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Labor Market Conditions and US Teen Birth Rates, 2001–2009

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Abstract Using unemployment rates as the sole labor market explanatory variable, most previous studies have concluded that employment conditions do not systematically influence teen birth rates. By contrast, this study found that birth rates were positively correlated with male employment rates (20–24 years old) and negatively correlated with the real minimum wage. Teen birth rates were also positively correlated with teen gonorrhea infection rates; and for the older teens (18–19 years old), by a measure of illegal drug use. By contrast, alcohol use was negatively correlated with teen birth rates. Finally, teen female employment rates were positively correlated with teen birth rates in weak labor market areas, suggesting that better job opportunities might increase teen birth rates among disadvantaged youth. Given the persistence of young adult birth rates among disadvantaged youth, policy recommendations to eliminate the marriage penalty they face are offered.

Keywords Teen birth rates · Male employment rates · Substance use · Teenage employment

Introduction

In 2006, for the first time in 15 years, the US teen birth rate increased from 4.05 to 4.19 % and to 4.25 % the following year. While it has since moved lower, analysts were troubled since studies consistently demonstrated that negative economic and psychological outcomes later in life are related to having one's first child at a young age (Casad et al. 2012). In particular, observers feared that this verified a growing hopelessness among many disadvantaged young women.

More recently, Kearney and Levine (2012a) brought the analysis into focus by looking at the link between socioeconomic disadvantage and childbearing. They found that holding constant socioeconomic status, "teens in the highest-inequality states are roughly 5 percentage points more likely to give birth as teens than teens in the lowest-inequality states" (p. 157). This link between growing up disadvantaged and higher rates of teen childbearing has been well researched (Bickel et al. 1977; Moore and Chase-Lansdale 2001; South and Crowder 2010; Browning and Burrington 2006). In the 1990s, Luker (1997) suggested that the sense of hopelessness, led many at-risk young women to see parenting as an opportunity to rise above their bleak existence. Indeed, Geronimus and Korenman (1992) argued that with such limited likelihood of economic advancement, it became rational to have children young when these poor women are healthier and have a stronger child-support network. Consistent with this thesis, researchers (Wilson and Koo 2006; Schoen and Tufis 2003; Rocca et al. 2013) found that perceptions of the social benefits from having a child are positively correlated with pregnancies and childbearing.

Teen birth rates have also been linked to the compromised, dependent position many young teenage women find themselves in. Rates of unprotected sex and taking pregnancies to term increase as the age between sex partners increases (Silverman et al. 2011). Darroch et al. (1999) found that although men 6 or more years older than their

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partners comprised only 6.7 % of all partners of 15–17-year olds, they comprised 19.7 % of the partners of those who became pregnant. These younger teen women were more likely to take pregnancy to term so that older partners comprised 24 % of all fathers of 15–17-year olds. This evidence is the reason why Shore (2009) proposed school counseling to build up self-esteem, which has been shown to enable young women to resist the pressures from boyfriends and peers (Young et al. 2001).

Some researchers have argued that teen employment might offer the best chance of resisting these pressures. Employment may give young women an alternate set of peers. Newman (1999) found that the social relations formed with fellow workers insulated many young people from engaging in the risky behavior common to the neighborhoods in which they lived. Shipler (2004) found that for many welfare leavers, it was the advice they received from those at their workplaces that led to better life decisions. By contrast, a number of researchers (Rich and Kim 2002; Bauermeister et al. 2009; Monahan et al. 2011) found that teen employment leads youth to engage in more risky behavior that may increase teen birth rates. Specifically, Monahan et al. (2011) found that youth who began working more than 20 h/week increased illegal drug use and delinquency compared with youth who were unemployed or worked <20 h/week.

Employment-Childbearing Relationship

A major focus of this study is to assess the impact of labor market conditions on US teen birth rates. Levine (2000) found that teen *pregnancy* rates were inversely related to teen employment rates and concluded, "Based on the evidence provided earlier, strengthening labor market opportunities for teens may increase the opportunity cost of childbearing and reduce its incidence" (pp. 43–44). Similarly, Colen et al. (2006) found that during the 1990s, declining unemployment rates explained a substantial share of the decline in *black* teen birth rates. They surmised, "During times of economic prosperity, when teens or their elders may perceive improved financial returns to education or immediate job opportunities, a great percentage of African–American teens in high-poverty communities may be both encouraged and personally motivated to delay childbearing" (p. 1533). They found, however, that improved labor market conditions increased white teen birth rates.

Dehejia and Lleras-Muney (2004) tested for a broader time period and found a tendency, short of statistical significance, for birth rates to be *negatively* related to unemployment rates: as the unemployment rate increased the birth rate decreased. Indeed, this tendency was stronger for black than white teens. As a result, they found that the *share* of a state's births that are black is inversely related to the state's unemployment rate. Their findings, however, held for all births as they did not separate out the impact of labor market conditions on teen birth rates. In a more recent paper, Kearney and Levine (2012b) assessed the decline in the teen birth rate using 1981–2008 data. They concluded, "We are similarly unable to identify a significant relationship between labor market conditions and teen childbearing … It is not surprising to us that women who are on the margin of giving birth as a teen are not responsive to short-term labor market conditions" (p. 24).

Finally, the Dehejia and Lleras-Muney (2004), Levine (2000), and Colen et al. (2006) studies all used data prior to the impact of welfare reform. Studies have demonstrated that prior to welfare reform, the ability to gain cash payments as an entitlement had a significant influence on childbearing decisions, especially among young black women (Hoffman and Foster 2000; Rosenzweig 1999). Similarly, Kearney and Levine (2012a) concluded that "more generous welfare benefits have a modest positive effect on nonmarital childbearing" (p. 154). With reform, access to welfare was drastically reduced and now had employment-related requirements. Thus, behavior of teen women towards childbearing may be substantially different since 2000 than in earlier time periods.

For 2006 and 2007, Rauscher (2011) assessed the impact of employment on the fertility of 17 year olds. When she tested using either an Ordinary Least Squares (OLS) or Logit model, there was a statistically significant negative relationship between paid employment and childbearing. When she, however, used an instrumental variable (IV) model, Rauscher found a statistically significant positive relationship. She reasoned that the OLS model had a selectivity bias: Adolescent women who are unlikely to have a child self-select into employment.

Methodology and Data

In this study, we use state-level data across the 33 largest US states. We have chosen to use the fixed effects model with state-level data because it parallels the methodology used by Kearney and Levine (2012a) in their recent and widely quoted papers.[1] We begin with a description of the US teen birth rate data over our test period as shown in Table 1. While teen birth rates did increase in the middle of the decade, they were significantly lower in 2009 than they were at the beginning of the decade. They declined

[1] We do not consider the same IV applied in Rauscher (2011) because the IV variable (work permit requirement) is constant within states and drops out of fixed effects model (Rauscher 2011).

Table 1 Various national teen birth rates, 2001–2009*

	Total 15–19 years old	Total 15–17 years old	Total 18–19 years old	Black non-hispanic 15–19 years old
2001	45.3	24.7	76.1	71.8
2002	43.0	23.2	72.8	66.6
2003	41.6	22.4	70.7	63.8
2004	41.1	22.1	70.0	63.3
2005	40.5	21.4	69.9	62.0
2006	41.9	22.0	73.0	64.6
2007	42.5	22.1	73.9	64.9
2008	41.5	21.7	70.6	63.4
2009	39.1	20.1	66.2	59.5
% Change between 2001 and 2009	−13.7	−18.6	−13.0	−17.1

* Birth rates are births per 1,000 women in each age group

Source: National vital statistics report "Birth Rates," 60#1 (Nov 2011) Table 4. http://www.cdc.gov/nchs/data/nvsr/nvsr60/nvsr60_01.pdf

somewhat faster for young teenagers so that the share of teen births to 18 and 19 year olds increased, reaching 69.7 % by 2009. Black teen birth rates declined at a somewhat faster pace than the overall rate.

Most past studies have relied solely on the unemployment rate as a measure of labor market conditions. While the unemployment rate is a reasonable index of general labor market conditions, it may be a poor measure for less educated young men and women. For this reason, in addition the unemployment rate, we included other relevant measures: the female teen employment rate and the employment rate for men, 20–24 years old.[2]

As documented above, a significant portion of the teen pregnancy may be a result of coercive relationships rather than the free choice of young women. However, to the extent that female choice is involved, the female teen employment rate has two potential influences on childbearing decisions. Improved employment prospects for young women increase the returns to non-childbearing activities (the substitution effect) but also provide additional income that can enable one to "consume" more (the income effect). The income effect indicates that as labor market conditions improve, young women are more able to afford to have children. Improved employment opportunities also raise the opportunity cost of childbearing as more potential income or educational activities is lost by withdrawing from the labor market (Hondroyiannis 2010). As a result, it is possible that in some circumstances the substitution effect dominates so that improved labor market conditions induces less childbearing while in other instances, the income effect dominates so that childbearing increases. Shreffler and Johnson (2012) found that women with strong career aspirations delay motherhood but working women with limited career aspirations do not.

Sum and Khatiwada (2010) documented that teen employment rates varied substantially along class lines, particularly among black and Latino youth. Among black and Latino teens, employment rates of those living in families with incomes between $75,000 and $150,000 were at least double the rates for black and Latino teens living in families with incomes below $40,000. These teen employment rate differences suggest that there may be a nonlinear relationship between the female teen employment rate and the teen birth rate. For poorer teens facing weak employment prospects, increased job opportunities make motherhood financially viable, inducing higher birth rates. By contrast, for better off teens living in more robust areas, teen employment could make further schooling viable, inducing lower birth rates. To test for this possibility, we added the female employment rate squared as an explanatory variable.[3]

The male employment rate has only an income effect so should be positively correlated with teen birth rates. We also included a minimum wage variable as an additional measure of labor market conditions. For less educated workers, it could be a benchmark by which they judge the wages that they can obtain. The federal minimum wage changed but once in 2008. However only ten states in our sample had a minimum wage that was the same as the national rate in every year.

There are also non-labor market conditions that might impact on teen birth rates for which annual state-level data

[2] We calculated the correlation coefficients between the three measures of labor market conditions across 33 states. The correlation coefficients range from 0.44 to 0.55 in absolute values. We further estimated the variance inflation factor (VIF) from the regression of the teen birth rates on the three measures of labor market conditions, and obtained the mean VIF = 1.89 for 33 states, and the mean VIF = 2.17 for 26 states. Therefore, both confirmed the small chance of multicollinearity problems among the three measures of labor market conditions.

[3] We also tested to see if the unemployment rate—teen birth rate relationship was nonlinear. However, the unemployment rate squared term was not significant in any of the specifications so we did not include it in our model.

Table 2 Data and sources

Variables	Abbreviations	Sources
State's birth rate: 15–19, 15–17, and 18–19 years old	BR	National vital statistics report "birth rates," 60#1 (Nov 2011) Table 4. http://www.cdc.gov/nchs/data/nvsr/nvsr60/nvsr60_01.pdf
State's unemployment rate	UR	U.S. Bureau of Labor Statistics (various years). "Employment status of the civilian noninstitutional population by state," http://bls.gov/lau/
State's employment rate for men, 20–24 years old	MEMP	U.S. Bureau of Labor Statistics (various years). "Employment status of the civilian noninstitutional population by state," http://bls.gov/lau/
State's employment rate for women, 16–19 years old	FEMP	U.S. Bureau of Labor Statistics (various years). "Employment status of the civilian noninstitutional population by state," http://bls.gov/lau/
State's real minimum wage rate	RMIN	Wage and Hourly Division (2012). "Changes in basic minimum wages in non-farm employment under state law." U.S. Department of Labor (Dec). http://www.dol.gov/whd/state/stateMinWageHis.htm
State's incidence of gonorrhea, 16–19 year olds	GON	U.S. Department of Health and Human Services, Division of STD/HIV Prevention, (various years). "Sexually Transmitted Disease Morbidity for selected STDs by age, race/ethnicity and gender 1996–2009," CDC WONDER On-line Database, June 2011. http://wonder.cdc.gov/std-std-race-age.html
State's composite incidence of illegal drug use	DRUG	Substance Abuse and Mental Heath Services Administration (SAMSHA) (various years): National survey of drug use and health, U.S. Department of Health and Human Services, Office of Applied Statistics. http://www.oas.samhsa.gov/WebOnly.htm#NSDUHtabs
State's composite incidence of alcohol use	ALC	Substance Abuse and Mental Heath Services Administration (SAMSHA) (various years): National survey of drug use and health, U.S. Department of Health and Human Services, Office of Applied Statistics. http://www.oas.samhsa.gov/WebOnly.htm#NSDUHtabs
Hispanic share of state's teen population: 15–19, 15–17, and 18–19 years old	SHH	United States Census Bureau. http://www.census.gov/popest/states/asrh/
Black non-hispanic share of the state's teen population: 15–19, 15–17, and 18–19 years old	SHB	United States Census Bureau. http://www.census.gov/popest/states/asrh/

is available. In particular, unprotected sexual relations have been linked to childbearing. As a result, we included three variables that have been associated with at-risk sexual behavior: the incidence of teen gonorrhea, illegal drug use, and alcohol use (Mensch and Kandel 1992). The Substance Abuse and Mental Health Services Administration (SAMSHA) estimates the share of individuals in various age groups in each state who have used alcohol and illegal drugs. For all years in our study, SAMSHA published use rates for two separate age groups, those 12–17 years old and those 18–25 years old. Testing procedures indicated that the best measures were composites of these two rates.[4]

Finally, for reasons discussed below, we have included two demographic variables: the Hispanic and the black non-Hispanic shares of each state's comparable teen population. Table 2 lists all the variables used in the regression analysis and the data sources. The summary statistics for each variable are given in Table 3.

There are many individual factors, including knowledge and access to contraceptives (Frost et al. 2012; Pesa and Mathews 2000), access to abortions, and family background (Fomby et al. 2010; Hofferth and Goldscheider 2010), that can influence teen fertility.[5] However, relevant direct measures are not available on a state-level annually. As a result, we used a fixed-effects model with state and year effects to insure that exclusion of other explanatory

[4] SAMSHA also reports alcohol binge rates. We found, however, that the alcohol use rate was a more accurate predictor so we used it rather than the binge rate.

[5] State-level measures of access to abortion clinics were available for only 4 years of the 10 years in our study. Since there was little year-to-year variation in this measure, when we tested those years, there was no statistically significant link to the state level variations in teen pregnancy rates.

Table 3 Summary statistics

Variables	Mean	Standard deviation	Minimum	Maximum
Birth rates (15–19 years old)	43.3	12.5	19.6	72.0
Birth rates (15–17 years old)	22.8	7.43	10.6	45.0
Birth rates (18–19 years old)	74.2	20.7	30.5	119.5
Unemployment rate	4.98	1.09	2.22	8.28
Male employ rate (20–24 years old)	73.2	5.40	57.3	85.0
Female employ rate (16–19 years old)	39.8	8.33	24.1	66.1
Real minimum wage rate	5.15	0.63	4.28	6.86
Alcohol use rate	29.0	3.93	0.00	38.7
Illegal drug use rate	12.9	2.02	0.00	18.4
Gonorrhea incidence rate	491.0	271.4	62.2	1,467.4
Hispanic share (15–19 years old)	10.3	10.3	1.37	43.7
Hispanic share (15–17 years old)	10.3	10.3	1.27	44.1
Hispanic share (18–19 years old)	10.4	10.3	1.48	43.0
Black share (15–19 years old)	16.3	11.8	1.85	45.5
Black share (15–17 years old)	16.4	11.7	1.86	45.5
Black share (18–19 years old)	16.2	12.0	1.81	45.6

Real minimum wage rate is measured in real dollars, gonorrhea incidence rate is per 10,000 populations, and all the other variables are in percentages

variables would not influence our results.[6] Moreover, explanatory variables other than Hispanic and black non-Hispanic shares are lagged 1 year. The SAMSHA measures are 2-year averages so that they are essentially already lagged. All variables other than the unemployment rate, the female teen employment rate, Hispanic and black non-Hispanic shares are given by their natural log values. Thus, the basic model is:

$$\begin{aligned}\ln(BR_{it}) = {} & \beta_0 + \beta_1 UR_{it-1} + \beta_2 \ln(MEMP_{it-1}) \\ & + \beta_3(FEMP_{it-1}) + \beta_4(FEMP^2_{it-1}) \\ & + \beta_5 \ln(RMIN_{it-1}) + \beta_6 \ln(GON_{it-1}) \\ & + \beta_7 \ln(DRUG_{it-1}) + \beta_8 \ln(ALC_{it-1}) \\ & + \beta_9 SHH_{it} + \beta 10 SHB_{it} + \delta_t \gamma_t + \varepsilon_{it}\end{aligned}$$

where i and t indicate state and year, respectively. β's represent the coefficients for each control variable, γ_t indicates the year effect, δ_t is the coefficient for the year effect, and ε_{it} is the error term.

Table 4 presents the annual national average for each of the explanatory variables, except the demographic measures. Over the 9 years, the unemployment rate increased by 1.8 percentage points or 45 %, the incidence of teenage gonorrhea declined by 10.3 %, while both employment rates also declined significantly. However for none of these explanatory variables is the annual movement always in one direction. The alcohol use and illegal drug use variables changed very little over the test period. The real *national* minimum wage declined by 9.1 % during the test period but since the majority of states deviated, the simple average for the 33 states in our study showed a 0.9 % increase.

Not shown in Table 4 are the Hispanic and black non-Hispanic shares of the teen population in the 33 states in our study. Between 2000 and 2009, the black non-Hispanic share of teen births, 15–19 year olds, fell from 30.0 to 24.2 %. By contrast, the Hispanic share increased from 25.5 to 33.5 % (Martin et al. 2002, 2011).

We used state-level birth rate data from 2001 through 2009 from the 33 largest states—those with populations above 2.5 million in 2000. We studied three different birth rates: the overall 15–19 year old rate, as well as the rate for 15–17 year olds and for 18–19 year olds. For the explanatory variables, the measures started in 2000. In that year, these states contained 92.5 % of the US population and 92.7 % of all teen births.

Including additional states would have been problematic. Unlike the state unemployment rate, age-specific employment measures are not available in smaller states for most years. This may be one of the reasons that most other studies used only the state unemployment rate. Even in these larger states, there were some observations missing.[7]

Gonorrhea is an outcome of risky behavior and may give us a good indicator of its link to teen birth rates. Gonorrhea,

[6] Fixed effects and random effects models are the two popular methodologies to conduct panel data analysis in the literature. We ran a Hausman test which confirmed that fixed effects model is preferred in our study.

[7] Levine (2000) had the same problem. Due to missing data, he was only able to include individuals from 28 states in his study and only had complete data for all four years for 11 states. It was also a problem for Kearney and Levine (2012b, Table 3) when they wanted to test the link between sexual behavior and teen birth rates where they only had 167 observations over the 17 year period 1991–2008; or about ten states per year.

Table 4 National measures of explanatory variables, 2000–2008

	UR (pct)	MEMP (pct)	FEMP (pct)	RMIN+	ALC (pct)*	DRUG (pct)*	GON (per 10,000)
2000	4.0	76.6	45.0	5.31	28.2	12.3	50.3
2001	4.7	74.2	44.5	5.21	29.6	14.0	49.5
2002	5.8	72.5	40.3	5.16	29.8	13.9	46.9
2003	6.0	71.6	37.8	5.06	29.8	13.4	43.8
2004	5.5	71.4	37.0	4.96	29.3	12.9	42.0
2005	5.1	71.5	37.8	4.85	29.1	12.7	43.0
2006	4.6	72.7	37.6	4.81	29.0	12.5	45.1
2007	4.6	71.6	35.8	5.16	28.1	12.4	45.8
2008	5.8	69.6	33.7	5.36	27.8	12.7	45.1
% Change between 2000 and 2008	45.0	−9.1	−25.1	0.94	−1.4	3.3	−10.3

Refer to Table 2 for the variable abbreviations

* ALC and DRUG measures are the average for that year and the next year; i.e. measure listed for 2008 is average of 2008 and 2009

+ this is the simple average of the minimum wage rate in the 33 states

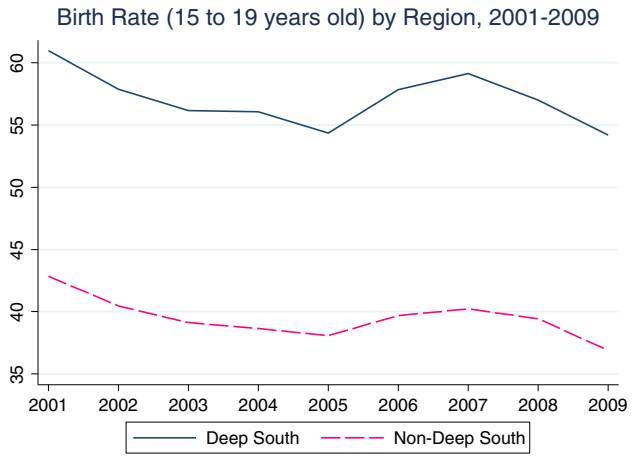

Fig. 1 Birth rate (15–19 years old) by Regions. Deep South states are AL, AR, GA, LA, MS, SC, and TN. The other 26 states included in this study are AZ, CA, CO, CT, FL, IA, IL, IN, KS, KY, MA,MD, MI, MN, MO, NJ, NY, NC, PA, OH, OK, OR, TX, VA, WA, and WI

however, is not a *source* of risky behavior. Since we do have two variables—alcohol and illegal drug use—that are potential sources of risky behavior, we looked at what difference it made whether or not the gonorrhea infection rate variable was included.

Our study should take into account the large disparity between black non-Hispanic, Hispanic, and white teen birth rates. Since 2000 these disparities have been reduced somewhat but, in 2009, black non-Hispanic rates were still at least double the white non-Hispanic rates for each of the age groups.[8] Kearney and Levine (2012b) tested separately non-white and Hispanic teen birth rates. Besides the difficulty of calculating these teen birth rates, modeling should include race-specific labor market and behavioral variables. For example, the black teen birth rate might be influenced by the black male employment rate but not necessarily the overall male employment rate; by the black alcohol use rate not necessarily the overall alcohol use rate. Unfortunately, these state-level, race- and gender-specific labor market and behavioral variables, except for the unemployment rate, are not available.

These statistical limitations may be why, except for some policy variables, Kearney and Levine (2012b) did not find other variables to be statistically significant. For these reasons, instead of testing black and Hispanic teen birth rates separately, we decided to incorporate the impact of these demographic factors by adding two explanatory variables: the age-appropriate black non-Hispanic and Hispanic teen shares of each state's teen population. This inclusion will allow us to assess the impact of changes in our other explanatory variables independent of demographic changes within each state.

There is some evidence that religiosity is linked to teen birth rates (Regnerus 2007). Strayhorn and Strayhorn (2009) found a high positive correlation between religiosity and teen birth rates after controlling for income and abortion rates. Unfortunately, state-level religiosity data is only collected periodically and is unavailable for most of the years of our study. The Pew Research Center's Religion and Public Life Project (2008) measured state-level religiosity. This data might enable us to infer whether or not religiosity influences teen birth rates by separating out the seven states in our study that have the highest measures of religiosity: Louisiana, Arkansas, Tennessee, Mississippi, Alabama, South Carolina and Georgia. Thus, if religiosity does influence teen birth rates, it should impact on the results depending upon whether or not we include these Deep South states.

In 2006, the black non-Hispanic share of the teen population, 15–19 years old, in the Deep South states was 34.0 % as against 13.6 % in the other 26 states in our study. For this reason, it might seem that the higher teen birth rates in these Deep South states (Fig. 1) are a result of

[8] For 2000 data, see Martin et al. (2002); for 2009 data, see Martin et al. (2011).

Table 5 Impact of labor, social, and demographic variables on birth rates (15–19 years old)

Dependent variable: birth rates (15–19 years old)	33 States				26 States			
	1	2	3	4	1	2	3	4
Unemployment rate	−0.002 (0.004)	−0.005 (0.005)	−0.008† (0.005)	−0.011* (0.005)	−0.003 (0.005)	−0.006 (0.005)	−0.010† (0.006)	−0.012* (0.006)
Male employ rate, 20–24	0.146* (0.062)	0.127* (0.064)	0.125* (0.061)	0.105† (0.063)	0.147† (0.078)	0.121 (0.080)	0.145† (0.075)	0.126 (0.077)
Female employ rate, 16–19	0.668* (0.265)	0.824** (0.270)	0.500† (0.261)	0.680* (0.267)	1.147** (0.382)	1.338** (0.330)	0.800* (0.330)	1.009** (0.331)
Female employ rate—squared	−0.008* (0.003)	−0.010** (0.003)	−0.005 (0.003)	−0.007* (0.003)	−0.013** (0.004)	−0.015** (0.004)	−0.008* (0.004)	−0.010** (0.004)
Real minimum wage rate	−0.128** (0.039)	−0.135** (0.041)	−0.128** (0.038)	−0.135** (0.040)	−0.112* (0.044)	−0.113* (0.045)	−0.120** (0.043)	−0.115* (0.044)
Alcohol use rate	−0.083 (0.067)	−0.111 (0.069)	−0.031 (0.067)	−0.067 (0.069)	−0.111 (0.081)	−0.154† (0.082)	−0.022 (0.082)	−0.070 (0.082)
Illegal drug use rate	0.053 (0.040)	0.065 (0.041)	0.046 (0.039)	0.057 (0.041)	0.039 (0.046)	0.058 (0.047)	0.024 (0.044)	0.039 (0.045)
Gonorrhea incidence	0.059** (0.015)		0.063** (0.015)		0.055** (0.017)		0.053** (0.017)	
Hispanic share (15–19 years old)			−0.012* (0.005)	−0.009 (0.005)			−0.003 (0.006)	−0.002 (0.006)
Black share (15–19 years old)			0.017** (0.007)	0.019** (0.007)			0.035** (0.009)	0.039** (0.009)
Sample size	282	282	282	282	224	224	224	224
R^2	0.667	0.646	0.688	0.664	0.688	0.670	0.715	0.700

All specifications include year dummies (not reported). Standard errors are reported in parentheses

* $p < 0.05$, ** $p < 0.01$, † $p < 0.1$

Table 6 Impact of labor, social, and demographic variables on birth rates (15–17 and 18–19 years old)

	Dependent variable: birth rates (15–17 years old)				Dependent variable: birth rates (18–19 years old)			
	33 States		26 States		33 States		26 States	
	1	2	1	2	1	2	1	2
Unemployment rate	−0.005 (0.006)	−0.007 (0.006)	−0.006 (0.007)	−0.008 (0.007)	−0.008 (0.006)	−0.011† (0.006)	−0.012 (0.008)	−0.016* (0.008)
Male employ rate, 20–24	0.142† (0.074)	0.124† (0.075)	0.201* (0.089)	0.184* (0.090)	0.153† (0.082)	0.126 (0.085)	0.095 (0.105)	0.062 (0.108)
Female employ rate, 16–19	0.948** (0.318)	1.109** (0.320)	1.062** (0.392)	1.251** (0.390)	0.071 (0.346)	0.323 (0.356)	0.650 (0.453)	0.981* (0.457)
Female employ rate—squared	−0.010* (0.004)	−0.012** (0.004)	−0.011* (0.004)	−0.013** (0.004)	−0.0002 (0.004)	−0.003 (0.004)	−0.007 (0.005)	−0.010* (0.005)
Real minimum wage rate	−0.101* (0.046)	−0.108* (0.047)	−0.130* (0.051)	−0.125* (0.052)	−0.151** (0.051)	−0.160** (0.053)	−0.104† (0.061)	−0.096 (0.063)
Alcohol use rate	−0.054 (0.081)	−0.087 (0.081)	0.006 (0.096)	−0.038 (0.096)	−0.105 (0.089)	−0.154† (0.092)	−0.194† (0.114)	−0.271* (0.115)
Illegal drug use rate	0.061 (0.048)	0.071 (0.048)	0.037 (0.053)	0.051 (0.053)	0.103† (0.053)	0.121* (0.055)	0.084 (0.062)	0.113† (0.063)
Gonorrhea incidence	0.058** (0.018)		0.050* (0.020)		0.091** (0.020)		0.082** (0.023)	
Hispanic share (15–17 years old)	−0.006 (0.005)	−0.003 (0.005)	−0.002 (0.006)	−0.002 (0.006)				
Black Share (15–17 years old)	0.020** (0.007)	0.022** (0.007)	0.030** (0.009)	0.033** (0.009)				
Hispanic share (18–19 years old)					0.001 (0.009)	0.005 (0.009)	0.016 (0.010)	0.023* (0.011)
Black share (18–19 years old)					0.018* (0.009)	0.019* (0.009)	0.034** (0.013)	0.037** (0.013)
Sample size	282	282	224	224	282	282	224	224
R^2	0.752	0.741	0.767	0.760	0.555	0.515	0.574	0.544

All specifications include year dummies (not reported). Standard errors are reported in parentheses

* $p < 0.05$, ** $p < 0.01$, † $p < 0.1$

their racial composition. This larger black non-Hispanic share in the Deep South states, however, was offset by its much smaller Hispanic share: 3.8 % compared to 18.3 % in the other states in our study. As a result, the 2005–2007 birth rate in the Deep South states would have been virtually unchanged if the Hispanic and black non-Hispanic shares there were the same as in the other states.

Rather than the racial/ethnic composition of its population, the higher teen birth rates in the Deep South states was the result of the higher race-specific teen birth rates there than in the other states in our study. Specifically in 2005–2007, the white and black teen birth rates in the Deep South states were 75 and 20 % higher, respectively, than in the rest of the states in our study. These regional race-specific disparities are dramatically higher than 15 years earlier.[9] These growing regional differences suggest that cultural factors, including religiosity, distinguish the Deep South states.

Results

Table 5 presents the results for teen births, 15–19 years old. Among the economic variables, the real minimum wage and male employment rate were statistically significant in six of eight specifications. In each specification, the teen birth rate varied inversely with the real minimum wage but was positively correlated with the male employment rate. Both the female teen employment rate and its squared term were statistically significant in the opposite directions, verifying a nonlinear relationship.[10] Given the coefficients in each of the specifications, as long as female teen employment rates are below 45 %, there is a positive relationship between it and the teen birth rate. Finally, the unemployment rate was statistically significant and inversely related to the teen birth rate in only the two specifications where demographic shares were included but the gonorrhea infection rate was not.

Among the behavioral variables, the gonorrhea infection rate was statistically significant and positively correlated with the teen birth rate in all four specifications while neither the alcohol or illegal drug use were statistically significant in any of the specifications. As expected, the black non-Hispanic share was strongly statistically significant and positively correlated with the teen birth rate in all four specifications. By contrast, the Hispanic share was not statistically significant for the 26 states. When the Deep South states were added, the Hispanic share became statistically significant but negatively correlated with the teen birth rate.

Table 6 presents separately results for the teen birth rates for 15–17 year olds and 18–19 year olds. We have only presented specifications which include the demographic shares since the results are virtually the same when excluded. The real minimum wage remained statistically significant in almost all specifications. By contrast, the male employment rate was statistically significant in all four specifications for younger teens but only one for older teens. Now the female teen employment rate was statistically significant in all specifications for younger teens and one specification for older teens; the same specifications in which the squared measure is also statistically significant but with the opposite sign. Just as with the 15–19 teen birth rates, as long as female teen employment rates are below 45 %, it is positively correlated with teen birth rates for each of the subgroups. Finally, the unemployment rate remained statistically significant in the same two specifications but only for the older teens.

Among the behavioral variables, the gonorrhea infection rate was again statistically significant in all specification. The alcohol use rate was statistically significant in three specifications for older teens but none for younger teens. However, now the illegal drug use was statistically significant and positively correlated with the teen birth rate among older teens in three of the specifications.

Discussion of Results

The strong link between male employment rates of 20–24 year olds and the younger teen birth rate may reflect coercive relationships. As Darroch et al. (1999) indicated, there was a strong link between age disparities and at-risk sexual behavior. In addition, Koon-Magnin et al. (2010) found that for women 16 and younger having a partner three or more years their senior had a higher odds of engaging in sexual intercourse than female students with partners closer to their age. Similarly, Ku et al. (1993) wrote, "Young men who worked more hours were more sexually active and also were more likely to have made someone pregnant" (p. 479). In an e-mail message to the authors on March 21, 2012, CDC statistician TJ Mathews indicated that for 2009, among those reporting the age of the father, 16 % of 15 year old mothers, 25 % of 16 year old mothers, and 41 % of 17 year old mothers reported that the age of the father was at least 20 years old.

Our results indicate that there is a nonlinear relationship between the female teen employment rate and the teen birth rate. In each of the specifications for both the younger and older teen birth rate, the income effect dominates so

[9] For 1990 birth rates, see Spitz et al. (1993). For 2007 birth rates, see Matthews et al. (2010). For 2005 birth rates, see Guttmacher Institute (2010).

[10] To enable the squared term to have a clearer measure in Tables 5 and 6, the female teen employment rate was rescaled by 100 by using the actual values rather than their percentage measures.

that there is a positive relationship between teen birth rates and the female teen employment rates, especially for disadvantaged youth. Also consistent with a strong income effect was the statistically significant inverse relationship between the unemployment rate and the birth rate among older teens in some of the specifications. These results suggest that lower unemployment rates, together with increased teen female employment rates, lead to higher teen birth rates, especially in areas where female teen employment rates are weak.

Geronimus and Korenman (1992) claimed that the substitution effect was weak because upward mobility for disadvantaged young women was limited even if they delayed motherhood. While disadvantaged young women have more opportunity for upward mobility than in the past, there are important policy changes that have weakened the substitution effect. In particular, society now provides many more support resources to single mothers who have paid work.

Support resources include income supplements and childcare subsidies. In 2012, the earned income tax credit (EITC) provided $3,169 to single mothers and one child, with annual income between $9,000 and $17,000. Over twenty states have a state EITC which is usually 20 % of the federal credit. There is also the $1,000 per child refundable child credit. In addition, many states have generous refundable child and dependent care tax credits that help mothers pay for charges they have from the expanded government-subsidized childcare services available.

The income effect is strengthened further when increased female employment create circumstances that may increase risky sexual encounters. Similar to the Monahan et al. (2011) finding cited earlier, Rosenbaum et al. (2014) stated:

> "Employment can help adolescent women avoid becoming dependent on their boyfriends—and thus have lower risks of abuse and reproductive coercion … Employment is not uniformly positive: employed teens have sex with more partners, use marijuana and alcohol more frequently, and have sex under the influence more frequently." (p. 169).

It is not surprising that the gonorrhea infection rate was strongly correlated with teen birth rates. This verifies the strong link between risky sexual behavior and teen pregnancy. Going against commonly held perceptions, in our study, increased alcohol use is mildly associated with a *reduction* in older teen birth rates. Our finding, however, is consistent with some previous research. Morrison et al. (2003) found that teens are no less likely to use condoms after consuming alcohol than when they have not been drinking. By contrast, illegal drug use was positively correlated with birth rates among older teens. More generally, these results strengthen the view that illegal drug use not drinking is the clearest predictor of risky sexual behavior for older teenage women.

The negative correlation between the teen birth rate and the real minimum wage rate could indicate that the more hopeful young women are that they will earn increased wages, the less likely they would be to have children. It is certainly possible, however, that there is an endogeneity problem despite using lagged explanatory variables. In particular, it could be that in some states, like those in the Deep South, religious and political conservativism leads to both higher teen birth rates and lower state minimum wages. This thesis is consistent with a stronger statistically significant relationship when the Deep South states are included (Table 6).

As other studies have found (Upadhya and Ellen 2011), the behavior of younger and older teens differs. For only older teens, the alcohol use, illegal drug use, and the unemployment rate influence birth rates. By contrast, it is only young teen birth rates that are influenced by the male employment rate and the teen female employment rate.

Teen birth rates were generally influenced by the same factors in the Deep South states as the rest of our sample. Among 15–19 year olds, the only difference was that the male employment rate was more strongly statistically significant in the 33 state than the 26 state specifications. Among older teens, there were two differences: Both the real minimum wage rate and illegal drug use rate were more strongly statistically significant when the Deep South states were included. Among young teens there was little difference in the results among the 26 and 33 states. Thus, explanations for the higher teen birth rates in the Deep South states were not substantially captured by the variables included in our model.

Among the demographic share variables, as expected, an increase in the share of black non-Hispanic teens raised the teen birth rate. By contrast, the Hispanic share variable was statistically nonsignificant in most specifications. At least part of the reason might be the way changes in Hispanic teen birth rate in the Deep South states deviated from changes elsewhere. In particular, in the 2005 and 2007 period when state birth rates for 15–19 year olds were available, national teen birth increased for both blacks and whites but not for Hispanics while in the Deep South states, the Hispanic rate declined by more than 10 %.

Policy Implications

This paper brings into question the current view that labor market conditions only marginally influence teen birth rates. In particular, we found a consistent positive

correlation between the employment rate of young men, 20–24 years old, and the teen birth rate, particularly among younger teens. This link is consistent with the unequal relationships that many young teen women may experience, especially those from disadvantaged backgrounds (Abma et al. 1998; Barone et al. 1996; Stock et al. 1997). With little direct sources of income, they are vulnerable to the pressures placed on them by older working men (Rosenbaum et al. 2012).

These findings reinforce efforts like those of Kids Count to strengthen self-esteem among young women from disadvantaged backgrounds. They also suggest that it is important that these young teenage women have independent sources of income, preferably jobs that are linked to their schooling. Career Academies and Career and Technical Education (CTE) programs have proven quite effective in linking work and education and should be dramatically expanded (e.g., Karp et al. 2008; Kemple and Willner 2008).

Our study rejects the claim made by Kearney and Levine (2012b) that teens in depressed areas would be unresponsive to short-term changes in labor market conditions.[11] Instead, we found that improved employment prospects—whether increased male employment rates, reduced unemployment rates, or increased female teen employment rates—will likely increase teen birth rates. In particular, Fragile Family studies documented the desire for motherhood among poor disadvantaged young women (Edin and Kefalas 2005; Institute for Research on Poverty 2002; Harknett 2008). For this group, the income effect dominates so that improved female teen employment prospects, by making motherhood financially viable, will result in higher teen birth rates. This childbearing behavior may explain the limited economic effectiveness of government training programs for young women. For example, evaluations of Career Academies found that the short-term gains were substantially higher for the young men than young women in the program because many young women, after completing their training, did not sustain employment due to childbearing (Kemple and Willner 2008).

This motherhood objective results in births before marriage. In 2012, 88.8 and 64.8 % of births to teenagers and to those 20–24 years old, respectively, were to unmarried women (Hamilton et al. 2013). What is often ignored is that a major financial impediment to subsequent marriage is the substantial marriage penalty low-income couples face. Consider the impact of marriage on a young mother having annual wages equal to $15,000. With one child, she qualifies for food stamps and the federal EITC and child credit, providing her with more than $7,000 annually. If she lives in one of the twenty states that has an EITC and qualifies for either housing and/or childcare subsidies, the total cash benefits she obtains could easily rise to $10,000.

Virtually all of these benefits are lost if she marries a man earning at least $25,000 annually. This marriage penalty may be a significant impediment to marriage (Fisher 2011). A number of solutions have been offered: replace the EITC with an individual worker subsidy (Biven et al. 2012); adjust benefit levels and income eligibility to be more generous for married couples with young children (Cherry 2012); or allow married couples to pay the same federal taxes as they did before marriage (Marquardt et al. 2012). Given the inherent unfairness of marriage penalties and how they might influence marriage decisions, Congress should seriously consider these proposals.

[11] In a subsequent revision made in December 2013, Kearney and Levine (2012c) found a statistically significant inverse relationship between unemployment and teen birth rates.

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