have important developmental effects and could impact adult wage and employment rates. The current federal child labor laws were passed during the Great Depression, in the midst of a public debate about the potentially conflicting needs of child development and economic growth. The current economic downturn and increasing adult unemployment is likely, once again, to generate renewed attention to youth employment legislation.

Despite this on-going concern and studies dating to the 1970s (Elder, 1974), establishing a causal relationship between employment and other teenage behavior, such as fertility, is a challenge. Methodological flaws haunt the field. A majority of the work fails to adequately address selection bias, relies on local, non-representative samples, and studies short-term outcomes.

This paper addresses the challenge of causality using an instrumental variable to control for self-selection into early employment. Making use of the 2006 American Community Survey, it provides a different perspective than previous research by addressing self-selection with a recent nationally representative sample.

Theorizing the Effects of Adolescent Employment

A vast body of empirical and theoretical literature on the effects of adolescent employment identifies a number of different pathways through which adolescent employment may affect other behaviors. The following theories are outlined below: social control theory; precocious development hypothesis, which encompasses differential association theory; human capital theory; social capital theory; and the self-selection argument. Figure 1 outlines the conceptual framework of this study and the competing theories discussed below.

(Figure 1 about here)

The figure shows each of the theories, the associated mechanism, the hypothesized effect on the likelihood of fertility, and how the effect of work is predicted to differ depending on job type and income level.

Social control theory (McNeal, 1997; Steinberg et al., 1993) predicts a direct association between adolescent employment and youth fertility, suggesting that work increases independence from parents which reduces parental control over youth behavior. Adolescent employment interrupts socialization by parents because it increases economic and emotional independence and reduces parental control. Complicating youth employment, social control theory suggests that employment in adult environments – including service or manufacturing jobs, as opposed to jobs typically done by youth, such as lawn mowing or childcare – reduces social control by parents or the community, which is theorized to increase risky or age-inappropriate behavior (McNeal, 1997). In addition, high paying jobs increase adolescent autonomy more than others, so high paying adult jobs should increase the likelihood of fertility more than others.

Differential association theory (Sutherland and Cressey, 1974; Ploeger, 1997) proposes that employment exposes adolescents to a wider social network, including delinquent peers. This theory assumes peers at work negatively influence behavior, but the direction of influence probably depends on the type of job and neighborhood; work peers may be particularly delinquent for those in a low quality job and low income neighborhood, but for high income youth, work peers may be relatively positive. Alternatively, compared to peers they would otherwise spend time with outside of work, work peers may have a relatively positive influence on youth from low income neighborhoods. Thus, differential association might predict complex or even contradictory interaction effects of household income with employment.

Similarly, precocious development hypothesis argues that early adult role transitions are linked because one early transition exposes youth to a less sheltered, more negative adult world before appropriate social or developmental preparation. Due to this exposure, working during high school is expected to be associated with risk taking and behaviors deemed problematic during adolescence (Bozick, 2006; Bachman and Schulenberg, 1993; Greenberger and Steinberg, 1986), such as delinquent behavior or drug use but presumably sexual activity and fertility as well. Partly due to the unskilled jobs available, the model suggests working adolescents are exposed to deviant attitudes and values (e.g., materialism, cynicism, unethical behavior), which increases deviance (Greenberger & Steinberg, 1986). Newcomb and Bentler (1988) suggest that early transition to adult roles truncates important developmental sequences that promote interpersonal, cognitive, and coping skills necessary for success in those roles; youth who transition early require institutional and social network support in order to prevent negative effects. Like differential association, precocious development suggests a socialization mechanism for employment effects. Employment effects should depend on the type of job and how well it pays. Individuals in unskilled, low paying jobs should experience the most negative norms with the least social support. Like differential association theory, it suggests a complex relationship between employment and household income. It suggests a similar complex relationship of adolescent employment with race and ethnicity. Lack of job availability and discrimination by employers (Pager, 2003) could limit work opportunities for nonwhite and Latino youth to jobs that adults or white youth do not want – presumably unskilled and low paid jobs – where social influence is predicted to be the most negative. On the other hand, Wilson (1987) suggests high unemployment in black neighborhoods promotes deviant behavior, particularly among black urban youth. As Newman's (1999) *No Shame in My Game* suggests,

even low wage work could expose black and Latino youth to more normative influence than they might find in other settings.

The delinquent peer mechanism of differential association is subsumed under precocious development's less-sheltered context and deviant attitudes. Therefore, the two models are combined for this study and referred to as precocious development. This model predicts work will increase the likelihood of fertility, but effects should depend on occupational category and individual income, with unskilled, low paid work exposing individuals to the most negative socialization.

In contrast, social capital theory suggests that youth employment promotes exposure to prosocial peers and positive behavior (Wright and Cullen, 2004; Vazsonyi and Snider, 2008). Employment is expected to build affective ties and positive social networks in institutions and communities, which promote positive behavior (Hirschi, 1969; Sampson and Laub, 1993), such as reduced adolescent fertility. This supports Wilson's (1987) argument that high unemployment promotes youth delinquency and suggests the effect of work could be strongest among black youth. Mechanisms include peer and neighborhood influence. Skilled jobs should expose youth to the most positive peer influence and work should have a stronger effect for low-income, nonwhite youth.

Human capital or learning theory expects that realistic contact with the adult world and the expectation of skills and mature behavior (e.g., responsibility, dependability, punctuality, diligence, and self-reliance) will promote positive behavior (President's Science Advisory Committee, Panel on Youth, 1973; National Commission on Youth, 1980; Ruhm, 1995). But only select jobs help develop these characteristics and time spent at work could hinder other forms of human capital development, particularly educational attainment (Ruhm, 1995). Nevertheless, jobs that develop skills or expose youth to positive role models could have positive

effects that outweigh any negative effect of time diverted from school to work. Job characteristics, such as skill level, are a key mechanism for human capital theory, with skilled jobs having particularly positive effects on youth.

Opportunity cost theory (equivalent to countercyclical fertility theory in demography) suggests positive effects of adolescent employment because working adolescents perceive negative consequences for risky or deviant behavior. Having a child, for example, could jeopardize the employment and income of working youth (Brewster et al., 1993; Kraft and Coverdill, 1994; Rich and Kim, 2002). Opportunity costs should be strongest for skilled and high paying jobs and those from lower income backgrounds.

All of the theories outlined above suggest that adolescent employment affects fertility and that the relationship depends on the type and income level of the job. However, apparent effects of youth employment may be due to self-selection. For example, Gottfredson and Hirschi (1990) suggest that a lack of self-control causes both youth employment and behavior problems. Similarly, youth who are more likely to have a child may also be more likely to work for a number of reasons, such as lack of self-control or desire to establish autonomy. Despite agreement that it is important to address self-selection, authors point out that research on the effects of youth employment has not adequately done so (Paternoster et al., 2003).

This study adjudicates among the theories outlined above, combining and testing them together to understand how early employment affects youth.

Previous Research

Early local (Elder, 1974) and national studies (D'Amico and Baker, 1984) identified surprisingly high rates of youth employment and stressed its positive effects. Later research stressed the negative effects of work, suggesting it competes with school and developmental

needs (e.g., Greenberger and Steinberg, 1986; Marsh, 1991). In other words, research has yielded contradictory results. Recent studies focus on conditions when work has negative or positive effects or whether effects are due to selection (Bachman and Schulenberg, 1993; Ploeger, 1997; Paternoster et al., 2003). Even recent research, however, produces contradictory findings. Bachman and Schulenberg (1993) and Mihalic and Elliott (1997), for example, find negative short- and long-term individual effects. Mortimer and Johnson (1998) and Mortimer et al. (2002) find evidence for positive effects of work, often conditional on work hours or quality. These contradictory findings could be due to several limitations shared by related research.

The review below, complemented by Table 1, outlines several common limitations, which this study seeks to improve on: 1) reliance on local non-representative samples; 2) failure to adequately control for self-selection; 3) failure to investigate heterogeneous effects by background; 4) investigation of short-term outcomes; and 5) focus on work or work hours rather than skill-level or income. (The following section reviews empirical research on adolescent employment, but a brief review of empirical and theoretical literature related to adolescent fertility is available in Appendix A.)

(Table 1 about here)

Several studies rely on local samples, which do not allow generalization to the national level. For example, Mortimer et al. (1996) and Mortimer et al. (2002) use the Youth Development Study, which provides rich panel data and a very high retention rate (93%), but only includes youth from the St. Paul, MN public school district. The YDS under-represents minority and low-income youth, who are of interest to several of the theories explaining effects of adolescent employment. Although several studies use national panel data, the cohorts in these datasets generally experienced adolescence many years ago. For example, Ploeger (1997) uses the National Youth Survey, which includes youth who were teens 30 years ago. Paternoster et

al. (2003) use the fairly recent NLSY 1997 data, but even in this case the youth were teens 10 years ago and employment effects may have changed. Recent data is necessary to understand the contemporary effects of adolescent employment.

Self-selection is a challenge in studies of adolescent employment (Entwisle et al., 2000). Unobservable characteristics that promote youth employment are often related to the outcomes studied. For example, lack of self-control, low aspirations, or a desire for early adult status may promote both adolescent employment and other outcomes, such as fertility. On the other hand, responsibility, long-term goal setting, motivation, or a strong work ethic may promote youth employment and reduce the likelihood of adolescent fertility. From these perspectives, any apparent relationship between employment and fertility or other outcomes could be spurious.

Much research attempting to control for unobserved heterogeneity finds that most (Ploeger, 1997; Bachman and Schulenberg, 1993; Steinberg et al, 1993; Mortimer et al. 1996) if not all (Paternoster et al., 2003) of the purported relationship between adolescent employment and various outcomes is due to self-selection. But even these studies have limitations. As shown in Table 1, several studies control for previous measures of the dependent variable (e.g., Bachman and Schulenberg, 1993; Ploeger, 1997; Mihalic and Elliott, 1997), which does not capture unobserved differences. Several unobserved characteristics, such as motivation or self-control, could affect both the decision to work and fertility.

Much of the research on adolescent employment does not investigate heterogeneous effects of work by background factors such as race, ethnicity, and class. Different treatment effects of work could explain the contradictory findings of previous research. Even research that adequately controls for self-selection (Paternoster et al., 2003) does not investigate potentially heterogeneous effects by class and race and could misrepresent the effect of work.

Research frequently studies effects of adolescent employment on short-term, individual

outcomes – such as stress, substance use, and academic achievement, (Bachman and Schulenberg, 1993; Hansen and Jarvis, 2000). While short-term outcomes such as self-concept or GPA could have important long-term effects, these effects of employment could also dissipate quickly and have limited long-term consequences (e.g., D'Amico and Baker 1984 suggest the effects of work dissipate within 3 years). To assess whether youth employment has a significant impact on one's life (e.g., life course, the transition to adulthood, or adult outcomes) we should study its effect in the long-term or on outcomes that have long-term consequences, such as adolescent fertility. Births to adolescent mothers have negative socioeconomic effects for the teen mothers (An et al., 1993; Hofferth and Hayes, 1987) even net of self-selection (Lee, 2007). Adolescent fertility has important, long-term consequences for both mother and child as well as for society. Furthermore, unlike adult fertility, explanations of adolescent fertility frequently treat it as irrational and fail to address the potentially important role of employment.

Finally, previous research tends to focus either on employment broadly or, more specifically, on work intensity (hours per week) (Greenberger and Steinberg, 1986; Marsh, 1991; Bachman and Schulenberg, 1993; Ruhm, 1995; Mihalic and Elliot, 1997; Paternoster et al., 2003), often neglecting occupation type or skill level. Hansen and Jarvis (2000) study the effects of work context and find that hours worked is more important than context. However, they are limited by a small sample size (N=450), only 2 contexts (family enterprise vs. private sector), and do not address occupation type. Using a local sample, Mortimer et al. (2002) study effects of youth employment on mental health, conditional on job quality, and find quality is important. Yeung and Rauscher (n.d.) use the national PSID Child Development Supplement to study effects of youth work on behavior problems and find that job quality and intensity are important. However, effects of job quality on fertility may be different and neither study adequately addresses selection. The relative neglect of job type may be due to the concentration of working

youth in service and retail occupations (D'Amico and Baker, 1984; Herman, 2000; Besen, 2006). However, Staff and Mortimer (2008) stress the importance of studying effects of job quality and, given the importance of job type in the theories explaining effects of youth employment, it is important to include it in this study. (The relationships found between job type and adolescent fertility should not be understood causally, because the instrumental variable only controls for self-selection into employment, not type of work.)

Table 1 outlines key empirical studies on the effects of adolescent employment and highlights the shortcomings discussed above. This analysis improves on these previous studies in several ways. First, it uses an instrumental variable approach to address self-selection into employment. Second, data from the 2006 American Community Survey provides a large, recent, nationally representative data set, including detailed occupation codes to examine whether employment effects vary by type of work. Third, it explores interaction effects to identify potential heterogeneous treatment effects by race, ethnicity, and class. Fourth, it examines effects of adolescent employment on an outcome with long-term consequences: adolescent fertility. Taken together, this approach advances existing research on adolescent employment.

Data and Methods

Based on the conflicting theories identified above, key research questions are: 1) What is the relationship between adolescent employment and youth fertility, net of self-selection? 2) What factors explain or mediate this relationship? 3) How do job type (skill and age level), individual income, household income, race, and ethnicity affect the relationship? More specifically, this study tests the following hypotheses (see Figure 1 for a visual outline):

1) adolescent employment **increases** the likelihood of fertility
   (social control, procyclical, precocious development models)
2) adolescent employment **decreases** the likelihood of fertility

(social capital, opportunity cost, countercyclical models)
3) adolescent employment **has no effect** on the likelihood of fertility (self-selection)

Within those findings:

4) skilled/adult/high paying employment increases the likelihood of fertility (social control, procyclical models)
5) skilled/high paying employment decreases the likelihood of fertility (precocious development, social capital, opportunity cost, countercyclical models)

Data

The 2006 American Community Survey (ACS), conducted by the US Census Bureau, provides public use household level data (including employment and fertility) and a large sample size to contend with the large standard errors of an instrumental variable approach. As of 2005, it samples households from every county in the US and includes individuals in group quarters since 2006. The ACS uses a series of monthly samples and, in contrast to the Current Population Survey, a rolling reference point (i.e., the week or year prior to date of survey response) to collect data throughout the year. This allows more sensitive measures of employment status, which may change throughout the year.

The overall ACS 2006 sample size is 2,969,741, of which 20,740 are females aged 17. Analysis is limited to 17 year olds because they are most sensitive to the instrumental variable. Excluding youth who have ever married, are not in school, live on their own, are noncitizens, from Alaska, or have allocated values for key measures results in a total sample of 16,306 17 year old females. These exclusions do not change the results (although they make the effect of work slightly less significant in models with race, ethnicity, and household income interactions), but they prevent the need to control for other endogenous factors (such as school dropout or marriage) and allow analysis of the "typical" US teenager, who lives with a parent, has never

married, and is in school. (See Appendix B for additional details about these exclusions and the ACS in general, including sampling and reliability.)

Dependent Variable

Fertility is measured using the following question answered by females ages 15 to 50: "Has this person given birth to any children in the past 12 months?"

An index of early transitions is created to assess whether effects of adolescent employment are limited to fertility, or apply more broadly. It includes whether an adolescent: had a child in the last 12 months; has ever been married; is not in school; or is living independently (as head of household, spouse, partner, boarder, or housemate).

Key Independent Variable

Youth employment is measured with the question "When did this person last work, even for a few days?" Responses available are: within the past 12 months; 1-5 years ago; and over 5 years ago or never worked. Youth employment includes those who worked within the past 12 months. A dummy variable for working 1 to 5 years ago is also created to address time-order concerns, given the cross-sectional nature and rolling reference point of the ACS. Although pregnancy could precede working with these measures, working 1 to 5 years ago would predate fertility (in the last 12 months) for everyone and predate pregnancy for the majority. (See Appendix B for details and concerns about measures.)

Working for a few days is a broad definition of employment, but captures youth employment that would be excluded otherwise. To address concern about this broad definition, a narrower measure is constructed for youth who worked at least 40 weeks in the past 12 months, limiting work to fairly consistent, long-term employment. The ACS does not include work intensity (hours per week), which Greenberger and Steinberg (1986) have identified as an

important factor in youth employment. However, explanations for a relationship between adolescent employment and fertility focus more on job type rather than time factors. While time at work may be important, this study does not address it.

Job skill level is theoretically important so jobs are categorized as skilled, service, and labor according to the standard occupational classification codes. Skilled jobs are defined broadly (see Appendix B) to help differentiate youth workers, who are overwhelmingly concentrated in service work; they include managers as well as occupations associated with high status or skill requirements. Job context (adult vs. youth) is also theoretically important. Jobs with the highest concentrations of youth according to the 2006 ACS should expose adolescents to a more youthful and less adult environment than others. High youth jobs (occupation codes holding 4% or more of 17 year olds working in the last year) include: waitress; cashier; retail sales; food service or sales; food preparation; restaurant hostess; and childcare.

Instrumental Variable

Most states either do not require employment certification or only require it until age 16. Living in a state that requires employment certification (a "work permit") until age 18 creates a small but additional barrier to employment for 17 year olds. It is an exogenous shock on adolescent employment, exploited here to control for self-selection. Work permits require extra steps in the employment process for both adolescents and potential employers. If a 17 year old is interested in working and lives in a state requiring work permits until age 18, she must follow the application process for approval from the appropriate authority. In general, potential employers in these states must sign and keep work permits on file for employees under age 18, verifying that youth will not be exposed to inappropriate work duties, environments, or hours. (Appendix C provides an example of additional obstacles faced by 17 year olds in these states.)

A review of state youth labor laws suggests they are not systematically related to region, main industry in the area, or urbanization. Table 2 outlines state differences in minimum age laws for various certifications.

(Table 2 about here)

Looking at those under the Age 18 column, for example, not all are agricultural, rust belt, southern, urban, or coastal. To check further for potential correlation between state characteristics and age restrictions, Figure 2 depicts the instrumental variable visually.

(Figure 2 about here)

It shows that states requiring work permits until age 18 are spread throughout the US and are in every region. While this requirement looks more common in urbanized states, it is not a perfect correlation; Florida, Illinois, and Massachusetts do not require it for example. In models addressing time order concerns, states requiring a work permit until ages 16, 17, or 18 are used as the instrumental variable. This broader instrument is necessary to contend with the broad time range in the work measure (worked 1 to 5 years ago).

Figure 3 shows state fertility rates for 15-17 year olds, for comparison with Figure 2.

(Figure 3 about here)

Comparing Figures 2 and 3 suggests that adolescent fertility is not correlated with the instrumental variable except through employment. In short, employment certification laws appear to be an exogenous influence on adolescent employment, and therefore a good instrumental variable. However, readers should interpret results with caution, because if they are related the results would overestimate the effect of employment on fertility.

Potential Mediators and Additional Control Variables

Regressions include several potentially mediating variables that are not endogenous for adolescents, who lack control over their place of residence and parental characteristics. These include: living in a state with a high proportion of Catholics (31% or more in 2000); living in a state with limited access to family planning; state male incarceration rate; female headed household; number of people in the household; and head of household education (measurement details are in Appendix B. A measure of generation age gap is constructed but not included in models shown because of missing values. Including it does not change the results).

Although potentially endogenous variables are excluded from early models, individual educational attainment and income are added in later regressions that include other potentially endogenous variables, such as type of job. Reported individual income is measured in $10,000s due to the small coefficient. Those in the top 40% ($2,500 for those who worked in the last year; $5,000 for those who worked more than 39 weeks) of individual incomes are considered to have a high paying job.

At the individual level, models control for race, ethnicity, and household size-adjusted income. Additional controls include the number of state child labor enforcement officers, region, and proportion of the state below poverty to reduce potential state-level effects and address potential issues with the instrumental variable (such as differences in enforcement). (See Appendix B for measurement details.)

Modeling Strategy

Two-stage linear probability models are used to estimate the effect of employment on adolescent fertility, correcting for endogeneity with the instrumental variable (IV). Figure 4 outlines the model below (Freedman, 2005: 187).

(Figure 4 about here)

1st stage regression: $E[P\{X_i^* = 1 | Z_i, S_i, \varepsilon_i\}] = aZ_i + bS_i + \varepsilon_i$

2nd stage regression: $E[P\{Y_i = 1 | X_i^*, Z_i, S_i, \gamma_i\}] = cX_i^* + dS_i + \gamma_i$

Here X^* is predicted employment; Y is likelihood of fertility; Z is the IV – whether a work permit is required until age 18; S is a set of control variables; and ε and γ are error terms. The second stage regression uses the predicted employment probability from the first stage, where Z has controlled for some exogenous variance. A two-stage linear probability model is used because OLS or logit models would incorrectly estimate the effect of employment on fertility due to potential self-selection on a number of factors.

Coefficients are expressed in probabilities and the key parameter is c, which estimates the effect of work on fertility without self-selection bias. This estimate can be thought of as the difference between the adolescent fertility rates in states that require work permits until age 18 and in those that do not, divided by the difference between adolescent employment rates in the same groups (net of control variables in S).

A significant effect of work on fertility using the IV approach would suggest the relationship is not due to self-selection. Due to correlation of observations at the state level, all regressions use Huber-White standard errors adjusted for intra-state correlation, providing robust standard errors despite state-level clustering of the data (Froot, 1989). All models presented include sampling weights; omitting weights makes the relationship between work and fertility more robust. Variance inflation factor tests yield averages less than 2.2, suggesting multicollinearity is not a concern.

Concerns about the use of an instrumental variable model are that the instrument is not exogenous (which cannot be tested directly), that the instrument is "weak," meaning it does not substantially affect the endogenous variable, or that it pushes some in opposite directions (lack of

monotonicity). Applied to this study, the concerns are that state employment certification laws are directly related to adolescent fertility (addressed above), that they change the work decisions of very few youth, or they result in defiance – with the additional obstacles perversely encouraging some to work for example. In all cases, effects would be overestimated. In this analysis, nearly all of the first stage regressions have an F statistic greater than 5 and often above 10, which suggests a sufficiently strong effect of the IV on youth employment (Bound et al., 1995). In addition, Wald F statistic tests of IV strength in most models meet Stock and Yogo (2005) critical values, often at their highest threshold. Exceptions occur in models of working 1 to 5 years ago (only meant to show similar results as a time-order check) or in models including interaction effects. All tables show IV strength tests and models with weak values should be interpreted with caution.

To check for direct effects of the IV, regressions of fertility on the IV for groups whose outcome should not be affected (e.g., 15 year old youth in this case) show no direct relationship. Regressions of the IV on fertility for ages 16 to 19 also show no significant direct relationship. Regressions of the IV on potential intermediate effects (e.g., not being in school, living on one's own) also show no direct relationship. Finally, youth employment rates are lower, on average, in states requiring work permits until age 18. The lowest youth employment rate occurs in a state requiring certification until age 18, and the highest rate occurs in a state that does not. This supports the monotonicity assumption. These steps cannot rule out the possibility that the IV lacks monotonicity or directly affects adolescent fertility, but they further reduce the possibility.

The linear probability model used here may result in predicted probabilities of fertility outside the 0 to 1 range. This is problematic, but the main interest here is the direction rather than magnitude of influence and correcting for self-selection is not possible with a logit approach. In addition, Hellevik (2007) finds evidence supporting the use of linear models for a

binary dependent variable. The results below present two stage linear probability models as well as OLS and logit models for comparison. In all models, the endogeneity test of adolescent employment suggests the IV approach is an improvement over OLS. This test is essentially equivalent to a Hausman test, but for clustered data. (Models use ivreg2 in Stata 10.)

A problem with cross-sectional data such as the ACS is establishing time order. While the IV approach should deal with time order by controlling for selection into employment based on pregnancy or fertility as well, time-sensitive variables in separate models provide an additional check. First, fertility is regressed on whether the youth worked in the last 12 months, but there may be reverse causality, with fertility (or known pregnancy) promoting employment. To address this, fertility is regressed on working 1 to 5 years ago for youth aged 17 to 19. Because of the broad time range, the IV in this model is whether a state requires work certification until age 16, 17, or 18. Few women are immediately aware when they become pregnant, and adolescents are particularly unlikely to learn early on in a pregnancy. For the adolescents who delivered early in the year, it is possible they knew before starting work. However, given the time frame, for the vast majority working 1 to 5 years ago, it is unlikely they knew they were pregnant before deciding to work. Using these variables, the timeline is such that it is unlikely that pregnancy would lead to employment rather than vice versa. Finally, adolescent fertility is also regressed on working at least 40 weeks in the last year to assess whether results are simply due to the broad definition of work.

Results

Descriptive Statistics

Table 3 shows descriptive statistics for all dependent, mediating, and control variables. There are significant differences between white, black, Asian, and Latino youth, with black and

Latino young women more likely to: experience fertility, have more early transitions, live in a low income female headed household, and live in a state in the Northeast with a lower proportion of Catholics, higher abortion restrictions, and a higher male incarceration rate. Asian, black, and Latino young women also have a smaller household generation age gap, more people in their household (not significantly different for black youth), and a less educated household head. State abortion restrictions tend to be higher for black youth, but lower than average for Latino and Asian youth. These descriptive statistics echo previous racial inequality research. Out of concern for the exogeneity of the instrumental variable, it is notable that black, Asian, and Latino young women are more likely to live in a state that requires employment certification until age 18. (Asian youth are more likely and Latino youth are less likely to live in a state requiring a work permit until age 16, 17, or 18, the IV in models assessing time order concerns.)

(Table 3 about here)

Table 3a shows descriptive statistics for employment and occupation variables.

(Table 3a about here)

Employment, including working more than 39 weeks, is more common among white than black, Asian, or Latino young women and white youth have higher incomes. Young white and black women are significantly more likely to be in service jobs.

Table 3b shows characteristics of those who worked in the last 12 months.

(Table 3b about here)

Comparing Tables 3 and 3b indicates differences between workers and nonworkers. Young women who worked in the last year are more often white, less often Latino, and tend to come from households with higher size adjusted income, fewer people, and two parents who are more educated. Contrary to assumptions and findings in the literature that youth employment competes with educational attainment (e.g., Mihalic and Elliot, 1997; Marsh, 1991), 17 year old

women who work tend to have completed slightly more education than nonworkers. Among those who work, black, Asian, and Latino youth earn more than white young women. All of these observable differences suggest there may be important unobservable differences and confirm the need to address self-selection into employment.

Regression Analysis

Table 4 compares two-stage least squares (2SLS) linear probability models with OLS and logit models predicting youth fertility using employment in the last 12 months and covariates. The right side of Table 4 shows similar results in models of fertility regressed on working 1 to 5 years ago among 17-19 year olds, suggesting time order is not a major concern. The endogeneity test of work is significant (in models 1, 2, and 5), suggesting the 2SLS models are an improvement. OLS and logit models show a negative relationship between working in the last 12 months and fertility (but only significant at $p<.10$ in the logit model). In contrast, after controlling for self-selection, the IV models suggest that working slightly (but significantly) increases the likelihood of fertility. This suggests many adolescent women who are unlikely to have a child self-select into employment. In contrast, working 1 to 5 years ago has a positive relationship with fertility in the 2SLS, OLS, and logit models, although the magnitude of the coefficient is much larger after controlling for self-selection in the 2SLS model. The stronger effect of work in the 2SLS model suggests that, even at an early age (the range includes youth ages 12-18), adolescent women who are less likely to have a child are more likely to work, resulting in an underestimation of effects of employment in OLS and logit models. It is important to note that working 1 to 5 years ago measures both the effect of early work and also of no longer working, which probably explains part of the large magnitude of the effect of

working 1 to 5 years ago. Overall, the consistent positive effect of work on fertility contradicts countercyclical, human capital, social capital, and self-selection arguments.

This positive effect is robust across various models, but does not hold in bivariate models, which suggests the effect of employment is suppressed by other factors associated with both work and fertility. According to Maassen and Bakker (2001), the likelihood of suppressor effects increases with the reliability of a variable. The reduced measurement error associated with an instrumental variable approach therefore makes suppressor effects likely. In models without probability weights, working appears to increase fertility for adolescent women relative to others in the same region and state poverty level. Applying weights (as all models presented do), the effect of work is significant when controlling for race, ethnicity, state poverty rate, and number of state child labor officials (as a proxy for enforcement). All of these factors are likely confounders, affecting the likelihood of both adolescent work and fertility.

Tests of IV strength – first-stage F and Wald F statistics – all exceed required strengths in Models 1 and 2, suggesting a weak IV is not a concern. However, tests in Model 5 are borderline, suggesting effects of work may be overestimated in the early employment model. Nevertheless, the effect of work in Model 5 is more than five times the standard deviation of fertility.

(Table 4 about here)

Factors significantly associated with fertility, in addition to employment, include racial identification; black, Asian, or Latino identification increases the likelihood of fertility. Household size adjusted income has a negative relationship with fertility. The number of state child labor officials, a measure of state child labor law enforcement, has a slight negative association. This suggests institutional concern for youth, aside from family planning, may help

prevent adolescent fertility. The proportion of the state in poverty and living in the South have significant but slight associations.

Potential cultural and structural mediators, added in Model 2 – including female headed household, people in the household, parental education, access to family planning, high rates of Catholicism, and male incarceration rate – all have significant associations with fertility (except male incarceration rate) in the expected directions, but do not mediate the work-fertility relationship.

Table 5 shows interaction effects by race, ethnicity, and household income.

(Table 5 about here)

Significant interaction terms indicate that heterogeneous treatment effects of employment exist by race and ethnicity. Compared to white youth, working does not increase fertility for black, Asian, and Latino youth. Figure 5 depicts this relationship visually, showing the difference in the predicted probability of fertility between an otherwise identical worker and nonworker by race and ethnicity.

(Figure 5 about here)

An interaction effect between household income and employment is not significant. However, Model 3 in Table 5 shows the strong, significant effect of work on fertility only among those from lower income households (less than $30,000). In contrast, models (not shown) limited to higher income youth consistently show no effect of work on fertility. These interactions suggest employment has a stronger effect on adolescent women from low income backgrounds, particularly whites.

Table 6 shows differences in the effect of employment by individual income and job categories. The type of occupation has a significant effect, as predicted by many of the theories.

(Table 6 about here)

Model 1 in Table 6 suggests that skilled and labor jobs have a lower overall positive effect of working on fertility than service jobs. This dampening effect of skilled occupations relative to others on adolescent fertility contradicts social control and procyclical theories. It supports precocious development hypothesis, which suggests that the negative effect of working is due to lack of developmental readiness and deviant norms at the low skilled jobs generally available to youth. Occupations that counteract the positive effect of employment probably convey norms and education against age-deviant behavior, such as fertility. In support of precocious development, skilled occupations may promote development of psychosocial skills, making up for the truncated development caused by early entry to work. However, finding similar effects on fertility for labor occupations suggests a more complicated story. Labor jobs are generally perceived to promote prematurely adult or even deviant values. However, these jobs could provide strong rules (e.g., the military) or anti-fertility norms for reasons this data cannot identify. For example, labor jobs may be masculinized and discourage female behaviors including fertility. Figure 7 illustrates the effect of different types of jobs.

(Figure 7 about here)

Like job type, Figure 7 shows that individual income plays an important role in the relationship between work and fertility. Teens in high paying jobs are less likely to have a child, regardless of job type. Working in a high paying, skilled or labor job reduces the effect of employment almost to zero.

Finally, theories differ in their expectations about the effects of youth vs. adult types of jobs. Models 2 and 3 in Table 6 show the effects of youth jobs and youth jobs excluding childcare (which does not encourage exposure to other teens) relative to other, more adult jobs. Figure 8 illustrates this relationship.

(Figure 8 about here)

The results suggest adult jobs have a larger effect (encouraging fertility) and jobs performed mainly by youth have a much smaller effect on fertility. This is consistent with social control theory, but skill level and individual income are more consistent with precocious development hypothesis. In addition, this stronger effect of adult jobs is also consistent with precocious development hypothesis, because adult jobs involve more exposure to adult attitudes and norms – the key mechanism of precocious development.

The results above show a relationship between adolescent employment and fertility, but effects could be limited to fertility. Table 7 shows regressions of early transitions on work and other factors. Early transitions are an index of whether an adolescent: had a child in the last 12 months, has ever married, is not in school, or is no longer living with their parents. The model is incomplete, has time-order concerns, and does not control for many factors potentially related to marriage, dropping out of school, or establishing an independent household, but it suggests a strong relationship between adolescent employment and early transitions to adulthood in addition to fertility. Models regressing early transitions on working 1 to 5 years ago show similar results, which slightly reduces but does not adequately address the time order concerns.

(Table 7 about here)

Comparing the IV approach in Model 1 (showing a significant test of employment endogeneity) to OLS and logit models further supports the need to address self-selection in research on adolescent employment. The relationship in Model 1 is consistent with precocious development hypothesis and supports the social construction of adolescence. Results suggest that passing one milestone in the transition to adulthood speeds the time to the next one.

Generalizability

IV models identify the local average treatment effect – the effect of working for youth who are borderline about their decision to work and can be swayed one way or the other depending on state employment certification requirements. It could be that employers are the determining factor and choose to hire fewer adolescents in states requiring work permits. If this is the case, results are more generalizable to all 17 year old women (or 17-19 year old women in the early work models). In general, the results do not apply to youth who would work regardless of state laws or those who would never work.

Information about male adolescent fertility is not available in the ACS. This analysis is limited to adolescent women and there may be heterogeneous effects of adolescent employment by gender, not assessed here. Nevertheless, this study contributes to our understanding of adolescent employment by: controlling for self-selection; using recent nationally representative data; complicating employment by occupation type; and investigating heterogeneous effects.

Conclusion

The results suggest that youth who choose to work as an adolescent have a lower likelihood of fertility; self-selection is a concern in research on youth employment. Nevertheless, IV models suggest that the relationship between adolescent employment and fertility is not spurious and, not only does self-selection not explain the effects, but failing to account for self-selection into youth employment results in underestimating its effects.

Results support precocious development hypothesis. The evidence shows that youth employment increases the likelihood of fertility (and is associated with other early transitions), but that the relationship depends on individual earnings, type of occupation, class background, race, and ethnicity. Thus, contrary to implicit assumptions in the 1996 welfare reform, reducing welfare benefits and encouraging employment seem unlikely to reduce adolescent fertility.

Although this analysis cannot directly assess whether workplace norms and attitudes mediate the work-fertility relationship, effects of job type and income are most consistent with precocious development hypothesis. Results suggest that exposure to adult roles and values encourages fertility and adult transitions, but that jobs offering the most positive values and support (skilled, high paying, or youth jobs) result in a smaller overall increase in the likelihood of fertility relative to others. The lower association between labor jobs and fertility may be due to stronger rules or masculine norms. This support for precocious development hypothesis helps account for some of the previous contradictory findings; research frequently labels outcomes as "positive" or "negative" (e.g., Entwisle et al., 2000 and see the Effects column of Table 1) but precocious development suggests "adult" vs. "adolescent" behavior may be a better characterization. Many of the previous findings of both positive and negative effects of adolescent work may be consistent with precocious development and early "adult" behavior.

The heterogeneous effects of adolescent employment by race, ethnicity, and class may help explain the different pathways to adulthood these youth experience. The emerging adulthood concept identified by Arnett (2004) seems to apply mainly to youth from higher class backgrounds. Findings suggest that employment can have long-term negative effects on white adolescent women from low-income backgrounds. Rather than providing an opportunity for self-discovery and experimentation, which Arnett (2004) and Erikson (1950) suggest are so important for adolescent development, adolescent employment nudges youth from different racial, ethnic, and income backgrounds onto very different life paths with long-term consequences.

Adolescent employment has changed in the decades since Elder's (1974) pioneering study. Youth are now concentrated in service jobs which, this study suggests, have the most negative effects. Employment is a key adult role and a central milestone in the transition to

adulthood. Results suggest that delaying employment can further delay other transitions to adulthood, such as parenthood, depending on one's background. The economic recession could reduce adolescent employment and further slow the already lengthening transition to adulthood identified by Furstenberg (2008), Arnett (2004), and Kimmel (2008). However, findings suggest this delay by itself could have positive effects for lower income, white adolescent women and minimal effects for nonwhite and high income youth.

The evidence suggests social situation affects youth decision making – it is not simply determined by brain development (Weinberger et al., 2005) or psychological factors associated with adolescence, such as lack of self-control or delayed gratification (Gottfredson and Hirschi, 1990). Results also contradict broader deterministic models of adolescent development (G. Stanley Hall and Freud). Social factors and individual actions influence the pace of development, adding further support for the social construction of adolescence.

Adolescent employment encourages adult behavior. The challenge is that society has contradictory expectations of adolescents – we want them to behave like adults in some respects but not others. In deciding whether adolescents should work, society should consider whether it wants more adult behavior (including both the "good" and the "bad") during adolescence. At the same time, criticizing stereotypical adolescent behavior is futile; adolescents will "grow up" – with all the accompanying "good" and "bad" behavior – when exposed to adult roles. Further research could address whether social norms and attitudes at work indeed explain the relationship identified here and what mechanisms could explain the heterogeneous effects of employment by social background.

Appendix

A. Adolescent Employment and Fertility

There is an assumption that employment or labor market attachment affects fertility among adult women. Theories of fertility for the whole population (read adults) offer contradictory expectations. Countercyclical fertility (Butz and Ward, 1979) suggests that increased female labor force attachment, usually tied to economic growth, reduces fertility – at least where women contribute a significant part of the household resources. Opportunity costs of fertility are suggested to be higher during economic growth and for employed women who contribute substantially to the household income. For example, this theory predicts stronger opportunity costs for black compared to white women because they often contribute a higher proportion of the household income. On the other hand, procyclical fertility suggests that economic growth increases fertility and recessions reduce it (Galbraith and Thomas, 1941; Silver 1965; Thomas 1925) because resources to support a child are greater during economic growth. These are long-standing, basic theories, but it is unclear how they relate to adolescents.

Whether through resources (Galbraith and Thomas, 1941; Silver, 1965), opportunity costs (Becker, 1960; Butz and Ward, 1979), or social norms and the status of women (Sacerdote and Feyrer, 2008), adult female employment is frequently tied to fertility. Adolescent fertility, however, is frequently explained by individual personality or characteristics (Schneider, 1982; Schinke et al., 1979) or family planning access and use (Boonstra, 2002).[1] Psychologists, for example, portray adolescent fertility as due to individual mental deficits: lack of self-esteem, desire for adult status, or lack of self-control (all factors that may be related to the decision to work). Others stress the structural factors of sex education and access to family planning. These explanations typically assume adolescent irrationality or powerlessness. In short, adolescents are treated as "a tribe apart" (Hersch, 1999). Yet adolescent employment may be related to fertility for a variety of reasons (e.g., resources, opportunity costs, social norms, peer effects, autonomy from parents, or early exposure to adult contexts).

Cultural (Anderson, 1990), structural (South and Baumer, 2001), psychological (Young et al., 2001), and health (Geronimus, 1992; 1996; 2001) explanations suggest that factors other than work are important for adolescent fertility. This analysis includes cultural and structural factors, controlling for the proportion of one's state that is Catholic and an index of the ease of access to family planning, but cannot address health and psychological explanations.

[1] Exceptions that examine the relationship between adolescent work and fertility include Colen et al. (2006), Kraft and Coverdill (1994), and Rich and Kim (2002). But research tends to focus on young adults rather than teens. Kraft and Coverdill (1994) include the effects of job holding continuity and wages on contraceptive use among older teens and young adult women, but fail to address self-selection. Colen et al. (2006) make an important contribution by studying changes in adolescent fertility in relationship to employment opportunities and asking how this relationship differs by race. They find a relationship between higher employment rates and lower fertility rates among black women aged 15-24 and no relationship for similar white women. They attribute this relationship to increased opportunity costs in a booming economy, but they do not study employment at the individual level so the relationship may identify youth reactions to employment of those in their household or social networks.

B. Additional Details about the American Community Survey and Measures

Housing unit sampling rates depend on the occupied housing units per block, the number of blocks in a tract, and previous response rate, but range from 1.6% in denser areas to 10% in others. Individual weights incorporate household weights and correct for differences in probability of selection to the sample. The ACS sampled almost 2.9 million housing units, which led to over 1.9 million household interviews, and almost two hundred thousand individuals in group quarters, resulting in 145,311 interviews with individuals in group quarters. The overall response rate was 97.5% with a national coverage rate of 98.7% for housing units but only 76.2% for group quarters, resulting in a 94.4% coverage rate for the entire US population.

To address nonresponse or invalid answers, the ACS allocates values based on answers to other questions or using statistical comparisons to others in the household or neighborhood. All analyses exclude individuals with allocated values for fertility, when last worked, weeks worked last year, marital status, and school enrollment. Allocation rates of these variables for the ACS sample of 17 year old women are as follows: fertility – 3%; when last worked – 4%; weeks worked – 4%; marital status – 1%; and school enrollment – 3%. Including allocated values does not change the results. Individuals living in Puerto Rico are excluded due to lack of data on some state-level variables. (See www.census.gov/acs/www/SBasics/ for further information about the ACS design and sampling.)

Validity

ACS annual data is an aggregate of monthly surveys, with a rolling reference point. Age at the time of the survey is available, but year of birth is not. Therefore, we cannot know for sure what age an individual was when giving birth or whether the birth occurred in 2005 or 2006. Because surveys occur throughout the year, many of the births to 17 year olds in the 2006 ACS occurred in 2005 and while the teen was 16 years old. Therefore, to assess data validity, the fertility rates for 17 year olds in this sample should be compared to rates for 16 and 17 year olds in 2005 and 2006.

Among this sample of 17 year old females, 1.4% (1.3% unweighted) had a child in the previous 12 months (2005-2006). This compares to a rate of 1.3% in both 2005 and 2006 using births to 16 and 17 year olds from the National Vital Statistics System[2] and total population of females 16-17 from the Bureau of Labor Statistics Current Population Survey.[3] Both the sample used here and BLS data exclude institutionalized youth. The rate for all 17 year olds in the ACS (including those not in my sample) is 2.4%. According to the NVS 2006 report, the fertility rate of adolescents age 15-17 was 2.1% in 2005 and 2.2% in 2006 (Martin et al., 2009: 42) comparing to 1.4% in the ACS data. Rates for 15-19 year olds were higher, at 4.05% and 4.19% in 2005 and 2006, respectively, comparing to 2.74% for 15-19 year olds in the ACS 2006 data.

All of this suggests that the ACS sample is relatively valid, but may have a lower rate of adolescent fertility than the population as a whole, except for the 16-17 year old fertility rate calculated using BLS data. The difference may be due to a number of factors: 1) most importantly, ACS data is based on fertility in the last 12 months, not age, so ACS rates should be compared to 14-17 and 14-19 year old birth rates, which would be lower but are not available; 2) the rolling reference point could allow some measurement error, with teens accidentally excluding some births 11 months ago; and 3) the sample could include fewer teens at risk for

[2] www.cdc.gov/nchs/nvss.htm or Martin et al. 2009. *National Vital Statistics Reports*, 57, 7. Washington, DC: US Dept of Health and Human Services.

[3] www.bls.gov/cps. NVSS aggregates ages 15-17, so population data from the BLS is used as the denominator to calculate a fertility rate among 16-17 year olds.

adolescent fertility. The person weights generally reduce the difference between ACS and other measures of adolescent fertility rates (except in the case of sampled 17 year olds), which suggests using them in regressions could reduce bias. Weights are used in all analyses. However, regressions (not shown) without weights indicate a more robust relationship between adolescent employment and fertility. Because of the possibility that the weights are not appropriately calculated for adolescents, and disagreements about the use of sampling weights in regressions, results shown here could understate the relationship.

According to the Bureau of Labor Statistics (www.bls.gov/data), 33% of 16-17 year old females were in the seasonally adjusted civilian labor force in 2005 and 2006. The unadjusted labor force participation rate was 34% in both 2005 and 2006. This compares to 43% (42% weighted) of females aged 16 to17 in the 2006 ACS. Again, the higher ACS rates of employment could reflect sample bias, but are probably largely due to the broader definition of employment, which includes anyone who worked even for a few days in the last 12 months rather than those currently in the labor force. This broader definition is appropriate for teenagers, who cycle in and out of work more frequently than adults. Even if youth are no longer currently working, the ACS captures previous employment that other surveys may miss.

Exclusions

The sample of 17 year old women excludes those who: have ever married (310; 1%); are not in school (an additional 1107; 5%); are head of a household or living alone (a further 162; 1%); have allocated values for marital status (another 270, 1%), school enrollment (another 466, 2%), when worked (another 497, 2%), weeks worked (another 520, 2.5%), or fertility (another 108, 0.5%). Noncitizens (an additional 744; 4%) and those living in Alaska (an additional 43; 0.2%) are excluded to strengthen the instrumental variable. Noncitizens may be less affected by youth age employment laws and Alaska uniquely requires employment certification until age 17, which is the age group most sensitive to other state laws. Finally, the sample excludes those without head of household educational attainment data (an additional 207; 1%) to make results comparable across regressions and because parental or household education may play an important role in both adolescent employment and fertility. This prevents the need to control for endogenous factors and allows analysis of the "typical teenager."

With very minor exceptions, these exclusions do not change the results. In models assessing heterogeneous effects by race and ethnicity, results remain the same as the "typical teenager" model until including youth with allocated school enrollment data, which makes the main effect of work and interaction terms significant at $p<.06$ ($p<.07$ for Latino*work) rather than $p<.05$. In assessing heterogeneous effects by household income (Model 3 in Table 5, limited to those below $30,000 in household size adjusted income), results remain the same as the "typical teenager" model until including those not enrolled in school. Including school dropouts (and everyone else), the main effect of work is significant at $p<.08$. Finally, in models assessing time order (regressing fertility on working 1 to 5 years ago), including those not in school and living on their own makes the effect of work insignificant. Dropping out of school and living independently may be additional effects of employment (as evidence presented here suggests), so excluding based on these potential outcomes is likely to reduce the observed effect on fertility. In all other models, including the groups above has no effect on the results. Differences outlined above suggest that school enrollment may be affected by adolescent employment and that the relationship between work and fertility among those not enrolled in school may be slightly weaker and depend on race, ethnicity, and household income.

Measures

Initially, a measure of fourth quarter fertility was regressed on working at least 40 weeks in the last 12 months to address time order concerns. However, the ACS uses a rolling reference point and interview date is not available. Therefore, fertility is regressed on working 1 to 5 years ago, using state employment certification requirements for ages 16 to 18 as an IV. This measure of early work is problematic because: it excludes those who worked in the last 12 months; it includes a 4 year time span, which reduces precision; this wide time span also limits the precision of the IV. This measures effects of early employment among those who are no longer working, which is of interest, but is different than effects of adolescent employment, per se.

Skilled jobs include those in the following occupations: management; business and finance; legal; computer, mathematical, or engineering; science; counseling and therapy; acting, producing, or directing; healthcare practice and support; and managers in all other occupational categories. Service jobs include those in: social work and health education; education; arts and entertainment (aside from acting, producing, and directing); protective service; food preparation; cleaning and maintenance; personal care and service; sales; and office and administrative support (excluding managers in each category). Labor jobs include those in: farming, fishing, and forestry; construction; installation/repair; production; transportation; and the military.

States with a high proportion of Catholics (31% or more in 2000) is a cultural measure to control for potential normative differences. State-level religion data is gathered from the Association of Religion Data Archives (www.thearda.com). An index of factors that limit the availability of family planning is created based on state-level data gathered from the Guttmacher Institute (www.guttmacher.org). It is a sum of the following dummy variables indicating states that: require parental consent or notification for an abortion; have a mandatory waiting period after counseling before an abortion; and limit public funding of abortion. The factor loadings are all above 0.67 and Cronbach's alpha is .86. This is intended as a structural measure, but could also be a cultural measure of anti-abortion sentiment.

Availability of male partners may explain any relationship between adolescent employment and fertility. If economically attractive male partners are unavailable, adolescent fertility may be more strongly related to the employment of potential mothers. If they know they will need to rely on their own earnings whenever they start a family regardless of age, working as an adolescent could affect the likelihood of fertility. To address this possibility, the full model includes a measure of state male incarceration rates from the Bureau of Justice Statistics. It measures "the number of prisoners with a sentence of more than 1 year" per 100,000 state residents at the end of 2006, with populations based on January 1, 2007 census population estimates (Sabol et al., 2007: 17-18). This measure is divided by 1000 because the effect is so small.

Previous research suggests family background variables affect the likelihood of adolescent fertility. For example, if a teen's mother is a single parent or had a child as an adolescent, she may be more likely to as well. Others have suggested that family size and low household education levels increase the likelihood of adolescent fertility. To address these arguments, controls are added for female headed household, number of people in the household, highest years of education of head of household or their spouse, and generation age gap (included in models not shown). All three variables are constructed from household (not equivalent to family) data and, therefore, may have substantial measurement error. They are included because they should partially control for the underlying factors of interest. Number of people in the household is the number reported minus 1 if an adolescent in the household had a child in the last 12 months. Female headed household is an indicator of whether the reference

person is a single female. Parental education is another potential mediator. More educated parents could encourage adolescent employment and experimentation in the adult world, but also teach girls about contraception or stress the importance of going to college. More educated parents could keep better tabs on their teens, steer them into better jobs, or counteract peer influence at work. Models therefore control for the highest years of education attained by either the head of the household or their spouse.

Generation age gap is constructed by calculating the difference between the age of the female parental figure (female reference person or spouse) and the maximum age of the second generation (child or step/foster child of the reference person) in the household. This measure is problematic because it requires a female parental figure in the household and older children may have already left the household. This generation age gap variable has the highest number of missing values (2042/20740 or 10%) and would limit the sample size to teens living with a female parental figure. Analyses shown do not include generation age gap, but controlling for it does not change the results.

Household size-adjusted income is measured by dividing total household income (minus any income earned by youth to prevent collinearity with youth employment) by the square root of the number of people in the household. This is a widely recognized calculation and is used by the Congressional Budget Office, among others. Because it has a tiny coefficient in models predicting fertility, it is measured in $100,000s.

Child labor enforcement data is obtained from the Child Labor Coalition using the results of their 2004 Child Labor State Survey sent to all state labor departments.[4] This survey asked how many labor compliance officers are exclusively responsible for inspecting workplaces for child labor compliance/violations. States with such officers include Alabama, Alaska, Arizona, Florida, New Mexico, Oklahoma, and Texas. This survey had an extremely low response rate (only 63% of states) and of the states that responded, few have child labor compliance officers. Because survey non-response indicates at least some lack of concern for child labor enforcement, non-responses are set to 0. Despite low response, controlling for this variable helps address the possibility that any relationship found between employment and fertility is only the result of lack of state child labor law enforcement. For example, employment may only increase fertility if child labor enforcement is extremely lax. Working youth may only be exposed to negative peer influence or values in states without child labor enforcement. Alternatively, those with strong enforcement may expose working youth to more positive experiences and peers.

Region is determined by the Census region categories. Proportion of the state below poverty is based on ACS data indicating the proportion of the population in each state below poverty. Proportion of the state population that is black could affect the relationship, but it is correlated with state poverty rates and not included in models.

[4] www.stopchildlabor.org/USchildlabor/2004_survey_results.htm

C. Example of Employment Certification Requirements: Additional Support for the IV

The North Carolina Department of Labor Youth Employment Certificate provides an example of the additional steps required of youth in these states. According to this document (www.nclabor.com/wh/yec.pdf), an individual under 18 seeking employment must: 1) download the form from the internet or, "as a last resort", call the Wage and Hour Bureau to get a copy; 2) complete the individual information on the form; 3) have the employer complete information about the job, including a job description, company name and address, type of business, and whether there is an alcohol permit on the premises. (This means an individual must have been offered a job already, which delays employment start dates and could frustrate employers); 4) get the form signed by a parent or guardian; 5) take the form and a proof of age document to their local Department of Social Services office (website provided to find locations) or a location of an approved designee (about which the form does not provide details); 6) give a copy of the form to her employer by at least her first day of work; and 7) the employer must keep the certificate on file. The form notes that it does not apply to governmental (public), agricultural, or domestic employers, who do not need employment certificates to employ youth under age 18. This example illustrates the additional barrier to employment in states requiring employment certification until age 18 and helps justify using it as an instrumental variable.

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Figures and Tables

Figure 1: Conceptual Framework of Competing Theories

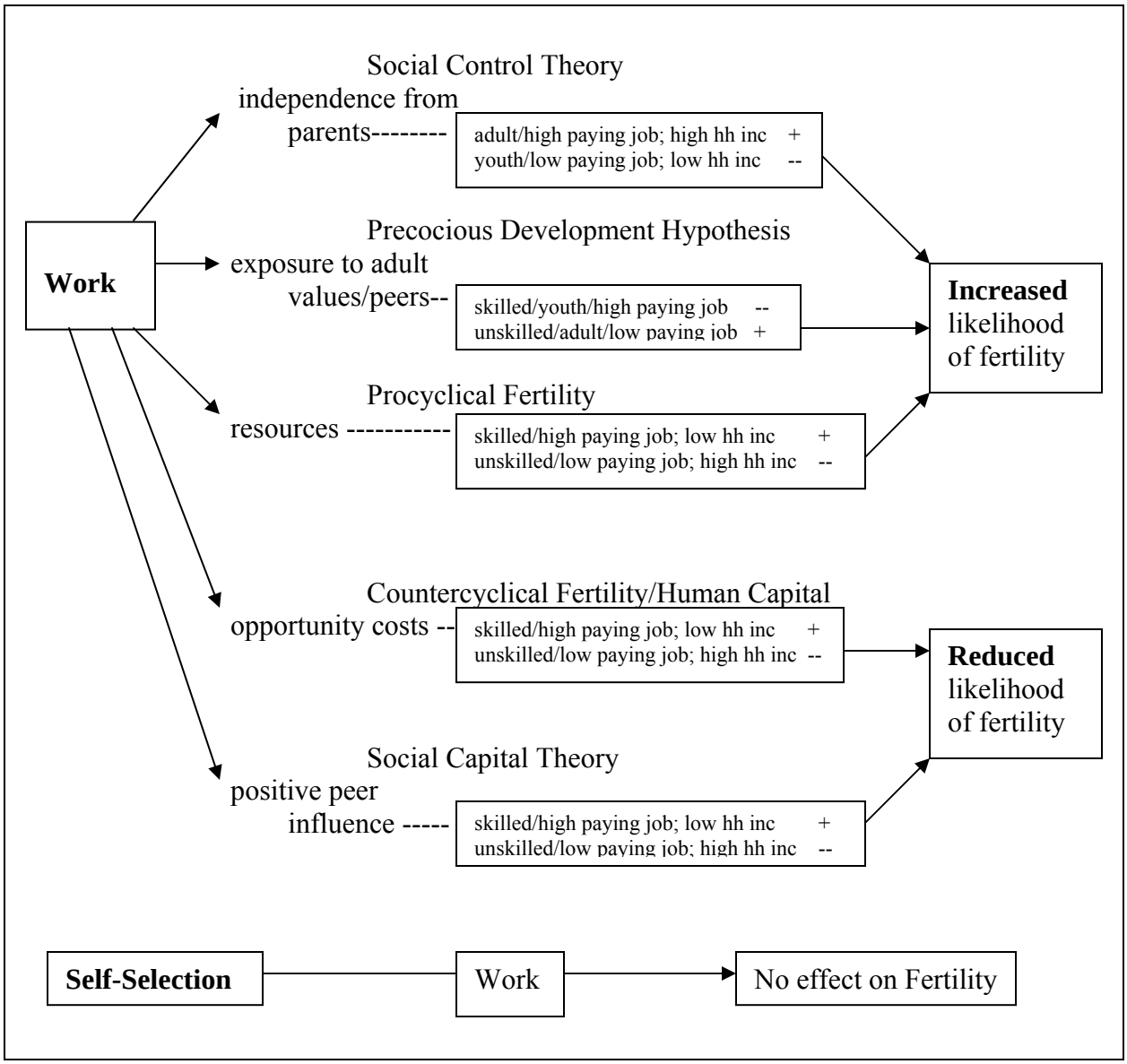


Table 1: Overview of Key Empirical Studies

Year	Author	Data	Nationally Repres. Sample	Recent Data (5 years)	Long-term Outcome	Measure of Work	Effects	Investigates Heterogeneous Effects	Adequately addresses selection
1984	D'Amico & Baker	NLSY 79-82	X		X	quality, hours	+ (none by 3 yrs after HS)	X (race, gender)	
1986	Greenberger & Steinberg	4 CA HSs; supplemental natl data				hours	-- (intense work)		
1991	Steinberg & Dornbusch	4000 10-12th graders in 6 CA and 3 WI HSs				hours	--	X (race)	
1991	Marsh	HS and Beyond - 1980-1992, 10,613 students	X		X	hours	-- (some + by job type, income use)	X (race, class, gender, ability)	
1993	Bachman & Schulenberg	Monitoring the Future - senior classes 1985-89 of 135 high schools	X			hours	--		
1993	Steinberg, Fegley, & Dornbusch	1777 soph/jrs in 9 HSs in WI and CA followed 1 year later - 1987-89				hours, type	--		
1995	Ruhm	NLSY 79	X		X	hours	+		
1996	Mortimer et al.	YDS - 1000 9-12th graders St. Paul, MN public sd (1988-91)				hours	-- (intense work) + (moderate work)	X (gender)	
1997	Mihalic & Elliot	National Youth Survey - 1976-1978	X		X	hours, duration	--	X (race, gender)	
1997	Ploeger	National Youth Survey - 1976-1978	X			work dummy	--		
2000	Entwisle et al.	Beginning School Study - Baltimore, MD			X	type, timing, consistency	work-education reinforcement	X (race, class, gender)	
2002	Mortimer, Harley, & Staff	YDS - follow up interview 4 yrs>HS			X	hours, quality	+ (high quality, allows balance; short-term only)	X (gender)	
2003	Paternoster et al.	NLSY 97	X	~10 years		hours	none		X
n.d.	Yeung & Rauscher	PSID-CDS 1997-2002	X	X		hours, quality	+ (high quality, moderate work)	X (race, class, gender)	
This study		ACS 2006	X	X	X	skill, income, context	adult (both + & --)	X (race, ethnicity, class)	X

Table 2: State Minimum Age Laws

	Age 14	Age 15	Age 16	Age 17	Age 18
Driver's License & Compulsory Education			AL, AK@, AZ, CO, DE, IA, MD, MI, MN, MO, NY, NC, ND, VT, WV, WY		
Driver's License	SD	HI, ID, MT, NM, SC	(16.08) IN (16.25) NH (16.5) CT KY MA NJ		GA
Agricultural Empl during school hours	ND IL (Age 12)				CA#, HI#, NH#, WA, WI
Compulsory Education				AR, FL, IL+, ME, MS, NV, PA, SC, TN	CA, CT, DC, HI, IN, KS, LA, NE, NM, OH, OK, OR, RI, TX, UT, VA, WA, WI
Mandated Employment Certification [Instrumental Variable]	NV		All others	AK	AL, CA, DE, DC, GA, IN, LA, MD, MI, NJ, NY, NC, OH*, PA, WA, WI

Source: Department of Labor, Wage and Hour Division

Age 16 unless otherwise specified

@AK = age 18/12th grade as of 2005

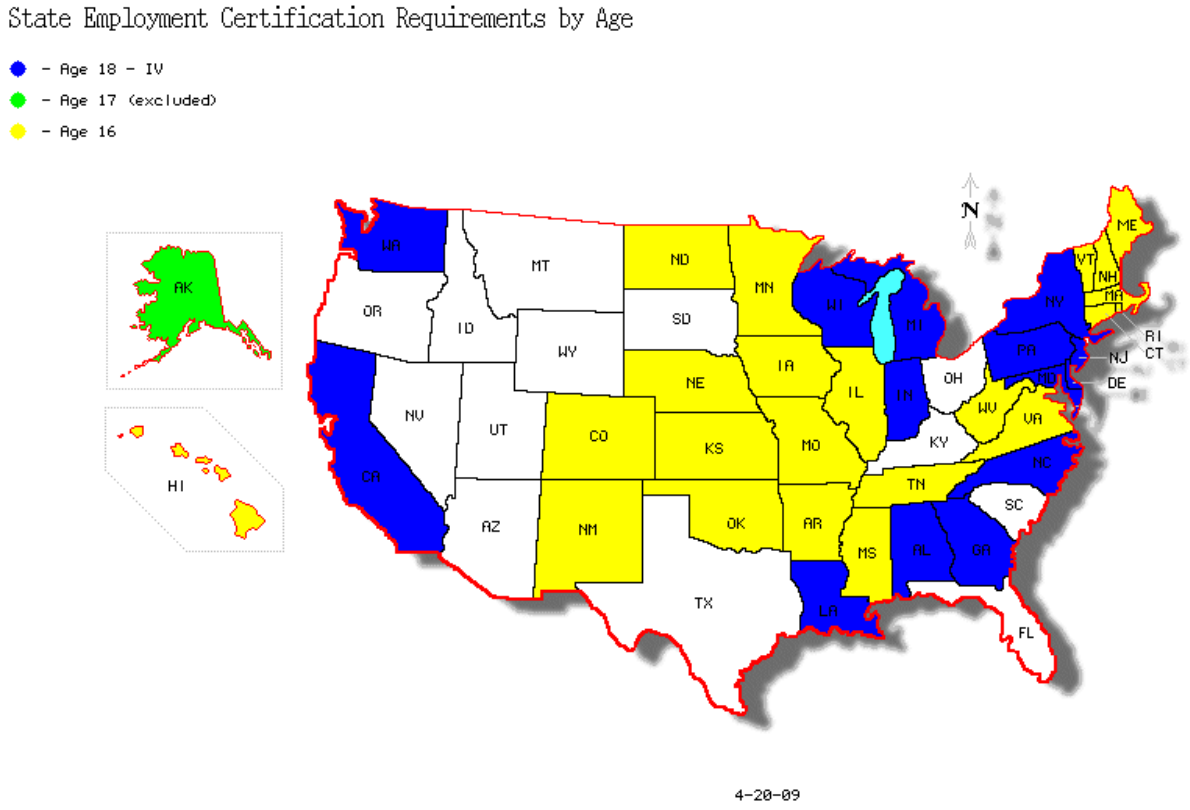
+IL = age 17 as of 2004

= 16 if school attendance not required

* OH = during school terms only

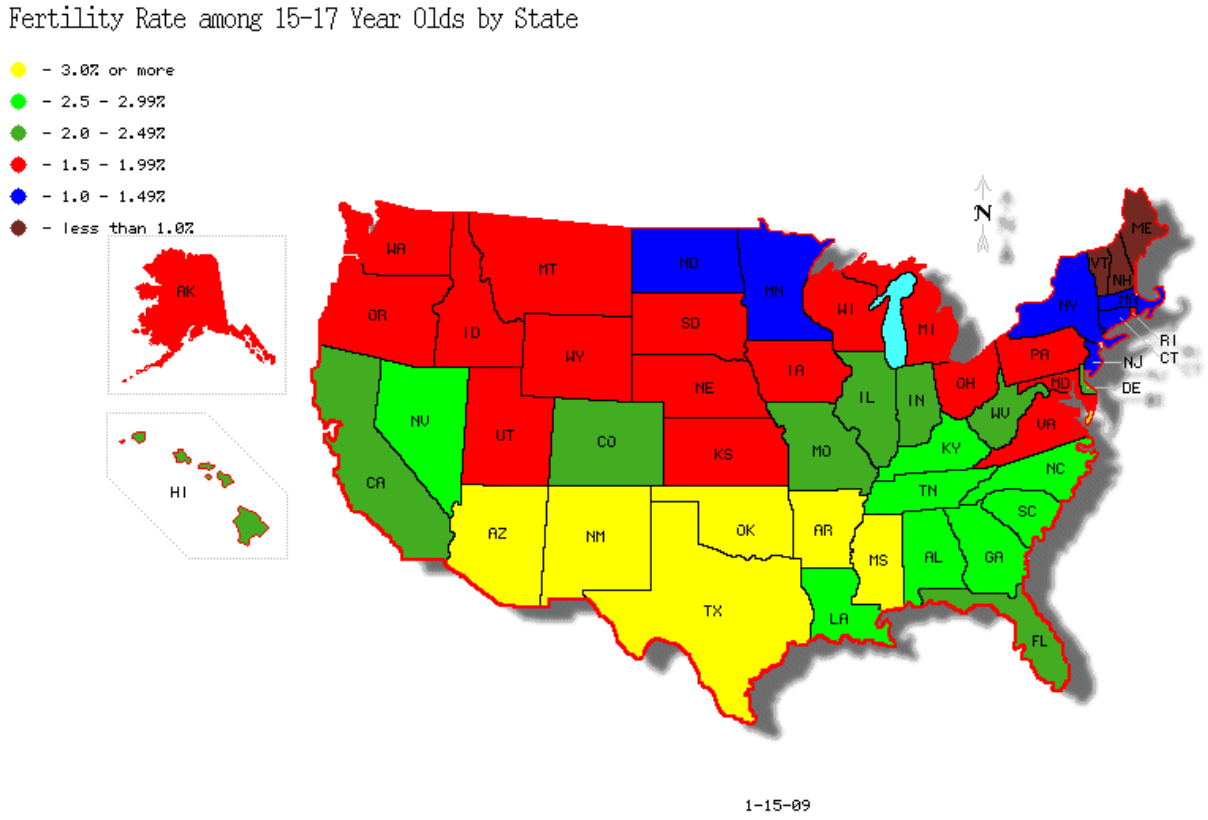
NB: AZ, FL, ID, KY, MT, OR, SC, SD, TX, UT, WY do not have provisions for issuing youth employment certification. These states default to federal policy, which is essentially equivalent to the unspecified category (states issuing certification until Age 16) for the purposes of this paper.

Figure 2: Instrumental Variable Map: Employment Certification Required until Age Specified



Note: Employment certification is not required if blank; Ohio requires certification until age 18 during school terms only – results shown in this paper treat Ohio as requiring certification until Age 16, but including it in the Age 18 category does not change results, and generally makes the findings more robust and the IV stronger.
Main analysis – IV is states shaded the darkest color compared to all others.
Time order analysis (worked 1 to 5 years ago) – IV is all shaded states (and Ohio) compared to all others.

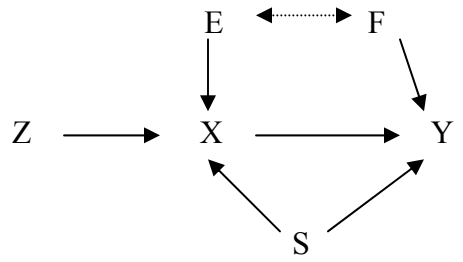
Figure 3: Teenage Fertility Rate by State in 2006



3% or more: AZ, AR, DC, MS, NM, OK, TX
2.5 – 2.99%: AL, GA, KY, LA, NC, NV, SC, TN
2.0 – 2.49%: CA, CO, DE, FL, HI, IL, IN, MO, WV
1.5 – 1.99%: AK, IA, ID, KS, MD, MI, MT, NE, OH, OR, PA, RI, SD, UT, VA, WA, WI, WY
1.0 – 1.49%: CT, MA, MN, ND, NJ, NY
Less than 1.0%: ME, NH, VT

Source: Martin et al., 2009: 49.

Figure 4: Two-Stage Linear Probability Model of Employment on Fertility



Z = state labor certification required > age 16
X = adolescent employment
Y = fertility
S = control variables
E and F = correlated error terms (rationale for IV approach)

Adapted from Freedman, 2005: 187.

Table 3: Descriptive Statistics by Race for Dependent, Mediating, and Control Variables

	All N=16306		White N=12216		Black N=1933		Asian N=502		Latino N=2111	
Variable	Mean	St Dev	Mean	St Dev	Mean	St Dev	Mean	St Dev	Mean	St Dev
Dependent vars:										
Youth fertility*	0.014	(0.118)	0.010	(0.098)	0.032	(0.175)	0.011	(0.105)	0.021	(0.143)
Early transitions§*	0.113	(0.397)	0.101	(0.385)	0.157	(0.434)	0.055	(0.229)	0.146	(0.480)
Race and Ethnicity:										
White	0.706	(0.456)	1	(0)	0	(0)	0	(0)	0.479	(0.500)
Black	0.151	(0.358)	0	(0)	1	(0)	0	(0)	0.013	(0.114)
Asian	0.032	(0.176)	0	(0)	0	(0)	1	(0)	0.006	(0.078)
Native Amer/HI	0.003	(0.058)	0	(0)	0	(0)	0	(0)	0.004	(0.065)
Other race	0.064	(0.245)	0	(0)	0	(0)	0	(0)	0.410	(0.492)
Multiracial	0.033	(0.179)	0	(0)	0	(0)	0	(0)	0.078	(0.268)
Latino	0.144	(0.351)	0.097	(0.297)	0.012	(0.110)	0.025	(0.156)	1	(0)
Household chars:										
Hh SA inc ($100k)*	0.412	(0.401)	0.466	(0.435)	0.239	(0.205)	0.424	(0.356)	0.304	(0.298)
Female headed hh**	0.262	(0.440)	0.197	(0.397)	0.560	(0.496)	0.152	(0.360)	0.269	(0.444)
People in householdΔ	4.193	(1.428)	4.122	(1.331)	4.160	(1.585)	4.589	(1.552)	4.660	(1.656)
Hh head educ max**	10.428	(2.742)	10.745	(2.600)	9.890	(2.381)	10.661	(3.444)	8.648	(3.520)
Gen age gap(/100)♦**	0.265	(0.056)	0.270	(0.055)	0.248	(0.061)	0.274	(0.055)	0.253	(0.057)
State chars:										
Abortion restrictions**	1.681	(1.304)	1.755	(1.281)	1.931	(1.228)	0.732	(1.173)	1.175	(1.330)
State high Catholic*	0.263	(0.440)	0.270	(0.444)	0.259	(0.438)	0.231	(0.422)	0.194	(0.395)
Male incarc rate (/1k)*	0.838	(0.246)	0.823	(0.245)	0.907	(0.257)	0.805	(0.203)	0.907	(0.228)
Child labor officersΔ	0.931	(2.230)	0.892	(2.190)	0.998	(2.274)	0.610	(1.881)	1.848	(2.949)
Poverty rate (/10)**	1.337	(0.260)	1.325	(0.255)	1.402	(0.296)	1.267	(0.214)	1.366	(0.235)
Northeast (omitted)*	0.182	(0.386)	0.190	(0.393)	0.169	(0.374)	0.170	(0.376)	0.130	(0.336)
South**	0.353	(0.478)	0.334	(0.472)	0.560	(0.496)	0.167	(0.374)	0.309	(0.462)
Midwest**	0.234	(0.423)	0.264	(0.441)	0.189	(0.392)	0.119	(0.324)	0.091	(0.288)
West**	0.231	(0.421)	0.212	(0.409)	0.082	(0.275)	0.544	(0.499)	0.470	(0.499)
Empl cert 18 (IV)**	0.471	(0.499)	0.440	(0.496)	0.543	(0.498)	0.678	(0.468)	0.502	(0.500)
Empl cert 16-18 (IV)@	0.783	(0.412)	0.779	(0.415)	0.805	(0.396)	0.875	(0.331)	0.667	(0.471)

* indicates white, black, and Latino youth differ significantly from others

** indicates all ethnic and racial categories, including Asian youth, differ significantly from others

Δ indicates black youth do not differ significantly from the mean, but all others do

§ Early transitions include fertility, head or spouse of household, ever married, and not in school. N = 17464.

♦ N=15058; not included in regressions due to missing values, but results do not differ when included.

@ N=35242 (includes 17-19 year olds), Asian and Latino means are significantly different from the total mean

Standard deviations in parentheses.

Table 3a: Descriptive Statistics of Independent Variables by Race and Ethnicity

	All		White		Black		Asian		Latino	
	N=16306		N=12216		N=1933		N=502		N=2111	
Variable	Mean	St.Dev	Mean	St Dev	Mean	St Dev	Mean	St Dev	Mean	St Dev
Independent vars:										
Worked last 12 mos*	0.510	(0.500)	0.570	(0.495)	0.346	(0.476)	0.345	(0.476)	0.380	(0.486)
Worked >39 weeks*	0.146	(0.353)	0.173	(0.378)	0.063	(0.244)	0.097	(0.296)	0.097	(0.296)
Worked 1-5 years ago@	0.040	(0.197)	*0.036	(0.186)	*0.056	(0.230)	0.048	(0.215)	0.042	(0.202)
Educ attainment§*	10.767	(0.791)	10.783	(0.742)	10.671	(0.909)	10.977	(0.789)	10.769	(0.842)
Indiv inc ($10k)§*	0.178	(0.497)	0.194	(0.556)	0.144	(0.316)	0.123	(0.378)	0.147	(0.314)
Of those who worked:	N=8840		N=7239		N=725		N=180		N=803	
Skilled job	0.025	(0.155)	0.022	(0.147)	0.029	(0.168)	0.030	(0.170)	0.029	(0.167)
Service job	0.866	(0.341)	*0.863	(0.344)	*0.887	(0.317)	0.901	(0.299)	0.874	(0.332)
Labor job	0.038	(0.190)	0.036	(0.187)	0.038	(0.192)	0.039	(0.193)	*0.049	(0.215)
No occup code*	0.072	(0.258)	0.078	(0.269)	0.046	(0.209)	0.031	(0.173)	0.049	(0.215)
High youth job	0.588	(0.492)	0.588	(0.492)	*0.642	(0.480)	*0.480	(0.501)	0.597	(0.491)
High youth job (excl childcare)	0.537	(0.499)	*0.533	(0.499)	*0.608	(0.488)	*0.464	(0.500)	0.554	(0.497)
Of those worked>39wks	N=2518		N=2154		N=141		N=47		N=205	
Skilled job	0.029	(0.169)	0.027	(0.161)	0.053	(0.225)	0.000	(0.000)	0.039	(0.194)
Service job	0.878	(0.327)	0.880	(0.326)	0.902	(0.299)	0.932	(0.254)	0.888	(0.316)
Labor job	0.035	(0.185)	0.035	(0.183)	0.023	(0.149)	0.021	(0.145)	0.044	(0.205)
No occup code	0.057	(0.232)	0.059	(0.236)	0.023	(0.149)	0.047	(0.214)	0.029	(0.169)
High youth job	0.686	(0.464)	0.680	(0.467)	*0.786	(0.411)	0.592	(0.497)	0.698	(0.460)
High youth job (excl childcare)	0.590	(0.492)	*0.577	(0.494)	*0.764	(0.426)	*0.545	(0.503)	0.615	(0.488)
Of those who worked:	N=8840		N=7239		N=725		N=180		N=803	
Mgmt occup	0.003	(0.050)	0.002	(0.047)	0.002	(0.043)	0.000	(0.000)	0.004	(0.063)
Bus/finance occup	0.001	(0.038)	*0.001	(0.029)	0.003	(0.052)	0.005	(0.073)	0.003	(0.051)
Math/science occup	0.002	(0.045)	*0.001	(0.036)	0.001	(0.026)	*0.016	(0.124)	*0.005	(0.072)
Comm service occup	0.003	(0.059)	0.003	(0.050)	0.009	(0.092)	0.006	(0.077)	0.003	(0.051)
Legal occup	0.000	(0.017)	0.000	(0.016)	0.000	(0.000)	0.000	(0.000)	0.000	(0.000)
Educ occup	0.023	(0.151)	*0.022	(0.146)	0.019	(0.137)	*0.107	(0.310)	0.021	(0.143)
Ent/media occup	0.017	(0.131)	0.018	(0.134)	0.013	(0.113)	0.012	(0.108)	0.010	(0.102)
Healthcare occup	0.011	(0.105)	0.010	(0.101)	0.015	(0.122)	0.004	(0.061)	0.010	(0.102)
Protec serv occup	0.000	(0.019)	0.000	(0.022)	0.000	(0.000)	0.000	(0.000)	0.001	(0.036)
Food prep/serv occ*	0.313	(0.464)	0.334	(0.472)	0.227	(0.419)	0.205	(0.405)	0.253	(0.435)
Personal serv occup*	0.097	(0.296)	0.102	(0.303)	0.078	(0.268)	0.043	(0.203)	0.079	(0.269)
Cleaning serv occup	0.011	(0.102)	0.011	(0.106)	0.004	(0.064)	0.008	(0.088)	0.012	(0.108)
Sales occup	0.344	(0.475)	*0.324	(0.468)	*0.487	(0.500)	0.343	(0.476)	*0.407	(0.492)
Admin occup	0.132	(0.338)	0.131	(0.337)	0.103	(0.304)	*0.213	(0.411)	0.141	(0.349)
Agric occup	0.001	(0.024)	0.001	(0.027)	0	(0)	0	(0)	0	(0)
Construction occup	0.003	(0.053)	0.002	(0.049)	0.005	(0.070)	0	(0)	0.003	(0.051)
Repair occup	0.001	(0.027)	0.001	(0.027)	0.000	(0.019)	*0.004	(0.064)	0.000	(0.000)
Production occup	0.010	(0.101)	0.011	(0.103)	0.004	(0.062)	0.010	(0.101)	0.014	(0.119)
Transport occup	0.026	(0.160)	0.025	(0.157)	0.031	(0.174)	0.026	(0.158)	0.034	(0.181)
Military occup	0.000	(0.006)	0.000	(0.007)	0	(0)	0	(0)	0	(0)

* Indicates all or individual ethnic and racial groups differ significantly from everyone else.
§ Endogenous variables not instrumented and only included in later models.
@ N=35242 (includes 17-19 year olds)
Standard deviations in parentheses.

Table 3b: Characteristics of Those Who Worked in 2006

	All N=8840		White N=7239		Black N=725		Asian N=180		Latino N=803	
Variable	Mean	St Dev	Mean	St Dev	Mean	St Dev	Mean	St Dev	Mean	St Dev
Dependent vars:										
Youth fertility*	0.009	(0.093)	0.006	(0.077)	0.026	(0.158)	0.008	(0.092)	0.014	(0.116)
Early transitions§*	0.100	(0.378)	0.085	(0.352)	0.161	(0.456)	0.052	(0.222)	0.152	(0.514)
Race and Ethnicity:										
White*	0.790	(0.408)	1	(0)	0	(0)	0	(0)	0.478	(0.500)
Black*	0.102	(0.303)	0	(0)	1	(0)	0	(0)	0.011	(0.105)
Asian*	0.022	(0.145)	0	(0)	0	(0)	1	(0)	0.009	(0.093)
Native Amer/HI*	0.002	(0.045)	0	(0)	0	(0)	0	(0)	0.002	(0.050)
Other race*	0.041	(0.199)	0	(0)	0	(0)	0	(0)	0.377	(0.485)
Multiracial	0.036	(0.186)	0	(0)	0	(0)	0	(0)	0.111	(0.314)
Latino*	0.097	(0.295)	0.057	(0.232)	0.012	(0.109)	0.034	(0.183)	1	(0)
Household chars:										
Hh SA inc ($100k)*	0.454	(0.402)	0.489	(0.420)	0.289	(0.227)	0.420	(0.344)	0.369	(0.359)
Female headed hh*	0.232	(0.422)	0.183	(0.387)	0.523	(0.500)	0.191	(0.394)	0.265	(0.442)
People in hh*	4.100	(1.327)	4.076	(1.269)	4.039	(1.501)	4.553	(1.511)	4.481	(1.607)
Hh head educ max*	10.814	(2.465)	11.025	(2.333)	10.252	(2.406)	10.495	(3.516)	9.329	(3.301)
Gen age gap(/100)♦*	0.268	(0.054)	0.272	(0.053)	0.252	(0.060)	0.272	(0.051)	0.256	(0.056)
State chars:										
Abortion restrictions*	1.762	(1.276)	1.806	(1.265)	1.932	(1.178)	0.922	(1.225)	1.301	(1.316)
State high Catholic*	0.279	(0.449)	0.292	(0.455)	0.246	(0.431)	0.251	(0.435)	0.198	(0.399)
Male incarc rate (1k)*	0.812	(0.245)	0.799	(0.244)	0.874	(0.241)	0.783	(0.218)	0.896	(0.231)
Child labor officers*	0.803	(2.087)	0.741	(2.018)	0.963	(2.225)	0.602	(1.829)	1.843	(2.910)
Poverty rate (/10)*	1.309	(0.260)	1.302	(0.256)	1.351	(0.295)	1.241	(0.222)	1.358	(0.249)
Northeast (omitted)*	0.193	(0.395)	0.204	(0.403)	0.176	(0.381)	0.141	(0.349)	0.121	(0.326)
South*	0.328	(0.469)	0.304	(0.460)	0.580	(0.494)	0.177	(0.382)	0.321	(0.467)
Midwest*	0.277	(0.448)	0.305	(0.460)	0.177	(0.382)	0.200	(0.401)	0.118	(0.323)
West*	0.202	(0.401)	0.188	(0.390)	0.067	(0.250)	0.483	(0.501)	0.440	(0.497)
Empl cert 18 (IV)*	0.434	(0.496)	0.422	(0.494)	0.503	(0.500)	0.588	(0.494)	0.431	(0.496)
Empl cert 16-18 (IV)@	0.773	(0.419)	0.743	(0.437)	0.841	(0.366)	0.969	(0.175)	0.684	(0.466)
Individual chars: Δ										
Educ attainment*	10.876	(0.715)	10.875	(0.690)	10.863	(0.764)	11.047	(0.769)	10.881	(0.751)
Individual income*	0.300	(0.605)	0.298	(0.647)	0.311	(0.414)	0.303	(0.567)	0.318	(0.413)

* Indicates significant difference from nonworkers.

§ Early transitions include fertility, head or spouse of household, ever married, and not in school. N=9443.

♦ N=8726

@ N=1450 (includes 17-19 year olds who worked 1-5 years ago)

Δ indicates Endogenous variable

Standard deviations in parentheses.

Table 4: Comparing Models: Relationship between Employment and Fertility among Adolescent Women

	Youth Fertility				Youth Fertility		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
VARIABLES	2SLS	2SLS	OLS	Logit	2SLS	OLS	Logit
Worked in last 12 mos	0.090*	0.132**	-0.005*	-0.347+			
	(0.042)	(0.044)	(0.002)	(0.194)			
Worked 1-5 years ago					0.615*	0.030**	1.047**
					(0.247)	(0.008)	(0.200)
Hh size adj inc ($100k)	-0.019**	-0.007*	-0.002	-1.757*	-0.008**	-0.005**	-2.063**
	(0.004)	(0.003)	(0.002)	(0.763)	(0.003)	(0.001)	(0.502)
Black	0.036**	0.035**	0.009+	0.321	0.005	0.016**	0.654**
	(0.010)	(0.010)	(0.005)	(0.231)	(0.005)	(0.004)	(0.131)
Asian	0.022**	0.024**	-0.001	-0.107	-0.007	0.001	0.091
	(0.008)	(0.009)	(0.005)	(0.461)	(0.004)	(0.003)	(0.268)
Latino	0.023**	0.016*	-0.002	0.030	0.007+	0.005	0.437*
	(0.008)	(0.006)	(0.003)	(0.241)	(0.004)	(0.003)	(0.176)
Single female headed hh		0.019**	0.017**	0.654**	0.010**	0.015**	0.464**
		(0.004)	(0.003)	(0.183)	(0.004)	(0.003)	(0.128)
People in household		0.012**	0.010**	0.386**	0.008**	0.009**	0.317**
		(0.002)	(0.002)	(0.039)	(0.001)	(0.001)	(0.027)
Max educ hh head/spouse		-0.004**	-0.002**	-0.095**	-0.001+	-0.002**	-0.061**
		(0.001)	(0.001)	(0.034)	(0.001)	(0.000)	(0.022)
State abortion restrictions		-0.005*	0.000	0.034	0.001	0.001	0.087
		(0.002)	(0.001)	(0.099)	(0.001)	(0.001)	(0.076)
State high Catholic		-0.011*	-0.004	-0.393	-0.005	-0.005+	-0.443
		(0.005)	(0.004)	(0.372)	(0.005)	(0.003)	(0.271)
State male incarceration rate		0.016+	-0.007	-0.386	-0.002	-0.006	-0.330
		(0.009)	(0.007)	(0.425)	(0.009)	(0.005)	(0.315)
Constant	-0.076*	-0.116**	-0.025*	-5.665**	-0.038*	-0.020*	-5.206**
	(0.034)	(0.031)	(0.012)	(0.654)	(0.017)	(0.009)	(0.443)
Observations	16306	16306	16306	16306	35242	35242	35242
R-squared	-0.148	-0.283	0.026	0.143 (pseudo)	-0.828	0.026	0.131 (pseudo)
First-stage F statistic	10.25**	13.2**			8.25**		
Weak IV test ▪	35.44@	19.36@			4.76		
Endog test of Employment Δ	4.87*	5.92*			4.00*		

** p<0.01, * p<0.05, + p<0.1; Robust standard errors in parentheses

▪ Kleibergen-Paap rank Wald F statistic

Δ difference between 2 Sargan-Hansen statistics, robust to heteroskedasticity

Indicates test of IV strength is above Stock-Yogo (2005) critical values: @ = 10% (highest); § = 15%; ♦ = 20%; ¤ = 25%

All models include the following variables, not shown: Native American/Hawaiian Islander; Other race; Multiracial; State child labor officials**; State poverty rate (* in 1-4); South (* in 1, 5-7); Midwest (* in 2); West.

Table 5: Adolescent Employment and Fertility by Race, Ethnicity, and Household Income

	Youth Fertility		
VARIABLES	(1)	(2)	(3) Hh inc<$30k
Worked in last 12 months	0.252*	0.223*	0.309**
	(0.118)	(0.101)	(0.110)
Hh size adj inc ($100k)	-0.005	-0.004	-0.377**
	(0.004)	(0.004)	(0.112)
Black	0.149*	0.142**	0.054**
	(0.064)	(0.053)	(0.019)
Asian	0.137*	0.046*	0.037*
	(0.063)	(0.020)	(0.018)
Latino	0.127*	0.113*	0.032*
	(0.059)	(0.050)	(0.014)
Black * worked last 12 mos	-0.250*	-0.219*	
	(0.114)	(0.098)	
Asian * worked last 12 mos	-0.246*		
	(0.113)		
Latino * worked last 12 mos	-0.245*	-0.219*	
	(0.112)	(0.096)	
Black * hh size adj inc ($100k)		-0.004*	
		(0.002)	
Constant	-0.192*	-0.174**	-0.161**
	(0.079)	(0.067)	(0.049)
Observations	16306	16306	7241
R-squared	-0.745	-0.606	-0.911
First-stage F statistic	4.08*	4.55*	8.94**
Weak IV test ▪	7.51♦	8.61♦	7.79♦
Endogeneity test of Employment Δ	5.92*	5.57*	8.07**

** p<0.01, * p<0.05, + p<0.1; Robust standard errors in parentheses

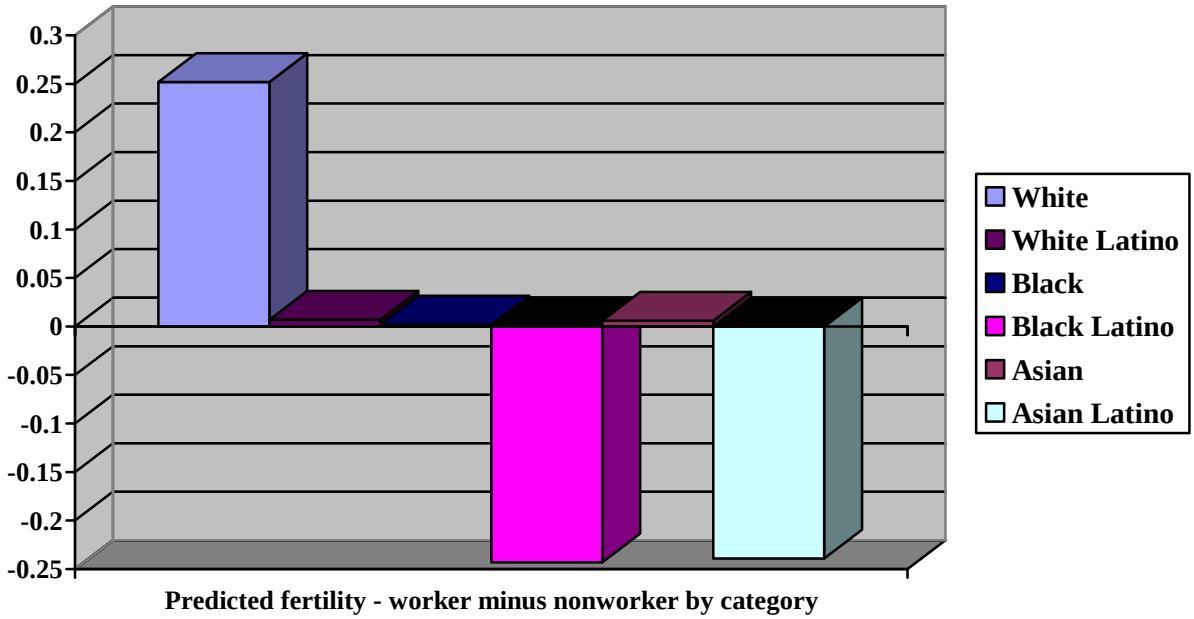
▪ Kleibergen-Paap rank Wald F statistic

Δ difference between 2 Sargan-Hansen statistics, robust to heteroskedasticity

Indicates test of IV strength is above Stock-Yogo (2005) critical values: @ = 10% (highest); § = 15%; ♦ = 20%; ¤ = 25%

All models include the following variables, not shown: Native American/Hawaiian Islander; Other race; Multiracial; Single female headed household (** in 1, 2); People in household**; Max education of household head/spouse**; State abortion restrictions (* in 3); State high Catholic; State male incarceration rate (* in 3); State child labor officials**; State poverty rate**; South; Midwest; West.

Figure 5: Effect of Work on Fertility Likelihood: Interactions by Race and Ethnicity



NB: Figure 6 depicts the difference between the predicted probability of fertility for an otherwise identical worker and nonworker. Figure 6 uses Model 1 Table 5. Black Latino and Asian Latino sample sizes are only 28 and 13, respectively, so the negative effect of work illustrated above for those groups should not be given much weight.

Table 6: Adolescent Employment and Fertility by Job Type and Individual Income

	Youth Fertility		
VARIABLES	(1)	(2)	(3)
Worked in last 12 months	0.160**	0.267*	0.223*
	(0.059)	(0.122)	(0.097)
Hh size adjusted inc ($100k)	-0.009*	-0.012*	-0.011*
	(0.003)	(0.005)	(0.005)
Black	0.033**	0.033**	0.032**
	(0.010)	(0.012)	(0.011)
Asian	0.024*	0.022*	0.023*
	(0.010)	(0.011)	(0.011)
Latino	0.014*	0.017+	0.015+
	(0.006)	(0.010)	(0.008)
Educational attainment	-0.015**	-0.016**	-0.015**
	(0.004)	(0.006)	(0.005)
High individual income (60^{th} percentile)	-0.069**	-0.075*	-0.065*
	(0.026)	(0.034)	(0.028)
Skilled job	-0.062**		
	(0.021)		
Labor job	-0.067**		
	(0.023)		
High youth job		-0.161*	
		(0.073)	
High youth job (excl childcare)			-0.128*
			(0.055)
Constant	0.060+	0.071+	0.066+
	(0.032)	(0.038)	(0.035)
Observations	16306	16306	16306
R-squared	-0.334	-0.637	-0.472
First-stage F statistic	15.95**	8.13**	9.47**
Weak IV test ▪	15.15§	8.48♦	11.32§
Endogeneity test of Employment Δ	5.53*	5.56*	5.57*

** p<0.01, * p<0.05, + p<0.1; Robust standard errors in parentheses

▪ Kleibergen-Paap rank Wald F statistic

Δ difference between 2 Sargan-Hansen statistics, robust to heteroskedasticity

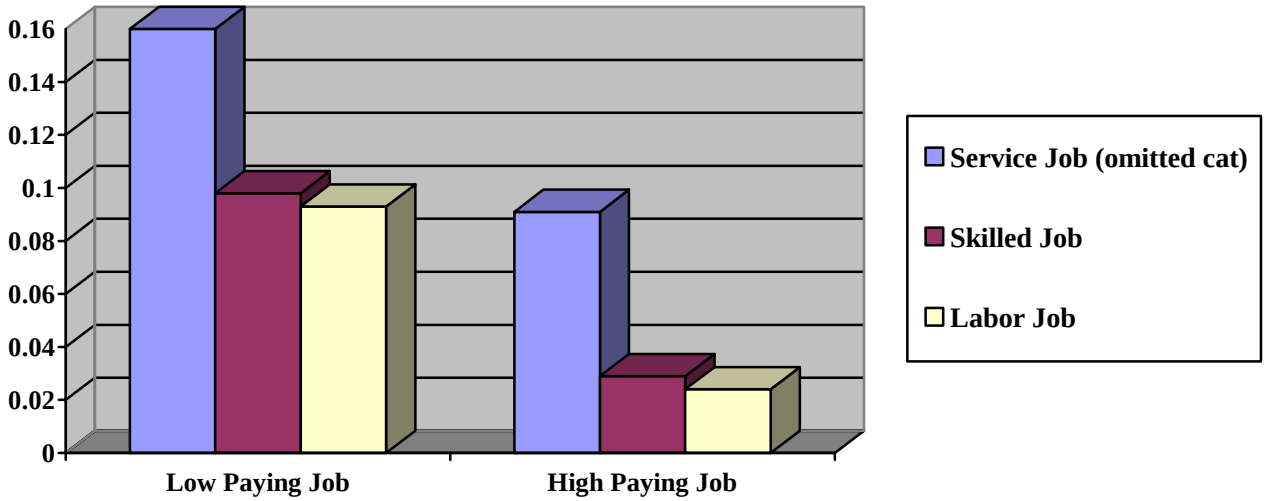
Indicates test of IV strength is above Stock-Yogo (2005) critical values:

@ = 10% (highest threshold); § = 15%; ♦ = 20%; ¤ = 25%

All models include the following variables, not shown: Native American/Hawaiian Islander; Other race; Multiracial; Single female headed household**; People in household**; Max education of household head/spouse**; State abortion restrictions (* in 1); State high Catholic*; State male incarceration rate; State child labor officials **; State poverty rate**; South; Midwest*; West (* in 2).

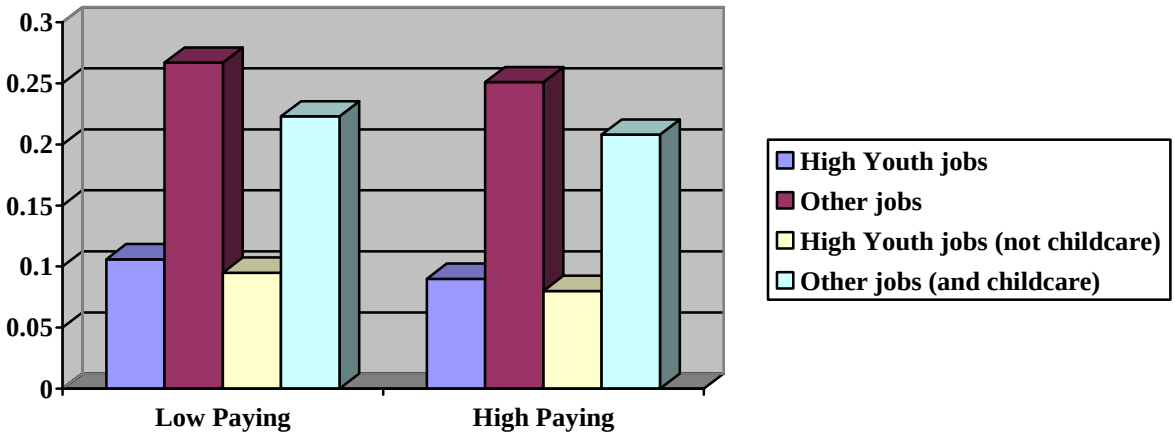
Note that job type, individual income, and educational attainment are all endogenous. Interpret with caution.

Figure 6: Effect of Work on Fertility Likelihood by Job Type



(Predictions based on Model 1 in Table 6. Note that job type is endogenous.)

Figure 7: Effect of Work on Fertility Likelihood by Job Type



(Predictions based on Models 2 and 3 in Table 6. Note that job type is endogenous.)

Figures 6 and 7 show the difference in the predicted probability of fertility between an otherwise identical worker and nonworker by job type.

Table 7: Comparing Models: Relationship between Adolescent Employment and Early Transitions to Adult Roles: Fertility, Independent Household, Not in School, Ever Married

	Early Transitions		
	(1)	(2)	(3)
VARIABLES	2SLS	OLS	Logit
Worked in last 12 months	0.502*	-0.015+	-0.166**
	(0.255)	(0.009)	(0.063)
Black	0.156**	0.047**	0.492**
	(0.059)	(0.015)	(0.109)
Latino	0.163**	0.073**	0.463**
	(0.050)	(0.027)	(0.159)
Constant	-0.373+	0.032	-2.889**
	(0.206)	(0.031)	(0.308)
Observations	17464	17464	17464
R-squared	-0.385	0.012	0.018 (pseudo)
First-stage F statistic	13.89**		
Weak IV test ▪	22.55@		
Endogeneity test of Employment Δ	4.02*		

** p<0.01, * p<0.05, + p<0.1; Robust standard errors in parentheses

▪ Kleibergen-Paap rank Wald F statistic

Δ difference between 2 Sargan-Hansen statistics, robust to heteroskedasticity

Indicates test of IV strength is above Stock-Yogo (2005) critical values:

@ = 10% (highest threshold); § = 15%; ♦ = 20%; ¤ = 25%

All models include the following variables, not shown: Asian; Native American/Hawaiian Islander (* in 1 and 3); Other race; Multiracial; State abortion restrictions; State high Catholic (* in 1); State male incarceration rate; State child labor officials; State poverty rate (* in 1); South; Midwest; West.