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LABOR MARKET SHIFTS AND THEIR IMPACT ON TEEN BIRTH RATES

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I dedicate this dissertation to my parents for their unconditional love, support and sacrifice for my aspirations.

To my grandparents who exemplified humility, public service and righteousness and paved the path for me to pursue my dreams.

To Paramahansa Yogananda who through the teachings of Self Realization Fellowship has reinforced my ideals of service to humanity and given me the wisdom and strength of mind to make the often seemingly impossible, possible.

To those who live in dire economic poverty, I sincerely hope that I can use my academic training and other resources to contribute to your long term prosperity.

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ABSTRACT

In the first paper I investigate whether higher returns to education for women lead to a reduction in teen birth rates. I first estimate the impact of the growth in the female college wage premium on teen birth rates in the U.S. An increase in the college wage premium is a proxy for higher expected earnings after completing college. Higher future earnings create incentives to pursue further education and they decrease the relative returns to having a birth as a teen. Using state variation, I find that an increase in the female college wage premium does lead to a reduction in teen birth rates. To address endogeneity and measurement error issues, I use a shift-share instrumental variable for women's wages to construct the female college wage premium. Results from three supplemental analyses support the main results. First, teen birth rates also respond similarly to the growth in the female high school wage premium but due to a weak first stage, the results are not conclusive. Second, the estimates suggest that growth in the male college wage premium has a lower impact on teen birth rates. Third, the elasticity of fertility with respect to the female college wage premium decreases as women grow older. This research can explain approximately 30% of the fall in teen birth rates that has occurred from the early 1990s up to the present.

In the second paper, I investigate the impact of more permanent changes in employment on teen birth rates. The employment shifts occur through large scale capital investments by corporations in counties. Often local governments enter into a bidding contest for businesses to locate in their jurisdictions. To create the right incentives for firms, local governments often offer large subsidies including tax breaks, land, tax-exempt bonds, construction of roads and other investments. I estimate the impact of entry of plants in a county on teen birth rates. Using a difference in difference analysis where counties that lose the bid by a very narrow margin consist of the counterfactual group, my results suggest that teen birth rates decline more in treatment versus comparison counties. Moreover, it appears that black teen birth rates decrease to a greater extent than white teen birth rates in response to the new employment opportunities.

CHAPTER 1

INTRODUCTION

From 1991 to 2014, there has been a 61% decline in teen birth rates in the U.S.[1] Figures 1.1 & 1.2 show that the precipitous fall has occurred for all 3 major race/ethnic groups.[2] The teen birth rate declined by 69%, 64% and 56% for Black, Hispanic and White teens, respectively. The number of teen births has fallen from 519,577 in 1991 to 247,632 in 2014. The decline in teen birth rates is not a part of an overall downward trend in fertility rates in the U.S. as shown in the graphs in Figure 1.3. Fertility rates of non-teenage women, younger than 30, fell at half the rate of teenage women. Moreover, for women older than 30, fertility rates increased.[3]

Understanding the causes of the decline is an important public policy issue because of the adverse socio-economic circumstances of teen parents and their children, and the costs to society. Children of teenagers face higher incarceration rates, more abuse and neglect and lower levels of educational attainment (Grogger (1997); Goerge, Harden, and Joo (2008); Manlove, Terry-Human, Mincieli, and Moore (2008)). Also, teen mothers are more likely to have lower levels of education and earnings (Hoffman (2008)). Further, according to the National Campaign to Prevent Teen and Unplanned Pregnancy, teen childbearing cost taxpayers $9.4 billion in 2010.

In this paper I examine whether 15-19 year old women respond to the higher economic returns to completing college and thus reduce their birth rates. If higher expected earnings from post-secondary education creates incentives for young women to complete college, they would be less likely to have children during their teen years since being a teen parent reduces the probability of completing college (Hoffman (2008)). Moreover, when the economic returns

1. The rate further dropped to 22.3 in 2015 resulting in a 64% decline from 1991 to 2015.

2. The rate has steadily decreased except for a transitory 5% increase during 2005-2007.

3. Fertility decreased 32% for 20-24 year olds and 16% for 25-29 year olds between 1990 and 2012. During this time period, fertility increased 15% and 46% for 30-34 and 35-39 year old women, respectively. Consistent with declining teen birth rates, the mean age at first birth has changed dramatically from 24.2 in 1990 to 26.3 in 2014 (Mathews and Hamilton (2002); Mathews and Hamilton (2016)).

to education increase, the opportunity cost of having a child during one's college years rises. In order to study the effect of higher expected returns on teen birth rates, I use the female college wage premium as a proxy for expected income from a college education. The female college wage premium is defined as the ratio of wages of college educated women (Bachelor's degree only) to the wages of high school educated women.[4]

Nationwide, the college wage premium for women rose 11% between 1991 and 2014 (Figure 1.4). The reason for the rise has been the relatively higher growth in wages of college educated women. They rose 15% while wages of high school educated women rose 4% during this time period (Table 1.9 (Appendix)).[5] Moreover, during this time period, college enrollment grew 154%, 56% and 32% for 18-24 year old Hispanic, Black and White women, respectively (See Figure 1.5(a)).[6]

To test my hypothesis, I use state variation in the growth of the female college wage premium and measure its impact on teen birthrates. I address possible endogeneity and measurement error issues by uaing an Instrumental Variable (IV) analysis. I first construct a shift share instrumental variable for college educated and high school educated wages, respectively. The instrumental variable for the female college wage premium is then calculated as a ratio of the instrumental variables for wages of college educated and high school educated women. I estimate the impact on teen birth rates using both ordinary least squares (OLS) and IV methods.

I supplement my results with other analyses to support my main findings. Using the same methodology as mentioned above, I measure the impact of growth in the female high

4. I use "Wages" interchangeably with "Earnings".

5. The high school wage premium for women also grew 9%. Unlike the college wage premium its growth was a result of both a rise in high school educated wages and a fall in less than high school educated wages of approximately 4% each. The male college wage premium grew 5% during the 1991-2014 time period and was solely the result of growth in male college educated wages as high school educated wages fell -.1% (Table 1.10 (Appendix)). The male high school wage premium grew 12% due to a decline of 11% in wages of less than high school educated men.

6. High school completion increased 24%, 20% and 10% for Hispanic, Black and White women, respectively.

school wage premium on teen birth rates. The high school wage premium is calculated as the ratio of wages of high school educated women to the wages of less than high school educated women. Changes in the high school wage premium would affect the incentives of 15-17 year old women to finish high school. Moreover, a rise in the high school wage premium could also create incentives for labor force participation rather than enrollment in college. While different in levels, the trends of the two wage premia have been similar (See Figure 1.4). Next, I estimate the impact of the male college wage premium on teen birth rates. I construct the male college wage premium in the same manner as the female college wage premium, except I use male wages by education level. The male college wage premium serves as a proxy for higher expected income for males. Finally, as a placebo test I estimate the growth in the female college wage premium on birth rates of older women. As women get older, there is a higher likelihood that post-secondary education will be completed. Therefore, growth in expected income through the channel of education should matter less as women get older.

There is a prior literature on the impact of expected income on teen birth rates (Aassve (2003); Wolfe, Wilson, and Haveman (2001); Wolfe, Haveman, Pence, and Schwabish (2007)). The studies establish a negative relationship between teen birth rates and higher expected income, though some endogeneity issues remain. Further, Kearney and Levine (2012b) find that teen birth rates were lower in states where there was less inequality. However, they acknowledge that since inequality has not changed much within each state, it cannot by itself explain the decline that has occurred since the early 1990s. The literature also examines the impact of unemployment rates on teen birth rates (Schaller (2012); Colen, Geronimus, and Phipps (2006); Cygan-Rehm and Riphahn (2014); Cherry and Wang (2014)). Unemployment rates represent current and future economic opportunities. The evidence on the impact of unemployment rates is mixed. Schaller (2012) finds that birth rates of 16-25 year old women are procyclical. While Colen, Geronimus, and Phipps (2006) and Cygan-Rehm and Riphahn (2014) find that teen fertility is counter-cyclical. Cherry and Wang (2014) estimate the correlation of female teen employment rates on teen birth rates and find no relation. During the period of my study, teen employment rates most likely had a decreasing impact on teen birth rates since labor force participation of 16-19 year olds fell 35 percent from 1990 to 2012. In contrast, the fall in labor force participation was only 9% percent for 20-24 year olds.[7]

Research also shows that expectations of college attendance are negatively correlated with teen parenthood. For example, Kalil and Kunz (1999) find that for the NLSY79 sample, the probability of being a teen mother falls when college expectations are high. They do not address endogeneity issues and so no causal inference can be reached regarding this relationship.

Welfare payments also represent expected income for women. Welfare reform or PRWORA (Personal Responsibility and Work Opportunity Reconciliation Act) reduced welfare benefits to teen mothers in 1996. The results from studies that estimate the impact of PRWORA on teen childbearing are indeterminate. Hao and Cherlin (2004) do not find any consistent effects of PRWORA on teen fertility but Kearney and Levine (2012a) claim that 2.7% of the decline in teen birth rates from 1991 to 2008 can be attributed to a reduction in welfare generosity. However, in the evaluation of the "family cap" policy under PRWORA, that ended the practice of providing families on welfare with cash assistance, Kearney (2004) does not find any impact on teen birth rates. The evidence from studies that looked at the impact of welfare benefits prior to PRWORA is also mixed. Lundberg and Plotnick (1995) find that the AFDC cash benefit and food stamps provided to a family with no income increased the probability of a pre-martial teen birth. However, Duncan and Hoffman (1990) do not find that welfare payments impact teen birth rates.

The first contribution to the literature is that I empirically test an economic model of fertility choice that also includes schooling and work as choice variables. For the empirical

7. The labor force participation rate for 16-19 year olds is not available by gender prior to 1998. Post-1998 data suggest that labor force participation of male and female young adults are similar. Between 1998 and 2014 female and male 16-24 year olds had 17% and 15% declines in labor force participation rates, respectively (Canon, Kudlyak, and Liu (2015)).

analysis, I use a measure of expected income where the channel for wage variation is education rather than other sources of income shocks such as uniform demand shocks or changes in public benefits. I also test whether higher supplemental income, the male college wage premium, has an impact on teen birth rates. Second, I circumvent endogeneity issues that have been a challenge in the literature so far when estimating the impact of higher expected income on teen birth rates. Third, using the elasticity measures of changes in the college wage premium on the birth rates of women of different ages, I estimate an age gradient of fertility with respect to higher expected income. Lastly, this paper can explain a large part of the continuous fall in teen birth rates that still remains unexplained in the literature.

The main findings are as follows. First, I estimate an elasticity of -2.5 of teen birth rates with respect to the female college wage premium. The elasticity measure is similar and significant for all 3 race/ethnic groups. Moreover, the elasticity estimates in this paper are consistent with those found in the literature.[8] Second, the elasticity of teen birth rates with respect to the high school wage premium is -2.6 for "All" teens (all race/ethnic groups). However, the first stage results are weak (for all the race/ethnic groups) and hence the results cannot be interpreted as causal. Third, the elasticity of teen birth rates with respect to the male college wage premium is -1.9 for "All" teens. Again the first stage results are weak except for the analysis with Hispanic teen birth rates, where the elasticity estimate is -1. Fourth, I find a positive age gradient of birth rates with respect to the female college wage premium. The age gradient has a similar pattern across race/ethnic groups with a slight change in the pattern for Hispanic women after 30. Fifth, from a back of the envelope calculation, I attribute 32% of the teen birth rate decline to growth in the female college wage premium. My calculation is based on the elasticity estimate of -2.5 and a growth in

8. For example, estimate the impact of changes in hourly earnings on female birth rates. The measure of earnings is different, but they provide a benchmark with which to evaluate my estimates. Butz and Ward (1979) find an elasticity of -0.87 for 20-24 year old women and -1.8 for 20-39 year old women in response to changes in female hourly earnings from 1960-75. The elasticity estimates from my analysis for 20-24 year old women is -1.5 and for 20-39 year old women is -0.9. See Section 1.6.7 and 1.6.11 of the Appendix for the elasticity estimates of 20-24 year old and 20-39 year old women, respectively.

the wage premium of 7% in the 1990-2012 time period. Similarly, I can explain 19%, 38% and 54% of the decline in Black, White and Hispanic teen birth rates, respectively.[9]

In Section II below I provide a theoretical framework for understanding teen fertility and schooling choices with respect to future earnings. Section III explains the empirical strategy. I then describe the data and provide descriptive statistics in Section IV. This is followed by Section V with results from the OLS and IV regressions and a discussion of how much of the decline can be explained by the estimates. Section VI concludes.

1.1 Theoretical Framework

Using an economic framework of utility maximization, I analyze the tradeoffs for a woman in a two period model setting. In time period 1, a woman can spend time with children, attend school and/or work. In time period 2, she can spend time with children and/or work. I assume time spent in leisure is included in time spent with children. The framework applies to women of all ages that are faced with making choices between children, schooling and/or work. Furthermore, the female wage premium below will refer to the high school wage premium if one is in secondary school and the college wage premium if one is enrolled or about to enroll in postsecondary education.

In considering the inter-temporal choice of having children in time period 1 versus time period 2, an increase in the female wage premium will increase the demand for children in time period 1 since the relative price of children will decline in time period 1 versus time period 2. The reason for the lower relative price is that the wage premium will be earned in time period 2 which increases the opportunity cost of children in time period 2. Women will thus substitute children from time period 2 to time period 1. I assume that time spent in school and at work is held constant. Assuming children are a normal good, demand for children in time period 1 will also rise due to higher available income, assuming no credit

9. The analysis does not extend beyond 2012 because that is the last year teen population estimates are available in the NIH Surveillance, Epidemiology, and End Results (SEER) Program data that I use to calculate teen birth rates.

constraints. If there are credit constraints, higher expected income might lead to a weak to zero income effect. In both cases, the substitution and income effects will result in an increase in the demand for children in time period 1.

In addition to the income and substitution effects that lead to more time spent with children in time period 1, a rise in the wage premium also creates a substitution effect between children and school in time period 1. There will be an incentive to pursue school as the returns to further education increase. Since time is fixed, an increase in time spent in school implies a decrease in time spent with children in time period 1, holding time spent at work constant. Through this substitution effect there will be a reduction in the demand for children in time period 1.

The overall effect is therefore ambiguous. If the substitution effect between school and children dominates there will be a net decline in teen births. However, if the substitution and income effects that increase the demand for children in time period 1 are stronger, there will be an increase in teen births in time period 1. The effects will vary and will largely depend on a woman's own relative costs and benefits of going to school.

In the previous paragraphs, I held time spent at work constant. A rise in the wages of high school educated women could create incentives to substitute work for college for teen women, holding time spent with children constant. Similarly, a rise in wages of less than high school educated women could lead to substitution of work for high school. If there are lower costs, including opportunity costs, to having a child while working rather than being in school, teen birth rates could rise in time period 1.

Higher expected income for males can also impact teen birth rates in this theoretical framework. Male wages could be a source of additional income for women in their teen and later years. This could come from marriage or support as a partner. If male partners bear a small share of the responsibility of raising a child out of wedlock, teen birth rates may not respond to changes in the male college wage premium. On the other hand, teen birth rates would rise in response to a rising male college wage premium if male partners did incur time and/or monetary costs for their children. Higher income would lead to higher demand for children in time periods 1 and 2 due to the income effect. Holding constant growth in women's earnings and therefore no negative substitution effect between school and fertility, there would be higher demand for children in both time periods.

However, if male partners did provide time and/or financial support to their children teen birth rates could still decline. This would occur if males were increasingly enrolling in college in response to the rising male college wage premium. Having a child during their teen years would make them more likely to drop out of college and work instead. If the opportunity cost of dropping out of college is substantial, young males might engage in behaviors to avoid being teen parents. Teen birth rates would then respond negatively to the male college wage premium.

The framework can also apply to women during their post-schooling years, i.e. in time period 2. A rise in the wage premium in time period 2 will increase the demand for children due to the income effect. The substitution effect between work and children will lead to a reduction in the demand for children. The net effect would be positive if the income effect dominates the substitution effect and negative if the opposite holds true.

1.2 Empirical Strategy

Using state variation from 1990 to 2012, I first measure the impact of growth in the female college wage premium on teen birth rates using Ordinary Least Squares (OLS). I then perform an Instrumental Variable (IV) analysis using two stage least squares. The IV regression attempts to correct for endogeneity and measurement error issues that I describe in more detail below. Next, I perform the OLS and IV analyses to measure the impact of the female high school wage premium and the male college wage premium on teen birth rates, respectively. Lastly, I measure the impact of changes in the female college wage premium on the fertility rates of older women.

1.2.1 OLS Regression

The OLS specification is

$$Ln(tbr)_{srt} = \beta_0 + \beta_1 Ln(WP_{coll})_{st-2} + \beta \sum_r Prop_{srt} + \Delta X + \kappa_s + \varphi_t + \epsilon_{st} \tag{1.1}$$

The left hand side variable $Ln(tbr)_{srt}$ is the natural log of the teen birth rate for state s, race/ethnicity r in time period t. $Ln(WP_{coll})_{st-2}$ is the natural log of the college wage premium in state s, and is lagged by two time periods. The female college wage premium is measured as the ratio of wages of 25-64 year old college educated women to the wages of 25-64 year old high school educated women, $\frac{College\ Wages}{HS\ Wages}$. Due to the double-log model, the coefficients are interpreted as the elasticity of the teen birth rate with respect to the female college wage premium.

To control for demographic shifts in the teen population, I include the proportion of teens in each state by race/ethnicity r for each year t, $Prop_{srt}$. The three race/ethnic groups included are Black, White and Hispanic and β is a 3x1 vector of coefficients. Other explanatory variables, the aids rate and the unemployment rate in the state in time period (t-1), are included in the X vector of variables. State and time fixed effects are κ_s and φ_t, respectively. Regressions are weighted by the number of female teens in the race/ethnic category in the state in 1990. Standard errors are clustered at the state level to account for heteroskedasticity in the error term across states.

Since, the wage premium measure represents expected returns to education, I would like to incorporate returns to education that may arise from work experience and thus include earnings of women older than 25 years old. Workers older than 64 are not in the sample since social security retirement benefits can start at age 65 and there thus might be reallocation of hours of work that could possibly not represent true earnings.

I use a two period lag of the college wage premium as a proxy for expected income. There are a number of ways to model one's expectations of future earnings and I assume that those formed a year prior to when one gets pregnant, (t-2), is some component of her beliefs. To ensure the robustness of my results, I also do the analysis for 1 and 3 lag periods. As a check on the quality of expectations formed from the past, I also estimate the elasticities for 4 lead periods. It is in time period (t+4), after she completes college, that a woman will earn the higher return. However, it could take more or less time and therefore I include 1, 2 and 3 lead periods to see if the results are qualitatively similar as a check on the robustness of my main specification.

1.2.2 Instrumental Variable (IV) Regression

The two threats to identification in this analysis are endogeneity and measurement error. On the endogeneity issue, there could be variables that are time variant that could affect both wages of women by education and teen birth rates. For example, industries that demand more college educated workers may choose to locate in geographic areas where there is a high skilled labor force (Moretti (2003)). Therefore, areas where the wage premium grows may tend to have a larger stock of skilled workers. The bias in the OLS coefficients would then depend on the trends in fertility of high skilled workers.

Further, the demographic characteristics of the immigrant population could also affect the bias of the coefficients. Giannone (2016) finds that since 1980 high skilled workers tend to migrate to cities that have an existing high skilled population. Large metropolitan areas also tend to attract more foreign immigrants (Wright, Ellis, and Reibel (1997)). Teen birth rates would thus change according to the relative characteristics of the immigrant population. A continuous inflow of skilled workers could overstate the effect. In contrast, a flow of lower-skilled workers would create a bias in the other direction.

Moreover, the OLS results from this analysis could also suffer from attenuation bias due to classical measurement error in the wage premium variable. I assume that the measurement error is classical for two reasons. First, the measurement error in this analysis appears to arise due to small sample sizes in several states. For example, between 1990 and 2012, in states such as New Mexico, Montana, Tennessee and West Virginia the standard deviation of the female college wage premium was greater than 15% of its initial value in 1990 (Figure 1.8). The correlation between the number of college educated women surveyed in a state on average and the standard deviation of the female college wage premium is -.34. Since a large portion of the measurement error arises due to small samples and teen birth rate changes are uncorrelated with the size of the state (See Figure 1.8), I assume that the error is uncorrelated to the unobservables that affect teen birth rates. Second, prior research suggests that the measurement error in earnings variables in the Current Population survey data is uncorrelated with major variables such as education, age and weeks worked that would render the error to be non-classical in my specification (Bollinger (1998) and Bound and Krueger (1991)). While there maybe other unobservables in the measurement error that could be correlated with teen birth rates, I assume that the most critical variables are not a problem in these data. I therefore assume the measurement error is classical which biases the OLS coefficients toward zero.

Based on the discussion above, it is unclear a priori whether the OLS coefficients will have an upward or a downward bias. There are numerous factors that could have contrary effects. To address both the endogeneity and measurement error concerns I estimate the coefficients using an IV analysis.

The IV estimates measure a local average treatment effect (LATE). The coefficients from the IV analysis are estimates for a subpopulation of teen women whose expected wages will be determined by changes in the instrumental variable. For them, a part of their expectation will be driven by long term changes rather than noisy transitory shocks. This group of women, the "compliers", will not be representative of the entire population of women that were in a state in which the shift-share instrumental variable grew. There are two assumptions that must be satisfied for the instrumental variable to be valid. The first is that the instrumental variable in my analysis must be correlated to the state female college wage premium. The F-statistics from the first stage results in the empirical analysis check this assumption. The second assumption is the exclusion restriction. In my analysis, it requires that the sectoral composition of women in 1980 be uncorrelated with the stock and changing composition of women or any other unobservable variable starting in 1990 that could potentially affect teen birth rates. This is not possible to test but since 1980 is sufficiently prior to the period of the analysis, I believe the exclusion restriction assumption is valid.

IV Methodology

I use a shift-share instrumental variable for the female college wage premium as a measure of exogenous wages in this analysis. This type of instrumental variable developed by Bartik (1991) and used widely in the literature allows one to predict local growth in women's wages using national wages. To construct the IV for the female college wage premium, $PredWP_{coll}$, I first create an IV for wages of college educated women and for high school educated women, respectively. The IV for the female college premium is then defined as:

$$PredWP_{coll} = \frac{Pred\ College\ Wages}{Pred\ High\ School\ Wages} \tag{1.2}$$

The variables $Pred\ College\ Wages$ and $Pred\ High\ School\ Wages$, hereafter referred to as $PredW_{set}$, are the IVs for wages in state s for education level e in time period t. I calculate $PredW_{set}$ in two stages. First, I create an IV for the annual growth rate of wages in each state for college and high school educated women respectively. Second, I apply this growth rate to the wages in the base year, 1990, W_{seb}. These steps are illustrated in equations (1.3) and (1.4) below.

$$PredG_{est} = \sum_{j} \frac{N_{jes80}}{N_{es80}} \frac{W_{jet} - W_{jet-1}}{W_{jet-1}} \tag{1.3}$$

$$PredW_{est} = W_{esb} \prod_{t=1}^{T} (1 + PredG_{est}) \tag{1.4}$$

In equation (1.3), the IV for the annual growth rate of wages, $PredG_{est}$, is calculated as a sum of annual national growth rates of women's wages in industry j for women of education level e for the nation in time period t, $\frac{W_{jet}-W_{jet-1}}{W_{jet-1}}$. The sum is weighted by the employment shares of women that work in industry j, of education level e in state s in 1980, $\frac{N_{jes80}}{N_{es80}}$.[10] The employment shares are chosen for a time period prior to when the wage growth is calculated and in this case it is 1980. The 19 industry sectors are classified according to the two digit 2002 North American Industry Classification System (NAICS) codes.[11]

To estimate the IV for wages for each state by education level e in time period t, $PredW_{est}$, IV growth rates $PredG_{est}$ are applied to wages in the state in the base time period (t=b) (Equation 1.4). This allows me to construct annual wages for each state for the time period t=1 to T, where T is the last year of the analysis. Using $Pred_{est}$, I calculate the IV for the female college wage premium (Equation 1.2).

Two Stage Least Squares

The first and second stage equations are

$$Ln(WP_{coll})_{st-2} = m_0 + m_1 Ln(PredWP_{coll})_{st-2} + m\sum_r Prop_{srt} + \mu X + \alpha_s + \nu_t + u_{set-2} \quad (1.5)$$

10. The 19 different industry sectors are Agriculture (11), Mining (21), Utilities (22), Construction (23), Manufacturing (31-33), Wholesale Trade (42), Retail Trade (44-45), Transportation and Warehousing (48-49), Information (51), Finance and Insurance (52), Real Estate and Rental and Leasing (53), Professional, Scientific, and Technical Services (54), Administrative and Support and Waste Management and Remediation Services (56), Educational Services (61), Health Care and Social Assistance (62), Arts, Entertainment, and Recreation (71), Accommodation and Food Services (72), Entertainment and Recreation Services, Other Services (except Public Administration) (81) and Public Administration (92). Active Military Duty is not included since this industry code is not available for the CPS MORG sample. Management of Companies and Enterprises (55) is not included because it was created in 1997 not available in the earnings data before 2000 and in the census data for 1990.

11. The CPS MORG earnings data for 1990-1992, 1993-2002 and 2003-2014 has industries coded per the 1980, 1990 and 2000 Census of Population Industrial Classification systems, respectively. I use a crosswalk between the 1990 Census and 2000 codes to classify the industries consistently over time.

$$Ln(tbr)_{srt} = \gamma_0 + \gamma_1 Ln(\widehat{WP}_{coll})_{st-2} + \gamma \sum_r Prop_{srt} + \Gamma X + \phi_s + \theta_t + \upsilon_{st} \tag{1.6}$$

In the first stage (equation 5), $(PredWP_{coll})_{st-2}$ is the college wage premium lagged by two time periods and u_{set-2} is an error term. State and time fixed effects are α_s and ν_t, respectively. In the second stage (equation 6), the predicted wage premium $(\widehat{WP}_{coll})_{st-2}$ is estimated from the first stage using two stage least squares. Like in the OLS regression, $Prop_{srt}$ is the proportion of teens by race in the state in time period t, X includes the aids rate and unemployment rate in time period (t-1) and ϕ_s and θ_t are state and time fixed effects, respectively.

1.2.3 High School Wage Premium

I also perform the OLS and IV analysis using the high school wage premium as the independent variable. The female high school wage premium in each state, (WP_{hs}), is the ratio of wages of high school educated women to the wages of less than high school educated women. The IV for the High School Wage Premium is calculated as

$$PredWP_{hs} = \frac{Pred\ High\ School\ Wages}{Pred\ Less\ than\ High\ School\ Wages}$$

The OLS and IV regressions are specified in the same way as equations (1.1), (1.5) and (1.6). Below, equations (1.7) and (1.8), are the OLS and second stage regressions with the high school wage premium as the independent variable.

$$Ln(tbr)_{srt} = a_0 + a_1 Ln(WP_{hs})_{st-2} + a \sum_r Prop_{srt} + AX + \delta_s + \Delta_t + k_{st} \tag{1.7}$$

$$Ln(tbr)_{srt} = b_0 + b_1 Ln(\widehat{WP}_{hs})_{st-2} + b \sum_r Prop_{srt} + BX + \xi_s + \Xi_t + j_{st} \quad (1.8)$$

A rise in the high school wage premium creates incentives for 15-17 year old women to finish high school. For some 18-19 year old women the rise in wages of the high school educated (keeping wages of the college educated fixed) could result in labor force participation rather than enrollment in college. If there are lower costs, including opportunity costs, to having a child while working rather than attaining a college education, teen birth rates of 18-19 year old women would decline less than in response to a rise in the college wage premium. Therefore, a rise in the high school wage premium could lead to a fall in teen birth rates of 15-17 year old women and not as big a decline in the birth rates of 18-19 year olds. Since, most of the teen births occur to women that are 18-19 years old (See Figure 1.9), a rise in the female high school wage premium would potentially have a lower impact on teen birth rates than the female college wage premium.

1.2.4 Male College Wage Premium

I also estimate the impact of the male college wage premium on teen birth rates. The OLS and second stage IV regressions are

$$Ln(tbr)_{srt} = c_0 + c_1 Ln(WP_{mcoll})_{st-2} + c \sum_r Prop_{srt} + CX + o_s + O_t + l_{st} \quad (1.9)$$

$$Ln(tbr)_{srt} = d_0 + d_1 Ln(\widehat{WP}_{mcoll})_{st-2} + d \sum_r Prop_{srt} + DX + \chi_s + \Lambda_t + n_{st} \quad (1.10)$$

The male college wage premium, WP_{mcoll}, is calculated in the same manner as the female college wage premium (equation 1.2) using wages of college educated and high school educated males. The national data indicate that male wages might matter less as a source of "family" income as since 1990 18-19 year old teens that have children are increasingly having them out-of-wedlock. The ratio has grown from 50% to 80% for White and Hispanic teens. However, for Black 18-19 year olds the ratio has continuously hovered at 90-100% (Figure 1.10). Even if non-spousal male partners did support their children, teen birth rates could decline if male teen partners were increasingly enrolling in college in response to the rising male college wage premium. Averett and Burton (1996) find that males of the NLSY79 sample respond to the college wage premium by increasing the probability of attending college. National trends in the data also show increasing college enrollment by men during this time period, though the growth is slower than that of women (Figure 1.5(b)).

1.2.5 Fertility of Older Women

I also measure the impact of the female college wage premium on the fertility rates of older women. The analysis serves as a placebo test as the growth in the wage premium should matter differentially to older women as explained in section II. I estimate elasticities for the birth rates of 20-24 year old, 25-29 year old, 30-34 year old and 35-39 year old women using the OLS and IV analyses. The OLS and IV second stage regressions for each of the four regressions are

$$Ln(br)_{srt} = e_0 + e_1 Ln(WP_{coll})_{st-2} + e \sum_r Prop_{srt} + EX + \iota_s + I_t + q_{st} \tag{1.11}$$

$$Ln(br)_{srt} = f_0 + f_1 Ln(\widehat{WP}_{coll})_{st-2} + f \sum_r Prop_{srt} + FX + \zeta_s + Z_t + r_{st} \tag{1.12}$$

The natural log of the birth rate of women for each age category in state s for race/ethnic group r and year t is $Ln(br)_{srt}$. In the regression for each age group, $Prop_{srt}$ is a vector of the proportion of women in that age group for state s, race r in time period t to control for demographic shifts in the population.

1.3 Data

Table 1.1 has descriptive statistics of the data that I will use in the analysis. The black teen birth rate had the largest decline of 62%. Also, during this time period, wages of high school dropout women decreased by 5% while those of high school graduates increased by 2%. The largest increase (9%) has been for college educated women. For males, there has been a 9% and 2% drop in wages of the less than high school educated and high school educated, respectively. Earnings of the college educated rose by 4% but the increase is less than that for college educated women.

The map (Figure 1.6) shows that the teen birth rate decline has been a nationwide phenomenon. However, there are some states that have been bigger drivers of the change such as District of Columbia, California, Massachusetts, New Jersey, Vermont and New York. There is also considerable variation in the growth of the female college wage premium. In high growth states such as District of Columbia, California, New Jersey, Massachusetts and Virginia, the college wage premium grew in double digits. In states such as Tennessee, Kentucky, Mississippi, it fell during this time period (See Figure 1.7).

Teen (15-19 year old) birth data are from the vital statistics natality files (Vital Statistics (2016)). To avoid noisy fluctuations in teen birth rates due to small teen population sizes, I exclude teen birth rates for a race in any year if the state has a teen population less than 1000. Teen birth rates are for "All", Non-Hispanic Black (hereafter "Black"), Non-hispanic White (hereafter "White") and Hispanic populations. I do not include births to teens of multiple races in each single race/ethnic group but they are included in the "All" category. As per convention in the literature, teen birth rates for each race/ethnicity are calculated per 1,000 15-19 year old women of the particular race/ethnic group.

The teen population numbers to calculate the teen birth rates are from the NIH Surveillance, Epidemiology, and End Results (SEER) Program for which data is available until 2012.[12] These population estimates make adjustments for the 2005 populations in Texas, Alabama, Mississippi and Louisiana due to hurricanes Katrina and Rita that occurred in August and September 2005, respectively. Multiple race categories are bridged to single race categories for the years after 2000. Approximately 2% of the population in 2000 was of multiple races.[13]

Earnings data are from the Current Population Survey Merged Outgoing Rotation Group (CPS, MORG) data.[14] I use median wages by gender and education level for 25-64 year old full time workers residing in households.[15] The variable is earnings per week, which is for the current job, and includes overtime, tips and commission.[16] The data is top coded at $100,000 per year. Observations are excluded when the earnings per week variable is missing or earnings are less than $126.875 per week in 2014$ which is half the federal minimum wage in 2014 ($3.625 = 0.5*$7.25 per hour) (See e.g., Katz and Murphy (1992)).[17]

I calculate wages for different education levels by gender. The three education categories are less than high school, completed high school and a 4 years bachelors degree (advanced degrees excluded). The completed high school category includes individuals with a GED. I have classified individuals with a GED as attaining a high school diploma to stay consistent across years as the GED category was created after 1998 in these data.

For the instrumental variable, employment shares in 1980 by gender and education level

12. Downloaded from the NBER website.

13. The other source of population data are the intercensal estimates from the Census Bureau. Data is available up to 2010. Post-censal estimates are available from 2010-2015. Teen birthrates using the two different teen population sources, are the same from 1990 to 1999. After 2000, there are 71 counties, where the teen birthrates using the SEER data are lower by 3% or more (for multiple years). In these counties teen population numbers were low ranging from 1,500 to 7,000. For two counties, Orleans Parish in Louisiana and Harrison County in Mississippi, the teen birth rate is higher by 3% or more using the SEER data in 2005.

14. Downloaded from the NBER website.

15. Workers are classified as full time based on the fulltime/partime (ftpt89 and ftpt94) variables.

16. In the data, earnings are collected per hour for hourly workers, and per week for other workers.

17. Earnings are calculated in 2014$ using the "Consumer Price Index - All Urban Consumers" for all items. The base period is 1982-1984.

and industry sector (two digit SIC/NAICS codes) are calculated using data from the census. The industry sectors are classified according to the 1990 Industrial Classification system. The data is the 5% sample from IPUMS (IPUMS (2015)). Employment criteria is the same as that used for earnings. The sample consists of 25-64 year old full time workers residing in households (not institutions) who earned at least $5075 per year which is half the minimum wage in 2014 (0.5*$7.25 per hour at 35 hours per week).[18]

1.4 Results

The OLS and IV results of the regressions of teen birth rates on the female college wage premium, high school college wage premium and the male college wage premium are in Tables 1.2, 1.4 and 1.6, respectively. The first stage results are in Tables 1.3, 1.5 and 1.7. The OLS and IV regression results of birth rates of older women are in Sections 1.6.7 to 1.6.10 of the Appendix and graphs of the IV coefficients are in Figure 1.12.

The OLS elasticity measures of teen birth rates with respect to the female college wage premium are in Table 1.2 and are between -0.12 to -0.37. The interpretation of the coefficient on "All", for example, is that a 1% change in the wage premium is associated with a .2% reduction in the teen birth rate. For the IV analysis, a 1% increase in the college wage premium leads to a 1.8 to a % to 4.4% decrease in teen birth rates. The coefficients are statistically significant for "All" and all 3 race/ethnic groups. I also calculate the regression coefficients for the estimations with different lags and leads of the female college wage premium variable. The order of magnitude remains the same across different lags and leads which confirms that the results are robust to different measures of expectations. The regression tables for different lags and leads are in tables 1.6.1-1.6.6 of the Appendix.

First stage results for the regressions of teen birth rates with respect to the female college wage premium are in Table 1.3. I report the Kleibergen-Paap rk Wald F statistics since the

18. Since there is no fulltime/partime classification in the Census data, I classify workers to be full time if they worked at least 40 weeks per year for at least 35 hours per week

standard errors are assumed to be heteroskedastic (clustered at the state level). I apply the rule of thumb checks on the F-statistics, that they should be greater than or equal to 10, even though these checks have been developed for homoskedastic errors. The first stage results suggest that the instrumental variable is sufficiently strong.

For the regression with the high school wage premium as the independent variable, the OLS coefficients indicate a negative correlation between the high school wage premium and teen birth rates of "All" and Hispanic teens (Table 1.4). Only the coefficient for Hispanic teens is statistically significant. The IV coefficients indicate that a 1% increase in the high school wage premium leads to an approximately 2.6% decrease in teen birth rates for "All" teens and a 1% decrease for Black teens. However, unlike in the case of the female college wage premium, the F-statistics do not suggest a strong first stage and so the IV results cannot be interpreted to be causal.

The OLS results using the male college wage premium are similar to when using the female college wage premium as the regressor (Table 1.6). For the IV regression using the male college wage premium, the elasticity estimates are lower than when using the female college wage premium. The results imply that on average male wages matter less to female teen childbearing decisions. However, the coefficients are statistically significant only for "All" and Hispanic teens. Also, the first stage results are weak except for Hispanic teens and therefore the estimates are causal only for Hispanic teens. I graph the IV coefficients for both the female and male college premia analyses in Figure 1.11.

For non-teens, the OLS coefficients start becoming less negative as women get older (except for Black women). They become statistically indistinguishable from zero for "All" and White women after the age of 35. The first stage for the IV regressions are adequately strong for all the race/ethnic groups but slightly weak in the regressions of 20-24 and 25-29 year old black women. The IV coefficients indicate that as women get older, the incentives to substitute school and/or work for fertility when expected income increases is not as large as for teenagers. For "All", Black and White women the coefficients continue to become less negative as women get older and eventually become zero for Black and White women (Figure 1.12). The results suggest no impact of higher expected earnings for women after the age of 35, except for Hispanic women. The different pattern suggests that older Hispanic women are more likely substituting work for children. The regression tables are in Sections 1.6.7 - 1.6.10 of the Appendix.

1.4.1 Discussion

There is a vast literature that examines the impacts of policies and other changing incentives on teen birth rates. A few studies explain some portion of the decline in teen birth rates using their results. According to Kearney and Levine (2012b), welfare benefits and expanded family planning services through Medicaid can explain approximately 12% of the decline in teen birth rates. They also estimate that the MTV 16 and Pregnant show can explain 24% of the decline between June 2009 and 2010.

Moreover, the literature acknowledges that much of the decline is still not understood. Using the estimates from my analysis, I do a back-of-the-envelope calculation to explain some of the drop in teen birth rates from 1990 to 2012 which is the period of my analysis. At a national level, the college wage premium increased 7% during this time period. Using, the elasticity estimates, teen birth rates fell 16%, 12%, 20% and 29% for "All", Black, White and Hispanic teenagers, respectively due to the college wage premium. The decline in teen birth rates was 52%, 62%, 51% and 54% for "All", Black, White and Hispanic teens during the 1990-2012 time period. The college wage premium can thus explain 32%, 19%, 38% and 54% of the fall in "All", Black, White and Hispanic teen birth rates, respectively.

Since, the first stage results are weak when using the high school premium, I do not claim that the IV results for this analysis are causal. I evaluate the estimates with the highest F-stat (Black teens). During the 1990-2012 period, the high school wage premium increased 11%. Based on the elasticity measure of -0.95 for Black teens, the 10% decline that might be attributed to the rising high school wage premium, can explain 17% of the 62% decline.

For the analysis with the male college wage premium, the first stage is strong only for Hispanic teens. The male college wage premium increased 7% during the 1990-2012 time period. Given the -1.02 elasticity estimate, the male college wage premium can explain 14% of the 54% decline in Hispanic teen birth rates.

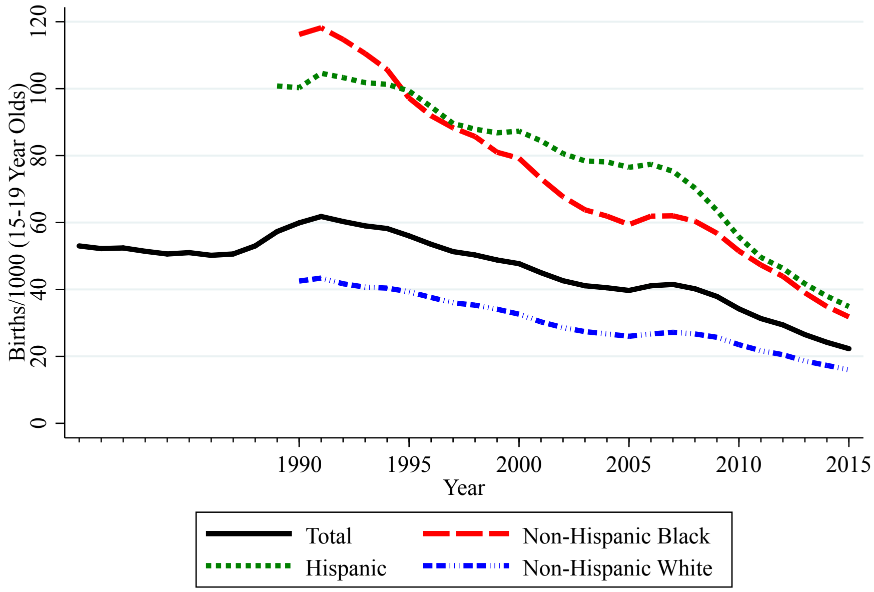
1.5 Conclusion

Using state variation, I show that a rise in the female college wage premium has a negative impact on teen birth rates. This relationship also holds true when I analyze the teen birth rates of the three different race/ethnic groups individually. I hypothesize that in response to an increasing college wage premium, women are more likely to enroll in or complete college. For the women that are pursuing a college education the total cost, including opportunity cost, of having a child while in college increases when the college wage premium grows. They will thus delay childbearing.

To eliminate the possibility of some other related mechanisms, I support the main result with additional analyses. First, the decline could be occurring due to a rising female high school wage premium. The elasticity estimates from the IV regressions are also negative. However, due to the weak first stage of the instrumental variable analysis, I cannot make a causal inference regarding these estimates. Second, it could be that a rise in the male college wage premium leads to higher college enrollment among males and therefore lower teen birth rates. Again due to the weak first stage of the instrumental variable analysis, I cannot make a causal inference regarding these estimates except for Hispanic teens. In the IV results, I find that the male college wage premium when compared to the female college wage premium has a lower impact on Hispanic teen birth rates. Third, as a placebo test I estimate the impact of the female college wage premium on the fertility rates of older women. I find that as women get older, the growth in the wage premium has less of a negative impact on birth rates.

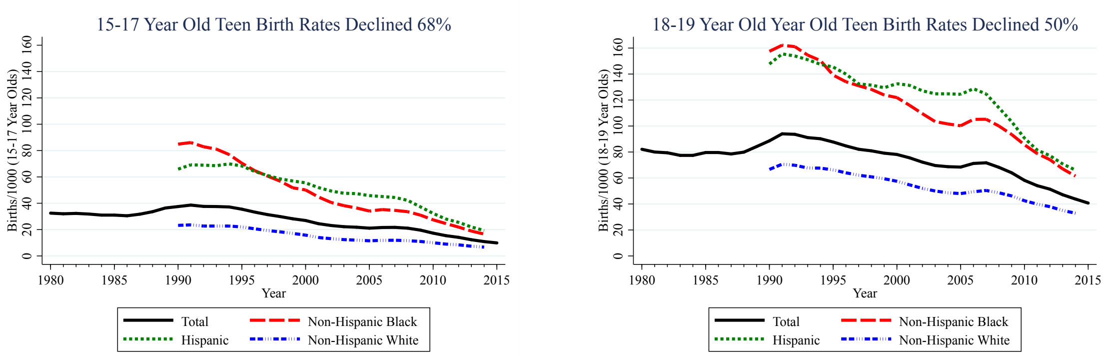
There are important policy implications of these results. In addition to the vast amounts spent on teen pregnancy prevention programs, policies that create a demand for skilled female labor and/or increase the likelihood of women completing high school and college can play an important role in reducing teen birth rates. First, sectoral shifts in the industrial composition that increase the demand for skilled female labor could create incentives for women to complete secondary and post-secondary education which would lower teen birth rates. Contrastingly, sectoral shifts that decrease the demand for skilled female labor could lead to a rise in teen birth rates. Second, development of early childhood education and K-12 programs that result in higher human capital accumulation for women would reduce teen birth rates by increasing the probability of young women completing high school and college. Similarly, more access to secondary and post-secondary education through scholarships, grants, lower tuition or creation of colleges could lead to higher high school and college completion. Moreover, the interaction between a rise in the demand for skilled labor, increasing human capital of women and improving high school and college access could possibly lead to large declines in teen birth rates.

Figure 1.1: Teen Birth Rates Have Declined 61% since 1991



Sources: National Vital Statistics Reports, Vol. 64, No. 12, Dec 2015; NCHS Data Brief, No. 259, Sept 2016.

Figure 1.2: Teen Birth Rates by Age Category



Source: National Vital Statistics Reports, Vol. 64, No. 12, Dec 2015

Source: National Vital Statistics Reports, Vol. 64, No. 12, Dec 2015

Figure 1.3: Fertility Rates of Women (1990-2012)

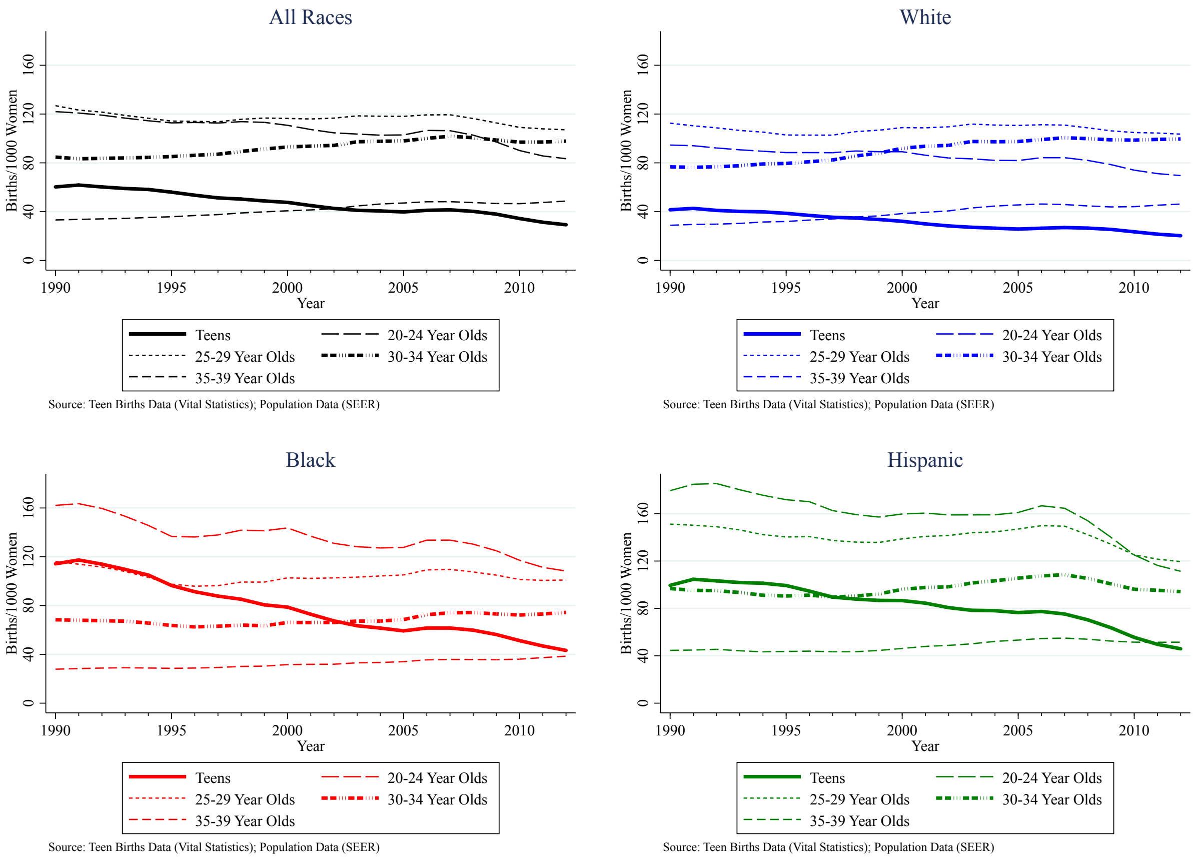
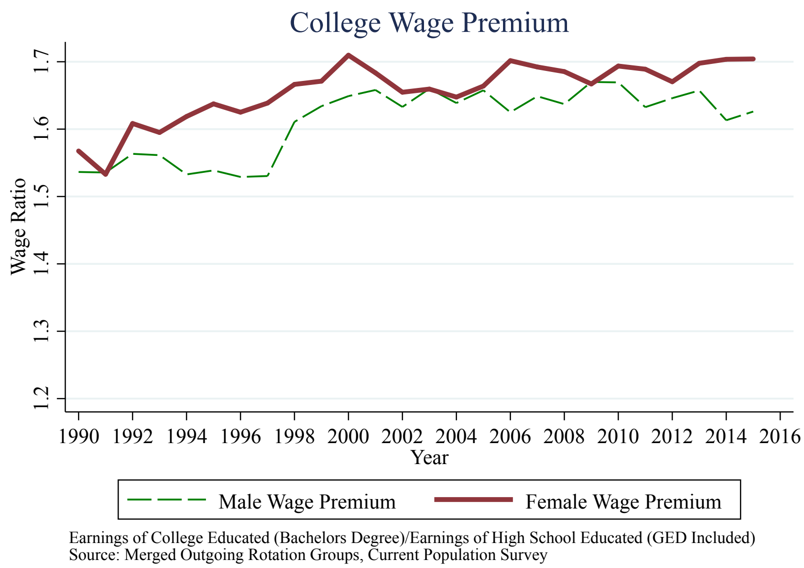


Figure 1.4: Growth in the Wage Premia



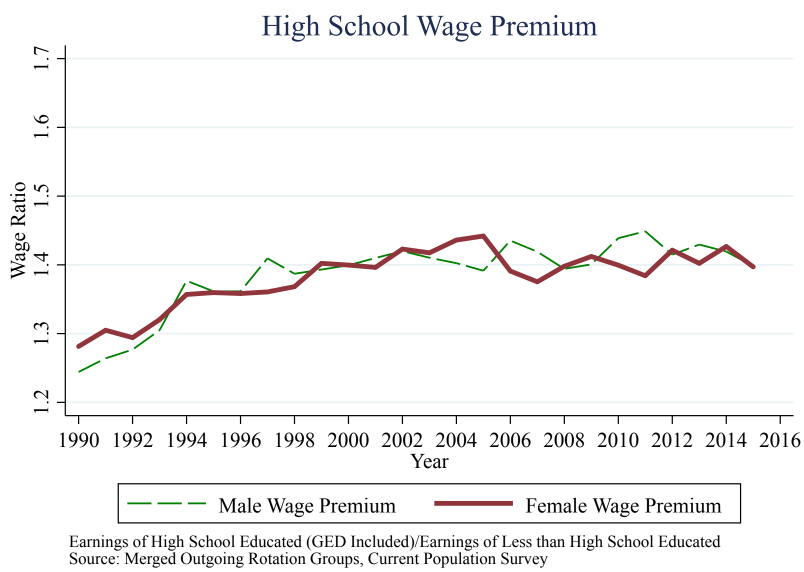
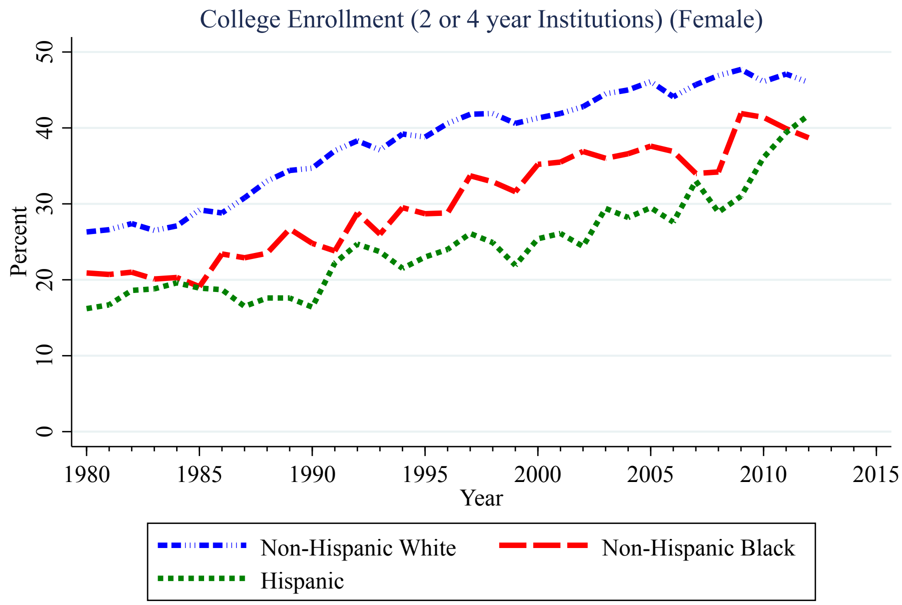
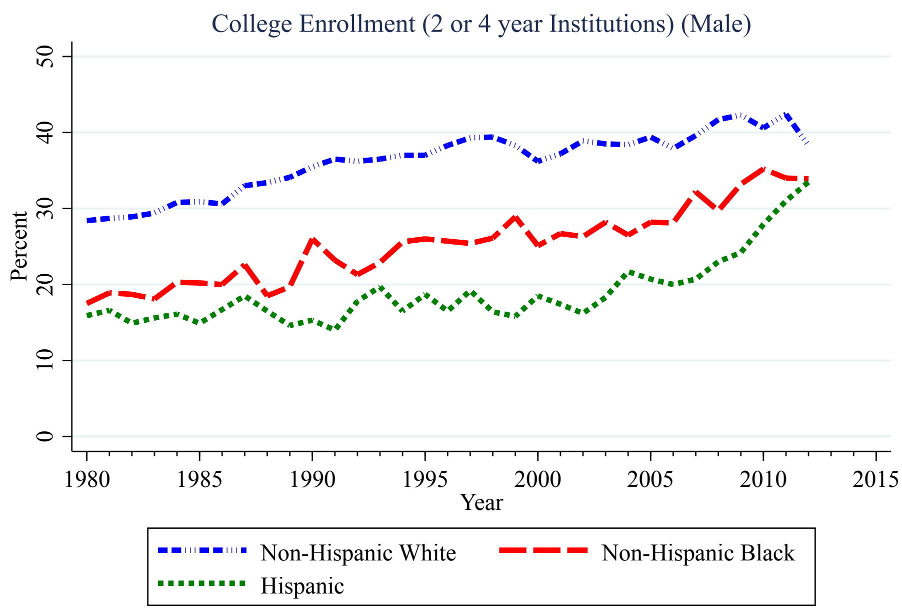


Figure 1.5: College Enrollment in Degree Granting Institutions: 18-24 Year Olds



Source: U.S. Department of Commerce, Census Bureau, Current Population Survey (CPS).



Source: U.S. Department of Commerce, Census Bureau, Current Population Survey (CPS).

Figure 1.6: Change in Teen Birth Rates - Log Differences*100 (1991-2012)

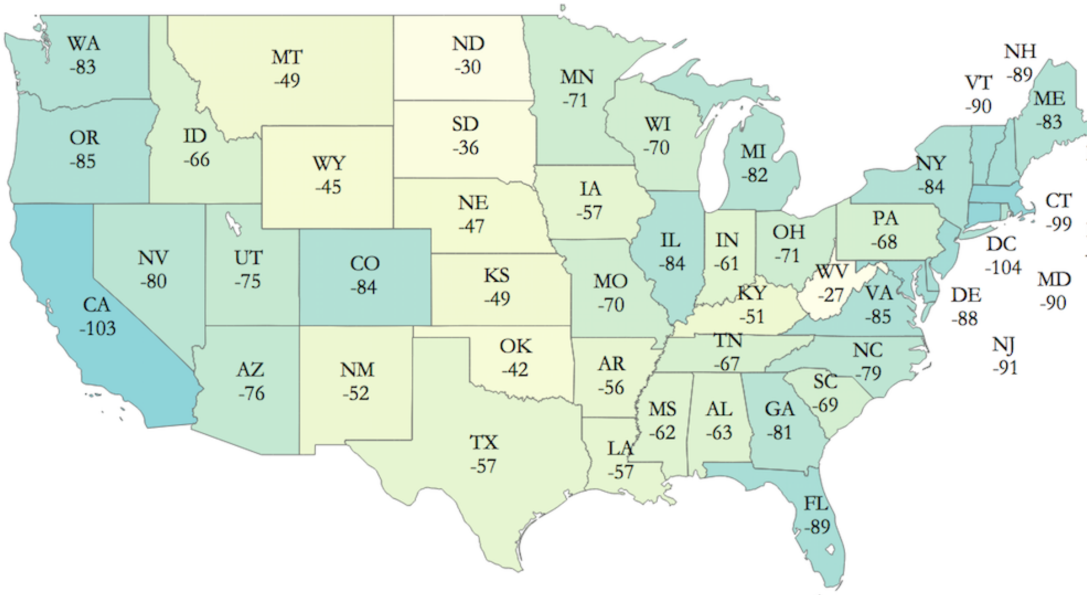


Figure 1.7: Change in Female College Wage Premium - Log Differences*100 (1991-2012)

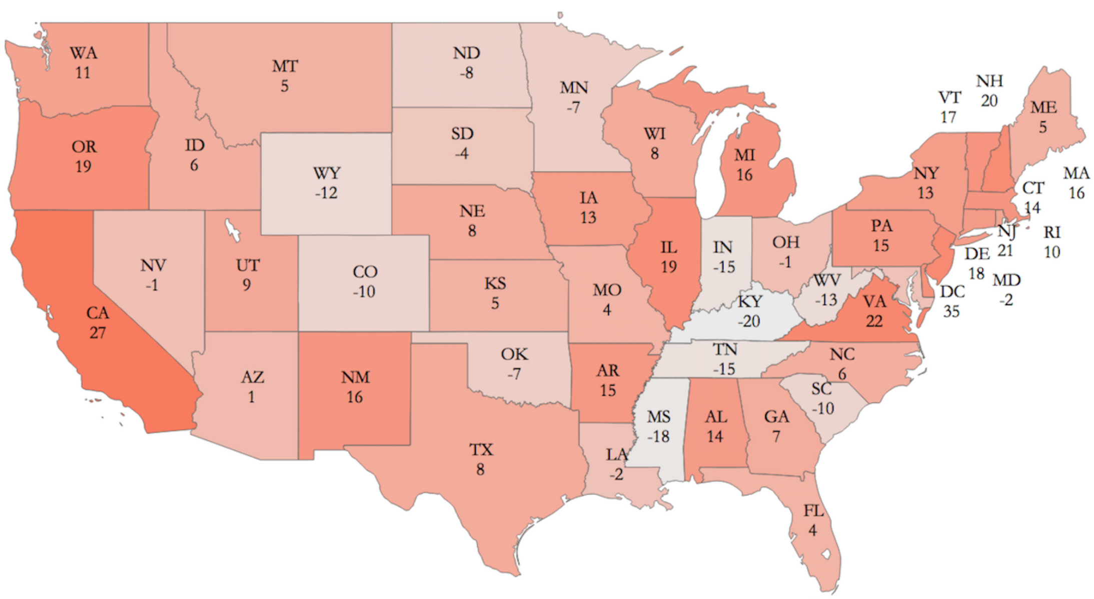


Figure 1.8: Standard Deviation of the Female College Wage Premium by State

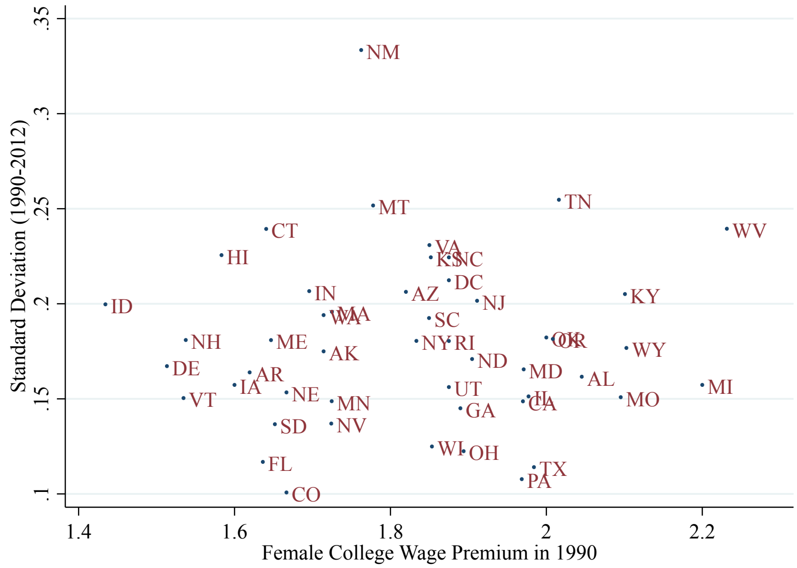


Figure 1.9: Teen Birth Rates by Age Category

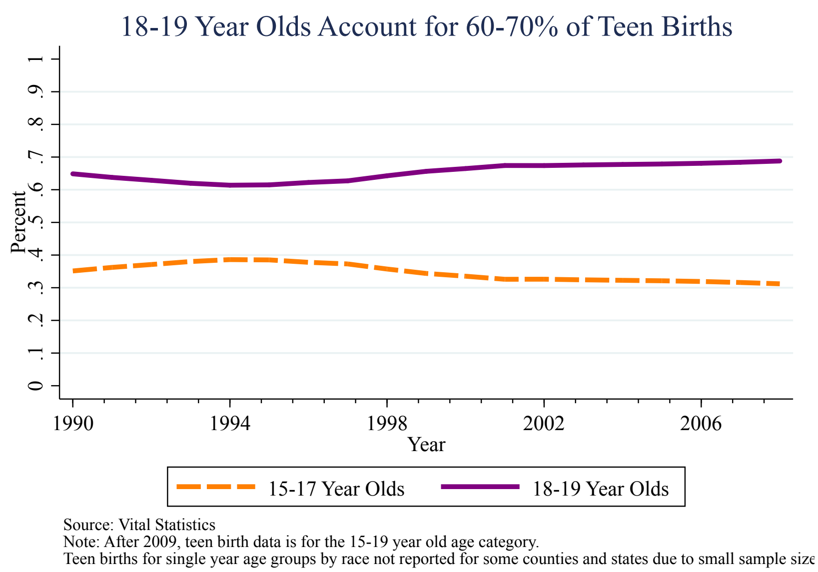
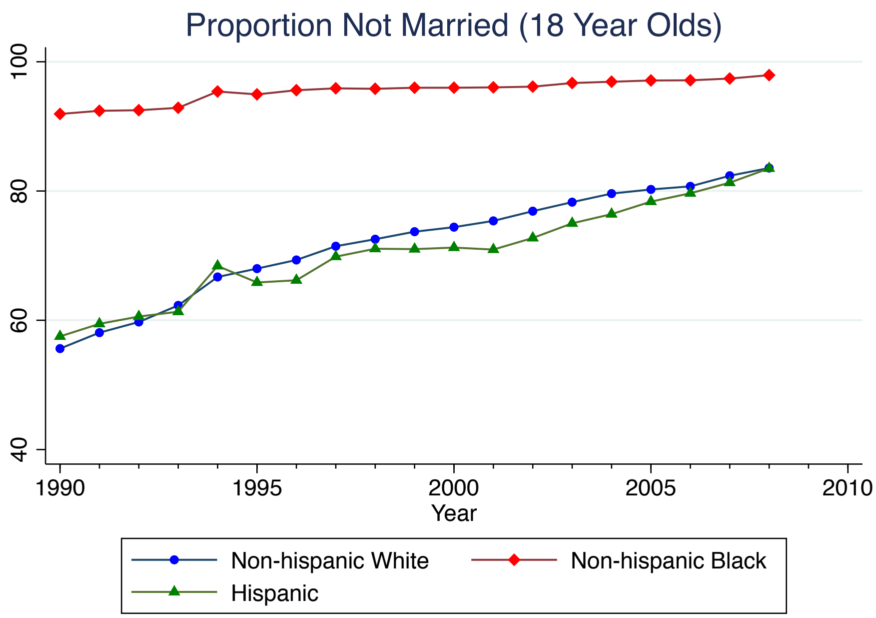


Figure 1.10: Proportion of Teens with Children that are Not Married



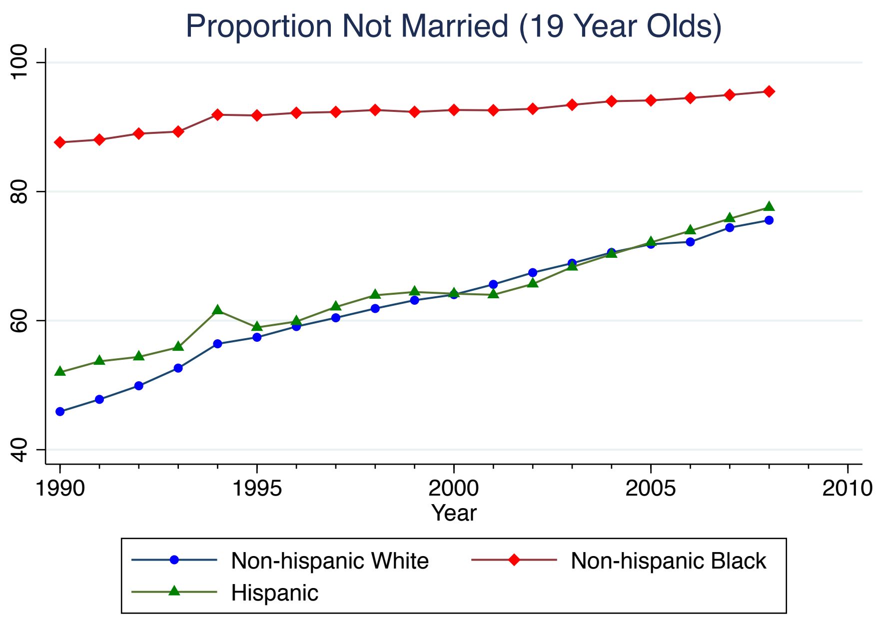


Figure 1.11: Impact on Teen Birth Rates: Female vs. Male Wage Premiums

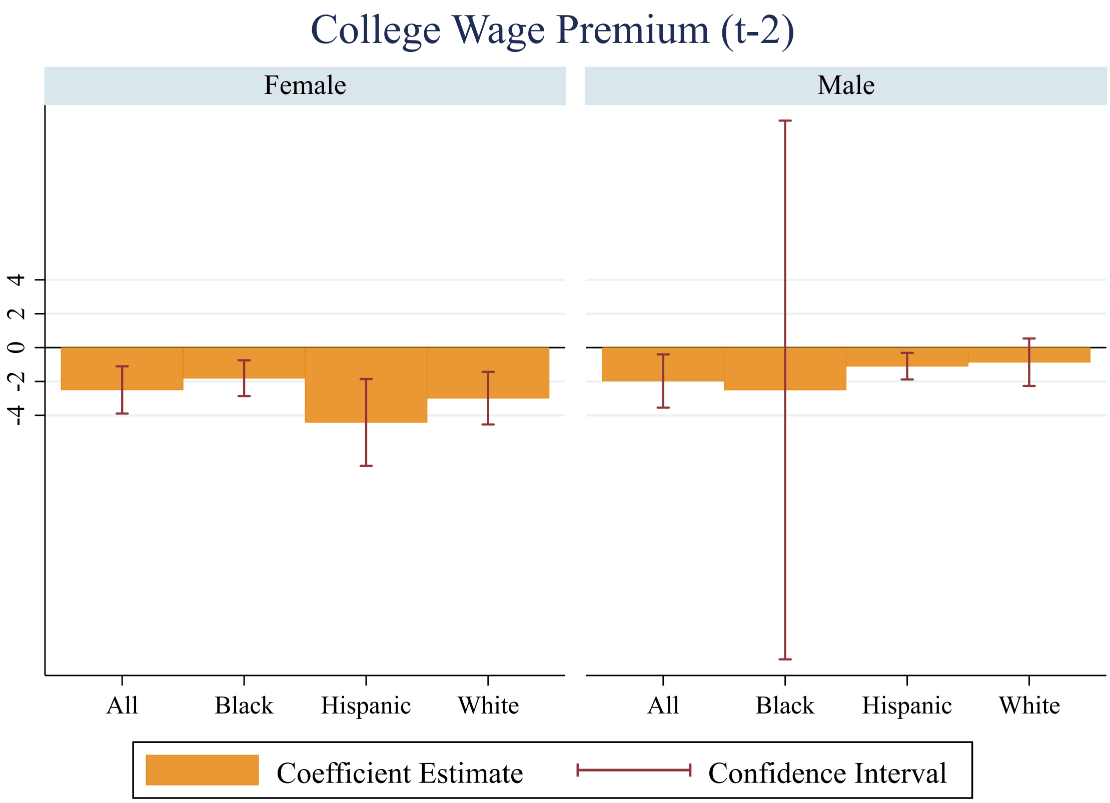


Figure 1.12: Impact of Change in Female College Wage Premium (t-2) on Birth Rates of Women in Different Age Groups

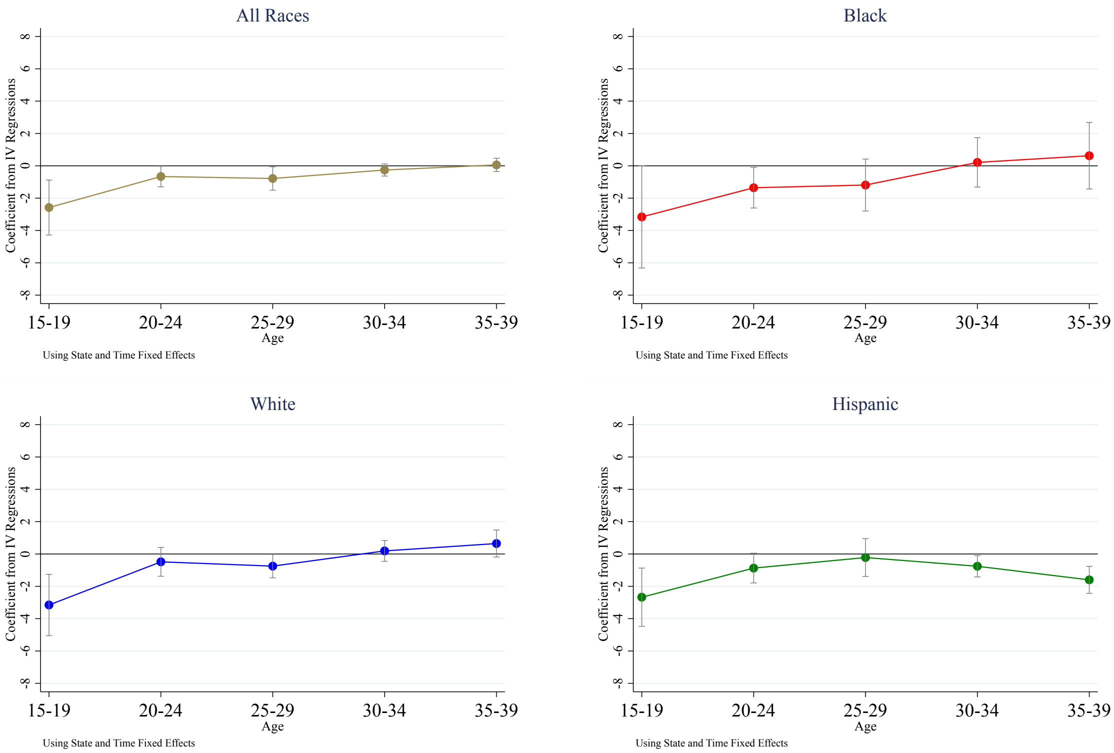


Table 1.1: Descriptive Statistics

	1993	2012
Teen Birth Rate	56	30
Black Teen Birth Rate	113	41
White Teen Birth Rate	40	22
Hispanic Teen Birth Rate	90	47
Mean Teen Births by State	11,011	6,460
Mean Black Births by State	3,123	1,519
Mean White Births by State	5,029	2,538
Women's Weekly Wages (Less than High School)	$436	$412
Women's Weekly Wages (High School)	$565	$575
Women's Weekly Female Wages (College)	$840	$918
Men's Weekly Wages (Less than High School)	$590	$536
Men's Weekly Wages (High School)	$786	$773
Men's Weekly Wages (College)	$1,180	$1,229

Teen birth rates are per 1,000 15-19 year old women of the particular race/ethnic category.
Weekly wages by gender and education are median weekly earnings in 2014$ calculated for 25-64 year old full time workers residing in households. I exclude workers that earned less than $126.875 per week which is weekly wages based on half the federal minimum wage ($3.625 per hour) in 2014.

Table 1.2: Teen Birth Rates and the Female College Wage Premium (Lag 2)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	All		**Black**		**White**		**Hispanic**	
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Ln College Wage Premium (t-2)	-0.19***	-2.50***	-0.12**	-1.81***	-0.21**	-2.99***	-0.37***	-4.42***
	(0.06)	(0.71)	(0.05)	(0.54)	(0.08)	(0.79)	(0.07)	(1.31)
Ln Aids Rate (t-1)	0.09***	0.06**	0.10***	0.09**	0.10**	0.08**	0.24***	0.14
	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)	(0.03)	(0.07)	(0.10)
Ln State Unemployment Rate (t-1)	-0.03	-0.09*	0.04	0.01	-0.02	-0.09	-0.16**	-0.26*
	(0.03)	(0.05)	(0.03)	(0.06)	(0.04)	(0.06)	(0.08)	(0.14)
Proportion of Hispanic Female Teens	-0.01	-0.02	0.03	0.00	-0.04	-0.06***	-0.04	0.00
	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.02)	(0.03)	(0.05)
Proportion of White Female Teens	-0.01	-0.02	0.04*	0.02	-0.01	-0.03	-0.03	0.00
	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.02)	(0.03)	(0.05)
Proportion of Black Female Teens	0.01	-0.02	0.03	0.00	-0.01	-0.05*	0.00	-0.03
	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)	(0.06)
Constant	3.76*		-0.22		4.05		6.57**	
	(2.01)		(2.22)		(2.82)		(2.61)	
R^2	0.93	0.55	0.97	0.84	0.91	0.44	0.89	0.30
N	1029	1029	851	851	1028	1028	884	884
F-Stat	322	138	1071	1189	142	70	10741	1859
State Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y
Time Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y

Table 1.3: First Stage: Teen Birth Rates and the Female College Wage Premium (Lag 2)

	Ln College Wage Premium (t-2)			
	All	Black	White	Hispanic
Ln Bartik College Wage Premium (t-2)	2.03***	1.94***	1.99***	2.32***
	(0.49)	(0.54)	(0.52)	(0.65)
N	1029	851	1028	884
F-Stat	16.9	12.7	14.7	12.8
p-value	0.00	0.00	0.00	0.00
State Fixed Effects	Y	Y	Y	Y
Time Fixed Effects	Y	Y	Y	Y

Table 1.4: Teen Birth Rates and the Female High School Wage Premium (Lag 2)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	All		**Black**		**White**		**Hispanic**	
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Ln High School Wage Premium (t-2)	-0.03	-2.64*	-0.05	-0.95**	-0.00	-3.22	-0.19***	-3.95
	(0.03)	(1.48)	(0.03)	(0.47)	(0.04)	(2.13)	(0.07)	(2.90)
Ln Aids Rate (t-1)	0.09***	0.03	0.10***	0.10***	0.10**	0.01	0.25***	0.13
	(0.03)	(0.05)	(0.03)	(0.03)	(0.04)	(0.07)	(0.07)	(0.11)
Ln State Unemployment Rate (t-1)	-0.02	0.15	0.05	0.11**	-0.01	0.18	-0.14*	0.08
	(0.04)	(0.13)	(0.03)	(0.05)	(0.05)	(0.18)	(0.08)	(0.25)
Proportion of Hispanic Female Teens	-0.01	-0.11	0.03	-0.02	-0.04	-0.14	-0.05*	-0.24
	(0.02)	(0.08)	(0.03)	(0.04)	(0.04)	(0.10)	(0.03)	(0.17)
Proportion of White Female Teens	-0.01	-0.09	0.04*	0.00	-0.00	-0.09	-0.04	-0.20
	(0.02)	(0.06)	(0.02)	(0.04)	(0.03)	(0.09)	(0.03)	(0.16)
Proportion of Black Female Teens	0.01	-0.07	0.03	-0.01	-0.01	-0.08	-0.00	-0.12
	(0.02)	(0.06)	(0.03)	(0.04)	(0.03)	(0.08)	(0.04)	(0.14)
Constant	3.62*		-0.27		3.72		7.41***	
	(2.06)		(2.25)		(2.92)		(2.71)	
R^2	0.93	0.23	0.97	0.92	0.91	-0.05	0.89	0.27
N	1029	1029	851	851	1028	1028	884	884
F-Stat	364	77	1046	1164	131	57	3169	1448
State Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y
Time Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y

Table 1.5: First Stage: Teen Birth Rates and the Female High School Wage Premium (Lag 2)

	Ln High School Wage Premium (t-2)			
	All	Black	White	Hispanic
Ln Bartik High School Wage Premium (t-2)	0.94**	1.37***	0.81*	1.12*
	(0.43)	(0.47)	(0.45)	(0.67)
N	1029	851	1028	884
F-Stat	4.6	8.5	3.3	2.8
p-value	0.04	0.01	0.08	0.10
State Fixed Effects	Y	Y	Y	Y
Time Fixed Effects	Y	Y	Y	Y

Table 1.6: Teen Birth Rates and the Male College Wage Premium (Lag 2)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	All		**Black**		**White**		**Hispanic**	
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Ln College Wage Premium (t-2)	-0.22***	-1.86**	-0.11*	-2.50	-0.27***	-0.85	-0.50***	-1.02**
	(0.06)	(0.78)	(0.05)	(6.78)	(0.09)	(0.63)	(0.08)	(0.41)
Ln Aids Rate (t-1)	0.08***	-0.00	0.10***	-0.04	0.09**	0.07	0.21***	0.16**
	(0.02)	(0.05)	(0.03)	(0.39)	(0.03)	(0.04)	(0.05)	(0.06)
Ln State Unemployment Rate (t-1)	-0.02	-0.01	0.05	0.05	-0.01	-0.01	-0.13	-0.11
	(0.03)	(0.04)	(0.03)	(0.08)	(0.05)	(0.04)	(0.08)	(0.08)
Proportion of Hispanic Female Teens	-0.01	-0.02	0.03	0.01	-0.04	-0.04	-0.04	-0.04
	(0.02)	(0.02)	(0.02)	(0.05)	(0.03)	(0.03)	(0.03)	(0.03)
Proportion of White Female Teens	-0.01	-0.01	0.05*	0.03	-0.01	-0.01	-0.03	-0.03
	(0.02)	(0.02)	(0.02)	(0.04)	(0.03)	(0.02)	(0.03)	(0.03)
Proportion of Black Female Teens	0.01	0.01	0.03	0.04	-0.01	-0.01	0.00	0.00
	(0.02)	(0.02)	(0.02)	(0.04)	(0.03)	(0.03)	(0.03)	(0.03)
Constant	3.71*		-0.38		4.02		6.71**	
	(1.95)		(2.16)		(2.80)		(2.50)	
R^2	0.93	0.72	0.97	0.68	0.91	0.89	0.89	0.88
N	1029	1029	851	851	1028	1028	884	884
F-Stat	265	210	1219	2168	177	215	5116	12655
State Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y
Time Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y

Table 1.7: First Stage: Teen Birth Rates and the Male College Wage Premium (Lag 2)

	Ln College Wage Premium (t-2)			
	All	Black	White	Hispanic
Ln Bartik College Wage Premium (t-2)	1.15**	0.28	1.20***	2.50***
	(0.48)	(0.80)	(0.45)	(0.56)
N	1029	851	1028	884
F-Stat	5.7	0.1	6.9	20.2
p-value	0.02	0.73	0.01	0.00
State Fixed Effects	Y	Y	Y	Y
Time Fixed Effects	Y	Y	Y	Y

1.6 Appendix

Table 1.8: Female Earnings Data by Education Level

	College WP	High School WP	College	High School	High School Dropout
1990	1.57	1.28	$978	$624	$487
1991	1.53	1.30	$972	$634	$486
1992	1.61	1.29	$1,009	$627	$485
1993	1.60	1.32	$1,008	$632	$478
1994	1.62	1.36	$1,011	$624	$460
1995	1.64	1.36	$1,011	$617	$454
1996	1.63	1.36	$1,003	$617	$454
1997	1.64	1.36	$1,028	$627	$461
1998	1.67	1.37	$1,073	$644	$471
1999	1.67	1.40	$1,087	$650	$464
2000	1.71	1.40	$1,118	$654	$467
2001	1.68	1.40	$1,124	$668	$478
2002	1.65	1.42	$1,129	$682	$479
2003	1.66	1.42	$1,137	$685	$483
2004	1.65	1.44	$1,128	$685	$477
2005	1.66	1.44	$1,130	$679	$471
2006	1.70	1.39	$1,137	$668	$480
2007	1.69	1.38	$1,132	$669	$486
2008	1.69	1.40	$1,122	$666	$476
2009	1.67	1.41	$1,134	$680	$482
2010	1.69	1.40	$1,143	$675	$482
2011	1.69	1.38	$1,125	$666	$481
2012	1.67	1.42	$1,104	$661	$465
2013	1.70	1.40	$1,124	$662	$472
2014	1.70	1.43	$1,124	$660	$462
2015	1.70	1.40	$1,144	$671	$480

College WP = $\frac{Male \quad College \quad Earnings}{Male \quad HighSchool \quad Earnings}$; High School WP = $\frac{Male \quad HighSchool \quad Earnings}{Male \quad High \quad School \quad Dropout \quad Earnings}$
Earnings are median weekly earnings in 2014$ for 25-64 year old full time workers residing in households. Workers that earned less than half the minimum wage are excluded.

Table 1.9: Male Earnings Data by Education Level

	College WP	High School WP	College	High School	High School Dropout
1990	1.54	1.24	$1,371	$892	$717
1991	1.54	1.26	$1,342	$874	$692
1992	1.56	1.28	$1,356	$867	$679
1993	1.56	1.30	$1,348	$863	$662
1994	1.53	1.38	$1,349	$880	$639
1995	1.54	1.36	$1,343	$873	$641
1996	1.53	1.36	$1,331	$870	$639
1997	1.53	1.41	$1,350	$882	$626
1998	1.61	1.39	$1,457	$904	$652
1999	1.63	1.39	$1,490	$912	$654
2000	1.65	1.40	$1,509	$915	$654
2001	1.66	1.41	$1,526	$920	$653
2002	1.63	1.42	$1,516	$928	$654
2003	1.66	1.41	$1,536	$925	$656
2004	1.64	1.40	$1,505	$918	$655
2005	1.66	1.39	$1,498	$903	$649
2006	1.63	1.44	$1,480	$911	$635
2007	1.65	1.42	$1,495	$906	$639
2008	1.64	1.39	$1,475	$901	$646
2009	1.67	1.40	$1,509	$904	$645
2010	1.67	1.44	$1,486	$890	$619
2011	1.63	1.45	$1,443	$884	$610
2012	1.65	1.41	$1,444	$878	$620
2013	1.66	1.43	$1,441	$869	$608
2014	1.61	1.42	$1,409	$873	$615
2015	1.63	1.40	$1,450	$892	$638

College WP = $\frac{Female \quad College \quad Earnings}{Female \quad HighSchool \quad Earnings}$; High School WP = $\frac{Female \quad HighSchool \quad Earnings}{Female \quad High \quad School \quad Dropout \quad Earnings}$
Earnings are median weekly earnings in 2014$ for 25-64 year old full time workers residing in households. Workers that earned less than half the minimum wage are excluded.

1.6.1 *College Wage Premium - Lag 3*

Table 1.10: Teen Birth Rates and the Female College Wage Premium (Lag 3)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	All		**Black**		**White**		**Hispanic**	
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Ln College Wage Premium (t-3)	-0.09	-2.48***	-0.03	-3.83	-0.10	-3.09***	-0.19**	-2.52**
	(0.05)	(0.90)	(0.05)	(2.43)	(0.08)	(1.01)	(0.09)	(0.98)
Proportion of Hispanic Female Teens	-0.02	-0.01	0.05*	0.01	-0.05	-0.06*	-0.08***	-0.03
	(0.02)	(0.03)	(0.03)	(0.08)	(0.04)	(0.03)	(0.03)	(0.03)
Proportion of White Female Teens	-0.00	-0.01	0.07**	0.04	-0.01	-0.03	-0.08**	-0.04
	(0.02)	(0.03)	(0.03)	(0.07)	(0.04)	(0.04)	(0.04)	(0.04)
Proportion of Black Female Teens	0.01	-0.01	0.07*	0.02	-0.02	-0.05	-0.06	-0.05
	(0.03)	(0.04)	(0.03)	(0.08)	(0.04)	(0.05)	(0.04)	(0.04)
Constant	3.81*		-2.81		4.73		11.18***	
	(2.10)		(2.94)		(3.52)		(3.26)	
R^2	0.93	0.32	0.95	-0.06	0.90	0.07	0.91	0.64
N	833	833	690	690	833	833	725	725
F-Stat	225	37	812	52	110	29	845	434
State Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y
Time Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y

Table 1.11: First Stage: Teen Birth Rates and the Female College Wage Premium (Lag 3)

	Ln College Wage Premium (t-3)			
	All	Black	White	Hispanic
Ln Bartik College Wage Premium (t-3)	2.38***	1.29	2.29***	4.04***
	(0.88)	(0.87)	(0.80)	(1.39)
N	833	690	833	725
F-Stat	7.4	2.2	8.1	8.4
p-value	0.01	0.15	0.01	0.01
State Fixed Effects	Y	Y	Y	Y
Time Fixed Effects	Y	Y	Y	Y

1.6.2 College Wage Premium - Lag 1

Table 1.12: Teen Birth Rates and the Female College Wage Premium (Lag 1)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	All		**Black**		**White**		**Hispanic**	
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Ln College Wage Premium (t-1)	-0.13**	-2.74***	-0.09	-3.34**	-0.16*	-3.15***	-0.30**	-3.39***
	(0.06)	(0.90)	(0.06)	(1.60)	(0.09)	(0.91)	(0.12)	(1.28)
Proportion of Hispanic Female Teens	-0.01	-0.04	0.05	-0.02	-0.04	-0.08**	-0.06**	-0.04
	(0.03)	(0.03)	(0.03)	(0.07)	(0.04)	(0.03)	(0.03)	(0.05)
Proportion of White Female Teens	-0.00	-0.03	0.07**	0.01	-0.01	-0.05	-0.06	-0.04
	(0.02)	(0.03)	(0.03)	(0.06)	(0.03)	(0.04)	(0.04)	(0.05)
Proportion of Black Female Teens	0.02	-0.04	0.06*	-0.04	-0.01	-0.08*	-0.02	-0.07
	(0.03)	(0.04)	(0.03)	(0.07)	(0.04)	(0.04)	(0.03)	(0.06)
Constant	3.41		-2.59		4.19		9.16***	
	(2.33)		(2.95)		(3.30)		(2.89)	
R^2	0.93	0.34	0.96	0.38	0.90	0.25	0.89	0.48
N	931	931	773	772	931	931	815	813
F-Stat	308	71	618	165	160	48	1594	1570
State Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y
Time Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y

Table 1.13: First Stage: Teen Birth Rates and the Female College Wage Premium (Lag 1)

	Ln College Wage Premium (t-1)			
	All	Black	White	Hispanic
Ln Bartik College Wage Premium (t-1)	2.43***	1.57*	2.32***	3.26**
	(0.89)	(0.90)	(0.81)	(1.36)
N	931	772	931	813
F-Stat	7.5	3.1	8.3	5.7
p-value	0.01	0.09	0.01	0.02
State Fixed Effects	Y	Y	Y	Y
Time Fixed Effects	Y	Y	Y	Y

1.6.3 College Wage Premium - Lead 1

Table 1.14: Teen Birth Rates and the Female College Wage Premium (Lead 1)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	All		**Black**		**White**		**Hispanic**	
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Ln College Wage Premium (t+1)	-0.09*	-3.09**	-0.01	-4.24	-0.12**	-3.16**	-0.27**	-3.62***
	(0.05)	(1.23)	(0.05)	(3.49)	(0.06)	(1.23)	(0.11)	(1.20)
Proportion of Hispanic Female Teens	-0.01	-0.03	0.05	-0.03	-0.04	-0.07**	-0.04	-0.03
	(0.03)	(0.04)	(0.03)	(0.09)	(0.03)	(0.04)	(0.03)	(0.05)
Proportion of White Female Teens	0.00	-0.03	0.07**	-0.01	-0.00	-0.05	-0.04	-0.02
	(0.02)	(0.04)	(0.03)	(0.08)	(0.03)	(0.04)	(0.03)	(0.06)
Proportion of Black Female Teens	0.02	-0.04	0.07*	-0.05	-0.01	-0.07	0.03	-0.03
	(0.03)	(0.05)	(0.03)	(0.11)	(0.03)	(0.05)	(0.03)	(0.07)
Constant	3.25		-2.73		4.02		6.90**	
	(2.42)		(3.14)		(2.78)		(2.68)	
R^2	0.91	0.05	0.95	-0.07	0.89	0.17	0.84	0.29
N	931	931	773	772	931	931	815	813
F-Stat	159.03	94.93	600.11	89.90	145.50	70.97	512.19	766.10
State Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y
Time Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y

Table 1.15: First Stage: Teen Birth Rates and the Female College Wage Premium (Lead 1)

	Ln College Wage Premium (t+1)			
	All	Black	White	Hispanic
Ln Bartik College Wage Premium (t+1)	1.94**	1.07	1.87**	3.19**
	(0.88)	(0.97)	(0.83)	(1.24)
N	931	772	931	813
F-Stat	4.8	1.2	5.1	6.7
p-value	0.03	0.28	0.03	0.01
State Fixed Effects	Y	Y	Y	Y
Time Fixed Effects	Y	Y	Y	Y

1.6.4 College Wage Premium - Lead 2

Table 1.16: Teen Birth Rates and the Female College Wage Premium (Lead 2)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	All		**Black**		**White**		**Hispanic**	
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Ln College Wage Premium (t+2)	-0.09**	-3.22**	-0.02	-3.48	-0.11**	-3.16**	-0.23***	-3.76**
	(0.04)	(1.49)	(0.03)	(2.62)	(0.04)	(1.49)	(0.08)	(1.58)
Proportion of Hispanic Female Teens	-0.01	-0.02	0.05	-0.00	-0.05	-0.07*	-0.03	0.00
	(0.03)	(0.04)	(0.04)	(0.07)	(0.03)	(0.04)	(0.03)	(0.06)
Proportion of White Female Teens	0.00	-0.02	0.07*	0.02	-0.01	-0.04	-0.03	0.01
	(0.03)	(0.04)	(0.04)	(0.07)	(0.03)	(0.04)	(0.03)	(0.07)
Proportion of Black Female Teens	0.02	-0.03	0.07	-0.02	-0.01	-0.06	0.05	0.03
	(0.03)	(0.05)	(0.04)	(0.09)	(0.03)	(0.05)	(0.04)	(0.08)
Constant	3.31		-2.53		4.35		5.90**	
	(2.56)		(3.59)		(2.65)		(2.64)	
Adj. R^2	0.90	-0.24	0.95	0.18	0.89	0.04	0.79	-0.00
N	882	882	731	731	882	882	769	769
F-Stat	129.52	51.99	367.17	54.29	142.06	52.14	974.58	523.57
State Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y
Time Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y

Table 1.17: First Stage: Teen Birth Rates and the Female College Wage Premium (Lead 2)

	Ln College Wage Premium (t+2)			
	All	Black	White	Hispanic
Ln Bartik College Wage Premium (t+2)	1.75**	1.14	1.71*	2.57**
	(0.88)	(0.85)	(0.89)	(1.15)
N	882	731	882	769
F-Stat	4.0	1.8	3.7	4.9
p-value	0.05	0.19	0.06	0.03
State Fixed Effects	Y	Y	Y	Y
Time Fixed Effects	Y	Y	Y	Y

1.6.5 College Wage Premium - Lead 3

Table 1.18: Teen Birth Rates and the Female College Wage Premium (Lead 3)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	All		**Black**		**White**		**Hispanic**	
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Ln College Wage Premium (t+3)	-0.10**	-3.16*	-0.08	-3.42	-0.11**	-3.23*	-0.20*	-5.11*
	(0.04)	(1.70)	(0.05)	(2.91)	(0.05)	(1.74)	(0.11)	(2.99)
Proportion of Hispanic Female Teens	-0.00	0.01	0.05	0.03	-0.05	-0.04	-0.02	0.09
	(0.03)	(0.05)	(0.04)	(0.07)	(0.03)	(0.03)	(0.03)	(0.10)
Proportion of White Female Teens	0.00	0.01	0.07*	0.05	-0.00	-0.01	-0.01	0.10
	(0.03)	(0.04)	(0.04)	(0.06)	(0.03)	(0.03)	(0.03)	(0.11)
Proportion of Black Female Teens	0.02	-0.00	0.06	0.01	-0.01	-0.04	0.07*	0.09
	(0.03)	(0.05)	(0.04)	(0.09)	(0.03)	(0.05)	(0.04)	(0.11)
Constant	3.24		-2.27		4.30		4.70*	
	(2.69)		(3.92)		(2.73)		(2.75)	
Adj. R^2	0.89	-0.35	0.94	0.14	0.88	-0.07	0.74	-1.18
N	833	833	690	690	833	833	725	725
F-Stat	132.48	32.78	227.97	55.28	64.33	37.79	536.12	169.30
State Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y
Time Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y

Table 1.19: First Stage: Teen Birth Rates and the Female College Wage Premium (Lead 3)

	Ln College Wage Premium (t+3)			
	All	Black	White	Hispanic
Ln Bartik College Wage Premium (t+3)	1.49*	0.92	1.46	1.81
	(0.89)	(0.84)	(0.89)	(1.18)
N	833	690	833	725
F-Stat	2.8	1.2	2.7	2.3
p-value	0.10	0.28	0.11	0.13
State Fixed Effects	Y	Y	Y	Y
Time Fixed Effects	Y	Y	Y	Y

1.6.6 College Wage Premium - Lead 4

Table 1.20: Teen Birth Rates and the Female College Wage Premium (Lead 4)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	All		**Black**		**White**		**Hispanic**	
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Ln College Wage Premium (t+4)	-0.11**	-2.29*	-0.10*	-2.18	-0.13**	-2.70*	-0.29**	-4.33**
	(0.04)	(1.22)	(0.05)	(1.77)	(0.06)	(1.39)	(0.13)	(1.74)
Proportion of Hispanic Female Teens	0.00	0.02	0.05	0.03	-0.05	-0.03	-0.01	0.09
	(0.03)	(0.04)	(0.05)	(0.05)	(0.03)	(0.03)	(0.04)	(0.06)
Proportion of White Female Teens	0.00	0.02	0.07	0.06	-0.00	0.00	0.00	0.10
	(0.03)	(0.03)	(0.04)	(0.05)	(0.03)	(0.03)	(0.04)	(0.06)
Proportion of Black Female Teens	0.02	0.02	0.06	0.03	-0.00	-0.02	0.10**	0.13
	(0.03)	(0.04)	(0.04)	(0.06)	(0.03)	(0.04)	(0.05)	(0.08)
Constant	3.01		-1.86		4.24		3.27	
	(2.68)		(4.01)		(2.67)		(3.17)	
Adj. R^2	0.89	0.21	0.94	0.61	0.88	0.20	0.70	-0.86
N	784	784	649	649	784	784	681	681
F-Stat	97.18	36.40	203.88	76.36	90.84	34.90	336.37	180.03
State Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y
Time Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y

Table 1.21: First Stage: Teen Birth Rates and the Female College Wage Premium (Lead 4)

	Ln College Wage Premium (t+4)			
	All	Black	White	Hispanic
Ln Bartik College Wage Premium (t+4)	1.47*	0.99	1.39	2.18*
	(0.87)	(0.76)	(0.85)	(1.14)
N	784	649	784	681
F-Stat	2.8	1.7	2.7	3.7
p-value	0.10	0.20	0.11	0.06
State Fixed Effects	Y	Y	Y	Y
Time Fixed Effects	Y	Y	Y	Y

1.6.7 20-24 Year Olds

Table 1.22: Birth Rates and the Female College Wage Premium (Lag 2)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	All		**Black**		**White**		**Hispanic**	
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Ln College Wage Premium (t-2)	-0.16**	-1.50***	-0.08*	-1.06***	-0.14**	-1.36*	-0.36***	-2.96***
	(0.07)	(0.45)	(0.04)	(0.27)	(0.07)	(0.73)	(0.09)	(0.86)
Ln Aids Rate (t-1)	0.08***	0.06***	0.09***	0.07***	0.05*	0.04**	0.16***	0.09*
	(0.03)	(0.02)	(0.02)	(0.02)	(0.03)	(0.02)	(0.05)	(0.05)
Ln State Unemployment Rate (t-1)	-0.03	-0.07**	0.08***	0.05	-0.02	-0.07**	-0.14***	-0.20*
	(0.02)	(0.03)	(0.03)	(0.04)	(0.04)	(0.03)	(0.04)	(0.10)
Proportion of Hispanic Females	-0.00	0.00	-0.02***	-0.01**	-0.02***	-0.01**	-0.03***	-0.02*
	(0.01)	(0.01)	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Proportion of White Females	0.00	0.00	-0.01***	-0.01***	-0.01*	-0.00*	-0.02***	-0.01
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.01)
Proportion of Black Females	0.01***	-0.00	-0.01***	-0.01***	-0.00	-0.01	-0.00	-0.02
	(0.00)	(0.01)	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)
Constant	4.17***		5.12***		4.87***		6.98***	
	(0.21)		(0.19)		(0.17)		(0.67)	
Adj. R^2	0.85	0.37	0.87	0.60	0.76	0.27	0.81	0.20
N	1029	1029	1028	1028	1028	1028	1028	1028
F-Stat	344.58	48.02	966.63	579.69	242.71	40.43	2103.45	942.44
State Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y
Time Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y

Table 1.23: First Stage: Birth Rates and the Female College Wage Premium (Lag 2)

	Ln College Wage Premium (t-2)			
	All	Black	White	Hispanic
Ln Bartik College Wage Premium (t-2)	2.20***	2.03***	2.20***	2.32***
	(0.57)	(0.64)	(0.57)	(0.64)
N	1029	1028	1028	1028
F-Stat	14.7	10.2	14.9	13.3
p-value	0.00	0.00	0.00	0.00
State Fixed Effects	Y	Y	Y	Y
Time Fixed Effects	Y	Y	Y	Y

1.6.8 25-29 Year Olds

Table 1.24: Birth Rates and the Female College Wage Premium (Lag 2)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	All		**Black**		**White**		**Hispanic**	
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Ln College Wage Premium (t-2)	-0.10***	-1.48***	-0.08**	-1.00***	-0.10***	-1.30***	-0.25***	-2.16**
	(0.03)	(0.42)	(0.04)	(0.35)	(0.03)	(0.41)	(0.06)	(0.84)
Ln Aids Rate (t-1)	0.05***	0.03	0.06***	0.04	0.04***	0.02	0.08**	0.02
	(0.01)	(0.02)	(0.02)	(0.03)	(0.01)	(0.02)	(0.04)	(0.04)
Ln State Unemployment Rate (t-1)	0.03*	-0.01	0.06**	0.03	0.05**	0.01	-0.00	-0.04
	(0.02)	(0.03)	(0.02)	(0.03)	(0.02)	(0.03)	(0.05)	(0.09)
Proportion of Hispanic Females	0.01***	0.01**	-0.00	-0.00	-0.01**	-0.00	-0.02***	-0.02**
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.01)
Proportion of White Females	0.00***	0.00***	-0.00**	-0.01***	-0.00***	-0.00**	-0.01*	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Proportion of Black Females	0.01***	-0.00	-0.00	-0.01**	-0.00	-0.01**	0.01	-0.02
	(0.00)	(0.01)	(0.00)	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)
Constant	4.00***		4.76***		4.83***		5.61***	
	(0.10)		(0.20)		(0.09)		(0.33)	
Adj. R^2	0.61	-1.86	0.52	-0.23	0.45	-1.48	0.55	-0.51
N	1029	1029	1028	1028	1028	1028	1028	1028
F-Stat	124.15	20.91	118.91	450.00	45.46	14.96	431.06	267.99
State Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y
Time Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y

Table 1.25: First Stage: Birth Rates and the Female College Wage Premium (Lag 2)

	Ln College Wage Premium (t-2)			
	All	Black	White	Hispanic
Ln Bartik College Wage Premium (t-2)	1.79***	1.70**	1.80***	2.00***
	(0.53)	(0.68)	(0.53)	(0.47)
N	1029	1028	1028	1028
F-Stat	11.5	6.3	11.5	18.3
p-value	0.00	0.02	0.00	0.00
State Fixed Effects	Y	Y	Y	Y
Time Fixed Effects	Y	Y	Y	Y

1.6.9 30-34 Year Olds

Table 1.26: Birth Rates and the Female College Wage Premium (Lag 2)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	All		**Black**		**White**		**Hispanic**	
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Ln College Wage Premium (t-2)	-0.06***	-0.58**	-0.10***	-0.07	-0.03*	0.10	-0.22***	-2.15***
	(0.02)	(0.27)	(0.03)	(0.58)	(0.02)	(0.25)	(0.05)	(0.59)
Ln Aids Rate (t-1)	0.01	0.01	0.02	0.02	0.00	0.00	0.04	0.00
	(0.01)	(0.01)	(0.03)	(0.03)	(0.01)	(0.01)	(0.03)	(0.04)
Ln State Unemployment Rate (t-1)	-0.03*	-0.05***	-0.00	-0.00	-0.04***	-0.04***	0.00	-0.04
	(0.02)	(0.02)	(0.03)	(0.03)	(0.01)	(0.01)	(0.04)	(0.08)
Proportion of Hispanic Females	0.01***	0.01***	0.00	0.00	-0.00	-0.00	-0.02***	-0.01**
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.01)
Proportion of White Females	0.01***	0.01***	-0.01**	-0.01*	-0.00	-0.00	-0.00	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Proportion of Black Females	0.01***	0.00	-0.00	-0.00	-0.00*	-0.00	0.01	-0.02
	(0.00)	(0.00)	(0.01)	(0.01)	(0.00)	(0.00)	(0.01)	(0.01)
Constant	4.05***		4.66***		4.85***		5.08***	
	(0.06)		(0.28)		(0.06)		(0.26)	
Adj. R^2	0.89	0.73	0.64	0.62	0.94	0.93	0.58	-0.67
N	1029	1029	1027	1027	1028	1028	1028	1028
F-Stat	222.60	317.07	281.98	228.80	712.42	916.30	283.69	143.03
State Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y
Time Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y

Table 1.27: First Stage: Birth Rates and the Female College Wage Premium (Lag 2)

	Ln College Wage Premium (t-2)			
	All	Black	White	Hispanic
Ln Bartik College Wage Premium (t-2)	1.82***	1.71***	1.87***	2.00***
	(0.48)	(0.61)	(0.48)	(0.51)
N	1029	1027	1028	1028
F-Stat	14.4	8.0	14.9	15.4
p-value	0.00	0.01	0.00	0.00
State Fixed Effects	Y	Y	Y	Y
Time Fixed Effects	Y	Y	Y	Y

1.6.10 35-39 Year Olds

Table 1.28: Birth Rates and the Female College Wage Premium (Lag 2)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	All		**Black**		**White**		**Hispanic**	
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Ln College Wage Premium (t-2)	-0.03	-0.20	-0.10*	0.24	0.00	0.69	-0.20***	-2.77***
	(0.03)	(0.26)	(0.05)	(0.77)	(0.02)	(0.43)	(0.06)	(0.64)
Ln Aids Rate (t-1)	0.01	0.00	0.01	0.01	-0.01	-0.00	0.07**	-0.00
	(0.02)	(0.01)	(0.03)	(0.03)	(0.02)	(0.02)	(0.03)	(0.05)
Ln State Unemployment Rate (t-1)	-0.03	-0.03*	0.01	0.02	-0.05*	-0.03	-0.01	-0.07
	(0.02)	(0.02)	(0.04)	(0.05)	(0.03)	(0.03)	(0.04)	(0.09)
Proportion of Hispanic Females	0.00***	0.01***	0.00	0.00	-0.00	-0.00	-0.03***	-0.03***
	(0.00)	(0.00)	(0.01)	(0.01)	(0.00)	(0.00)	(0.01)	(0.01)
Proportion of White Females	0.01***	0.01***	-0.00	-0.00	-0.00	-0.00	-0.00	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Proportion of Black Females	0.00	0.00	0.01	0.01	-0.01*	-0.00	0.01	-0.03**
	(0.00)	(0.00)	(0.01)	(0.01)	(0.00)	(0.00)	(0.01)	(0.02)
Constant	3.44***		3.75***		4.10***		4.73***	
	(0.10)		(0.36)		(0.08)		(0.23)	
Adj. R^2	0.95	0.94	0.70	0.65	0.96	0.90	0.74	-0.38
N	1029	1029	1018	1018	1028	1028	1028	1028
F-Stat	459.22	478.48	189.02	115.89	813.10	379.64	308.51	188.84
State Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y
Time Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y

Table 1.29: First Stage: Birth Rates and the Female College Wage Premium (Lag 2)

	Ln College Wage Premium (t-2)			
	All	Black	White	Hispanic
Ln Bartik College Wage Premium (t-2)	1.96***	1.81***	2.01***	2.12***
	(0.50)	(0.54)	(0.52)	(0.45)
N	1029	1018	1028	1028
F-Stat	15.6	11.2	15.1	22.7
p-value	0.00	0.00	0.00	0.00
State Fixed Effects	Y	Y	Y	Y
Time Fixed Effects	Y	Y	Y	Y

1.6.11 20-39 Year Olds

Table 1.30: Birth Rates and the Female College Wage Premium (Lag 2)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	All		**Black**		**White**		**Hispanic**	
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Ln College Wage Premium (t-2)	-0.08***	-0.88***	-0.08**	-0.60**	-0.06***	-0.20	-0.25***	-2.79***
	(0.03)	(0.24)	(0.03)	(0.29)	(0.02)	(0.28)	(0.05)	(0.67)
Ln Aids Rate (t-1)	0.03**	0.02*	0.04**	0.03*	0.01	0.01	0.07**	0.01
	(0.01)	(0.01)	(0.02)	(0.02)	(0.01)	(0.01)	(0.03)	(0.04)
Ln State Unemployment Rate (t-1)	-0.01	-0.04*	0.02	0.01	-0.02	-0.03**	-0.04	-0.11
	(0.02)	(0.02)	(0.02)	(0.02)	(0.01)	(0.01)	(0.04)	(0.11)
Proportion of Hispanic Females	0.00	0.00	-0.01	-0.01	-0.01***	-0.01***	-0.03***	-0.02***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)	(0.01)
Proportion of White Females	0.01***	0.01***	-0.00**	-0.01***	-0.00**	-0.00**	-0.00	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Proportion of Black Females	0.01***	0.00	-0.00	-0.01	-0.00	-0.01	0.02	-0.02*
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.02)	(0.01)
Constant	3.95***		4.71***		4.75***		5.55***	
	(0.08)		(0.17)		(0.06)		(0.33)	
Adj. R^2	0.64	-0.59	0.60	0.27	0.79	0.75	0.65	-0.91
N	1029	1029	1028	1028	1028	1028	1028	1028
F-Stat	436.18	52.17	795.89	1082.86	219.58	148.19	1176.05	214.77
State Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y
Time Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y

Table 1.31: First Stage: Birth Rates and the Female College Wage Premium (Lag 2)

	Ln College Wage Premium (t-2)			
	All	Black	White	Hispanic
Ln Bartik College Wage Premium (t-2)	1.88***	1.80***	1.93***	2.17***
	(0.48)	(0.59)	(0.49)	(0.50)
N	1029	1028	1028	1028
F-Stat	15.3	9.3	15.7	18.4
p-value	0.00	0.00	0.00	0.00
State Fixed Effects	Y	Y	Y	Y
Time Fixed Effects	Y	Y	Y	Y

CHAPTER 2

2.1 Introduction

This paper is part of a vast literature that attempts to understand factors that impact teen birth rates in the U.S. Teen child bearing often results in adverse economic and social circumstances for teens and their children that result in the persistence of poverty and inequality across generations. Children of teen mothers are more likely to be incarcerated, have lower levels of education and face more abuse and neglect.[1] The estimated cost to society of teen childbearing is $9.4 billion as of 2010.[2] Hoffman (2008) finds that a teen birth reduces the probability of getting at least 2 years of postsecondary schooling by 7.7% for the mother. He also finds more negative impacts of a teen birth for women who entered their teens in the early 1980s on own earnings and earnings of a spouse.[3]

Teen birth rates have been on the descent since 1960 (See Figure 2.1). The trend changed during the 1980s, where it flattened out and then actually increased between 1987 and 1991. From 1991 to 2015, there has been a steady decline (64%) in teen birth rates in the U.S. A large part of the decline has still not been understood in the literature.

In this paper I investigate the impact of changes in employment opportunities in counties on teen birth rates. The employment shocks occur due to the entry of large corporations

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1. Using the NLSY79 sample, Grogger finds that between 1979 and 1991, incarceration rates reduce by 12% if teens have their children at 20.5 instead of at 16. This leads to a 3.5% overall reduction in the incarceration rate and a saving of $920 million in 1994$ (Grogger, Kids Having Kids). Goerga finds that the probability that a child is put in Foster care in Illinois is 4% if the parent is a teen less than 18 years old, 3% if the parent is 18-19 years old and 2% if the parent is greater than 19 years old. Similarly, foster children are more likely to be abused if the parent is a teen (Goerge, Kida Having Kids). A lower percent (71%) of children born to mothers that are 18-19 years old graduated from high school versus mothers that were 20-21 years old (80%) Hoffman (2008).

2. The average child of a teen mother is estimated to use $110 - $145 more of Medicaid, SCHIP, CHAMPUS and Medicare for disabled children as opposed to a 20-21 year old mother. The public sector health care costs as of 2010 were estimated to be $2.1 billion. Due to higher probabilities of being in foster care and being incarcerated mentioned above, children of teens impose higher costs on the child welfare ($3.1 billion) and prison ($2 billion) systems. They also suggest that teen mothers pay lower taxes ($2.2 billion less) since they have lower levels of education.

3. Hoffman (2008) uses the same research design as Hotz, McElroy, and Sanders (2005) where the comparison group consists of teen women that had a miscarriage and thus were not teen mothers.

that build their plants in those counties that bid the highest for them. The counter factual for each county that won the bid for a firm is one that loses the bid by a very narrow margin. Identification comes from the loser county closely resembling the winner county as it almost won the bid for the plant. I replicate the research design of Greenstone and Moretti (2003) and Greenstone, Hornbeck, and Moretti (2010). Their papers measure the impact of plant investment on welfare and agglomeration spillovers. They find that the entry of firms results in an increase in labor earnings in the new plants industry (Greenstone and Moretti (2003)) and an increase in total factor productivity of incumbent plants (Greenstone, Hornbeck, and Moretti (2010)).

Plant investments could increase current employment but also represent future job opportunities. For teen women, higher expected earnings through their own employment could result in lower or higher teen births depending on the relative size of the income and substitution effects. Teen men, if responsible for care-giving of their children, will face a similar incentive structure as women and thus teen birth rates might rise or fall depending on the magnitude of the income and substitution effects. Employment of adult men and women may change parenting practices that could result in more or fewer teen births.

Table 2.1 has the list of winner and loser counties, with the names of the corporations. When information on the projected size of the capital investment and the number of employees the firm expected to hire was publicly available, I report those figures in the last two columns of Table 2.1. The average dollar investment was $380 million but ranged from $1.5 million to $3.5 billion. The number of employees the firms expected to hire ranged from 100 to 10,000. The per capita effects would vary by the size of the county population. I report the population size at entry in column 6 of Table 2.1. The average population of the winner counties was approximately 365,000 with a minimum size of 2,740 individuals and a maximum of 2 million.

There is a vast literature that investigates the impact of employment opportunities on teen birth rates. The results thus far are inconclusive. Colen, Geronimus, and Phipps (2006) finds that a 1% decrease in unemployment rates is associated with an approximately 2% decrease in teen birth rates. They find that 18-19 year old African-American women are most likely to lower their fertility in response to a decline in unemployment rates during the 1990s. They use a Poisson regression model and variation in state level unemployment rates to explain the relationship. Similarly, Levine (2001) finds that teen birth rates are countercyclical. Using German data, Cygan-Rehm and Riphahn (2014) also estimate a positive relationship between teen birth rates and unemployment rates. Also, using the Youth Risk Behavior Survey (YRBS) biannual data, Levine (2001) finds that sexual activity is countercyclical for both teen girls and boys. Other studies seem to suggest that teen birth rates are procyclical. For example, Levine (2002) estimates the impact of welfare reform, abortion policies and unemployment rates on teen birth rates and finds that during the 1985-1996 time period, teen birth rates are procyclical. Similarly, Schaller (2012) also concludes that birth rates of 16-25 year old women are procyclical. Arkes and Klerman (2009) find that for 18-20 year old women, births are procyclical, but for younger white women (15-17 years old), birth rates are countercyclical. Further, in a multivariate analysis, Kearney and Levine (2012a) estimate the relationship between teen birth rates and a variety of state level policies and macroeconomic indicators and conclude that unemployment rates do not impact teen birth rates.

My first contribution to the strand of literature on employment rates and teen birth rates is that I examine the impact of permanent shifts in employment rather than looking at more temporary shocks such as the employment (unemployment) rate. Second, I address endogeneity issues with respect to employment and teen birth rates. Except for Schaller (2012) who studies the impact of employment rates on 16-25 year old women, most of the literature assumes an exogenous relationship between employment (unemployment) rates and teen birth rates. Third, for the vast majority of the literature on employment and teen birth rates, the unit of analysis is the state. In this paper I examine the impact of employment shocks at the county level.

I use a difference in difference methodology with county and time fixed effects to estimate the impact of entry of plants on teen birth rates. The evidence suggests that the entry of large plants does reduce teen birth rates in treatment versus comparison counties. Moreover, the effects appear to be larger for black versus white teenagers.

Section II below discusses the theoretical framework. Section III describes the empirical strategy. Section IV has the data and descriptive statistics. Section V reports the results and Section VI concludes.

2.2 Theoretical Framework

The entry of plants into counties could impact teen birth rates through various mechanisms. I analyze the effects using an economic framework of utility maximization. Also, I describe the trade offs separately for teen women, teen men and adults.

An increase in female teen employment, as a result of entry, would result in both income and substitution effects. Assuming that children are a normal good, higher earnings would lead to more births. However, since time is fixed, an increase in time spent with children could imply a decrease in time spent at work. Further, there is a trade off between earnings spent on children versus on one's own consumption. Therefore, due to the higher opportunity cost of having children when employed, some teen women might substitute work for children thus reducing the demand for children. There will be an increase or decrease in teen births, as a result of entry, depending on the relative magnitude of the income versus substitution effects.

The entry of plants might create a demand for high skilled labor. In response to higher present value of lifetime expected returns, teens might respond and get a further education Becker (1993). Since time is fixed, an increase in time spent in school implies a decrease in time spent with children, holding time spent at work constant. Through this substitution effect there will be a reduction in the demand for children. However, if women don't have credit constraints, higher expected earnings could result in more children during their earlier years due to higher opportunity costs when they decide to work. The overall effect will depend on the relative size of the effects.

Higher expected earnings for males through more employment can also impact teen birth rates. Male earnings could be a source of additional income for women in their teen and later years. If male partners bear a small share of the responsibility of raising a child out of wedlock, teen birth rates may not respond to changes in male earnings. On the other hand, teen birth rates would rise in response to higher male earnings if male partners did incur monetary costs for their children. Higher income would lead to higher demand for children due to the income effect. However, if male partners did provide time and/or financial support to their children teen birth rates could still decline due to the substitution effect for men. Given a fixed amount of time available, having a child during their teen years could result in a substitution of work for children. Also, it would imply a lower amount of consumption spending. If the opportunity cost of having a child is substantial, young males might avoid becoming teen parents.

In addition, the entry of firms into counties may lead to an increase in employment for adults. Teen children could be affected through the additional income or lower time available. Higher income due to employment could result in more human capital investment in teens. However, more employment could create time constraints that could lead to lower time spent rearing children and therefore possible negligence. The impact is therefore inconclusive.

Since, there are contradictory forces at work, the overall effect on teen birth rates is ambiguous. I empirically test the impact below. The results provide suggestive evidence of the dominant effects of plant entry on teen birth rates.

2.3 Empirical Strategy

I use a difference in difference analysis to identify the causal impact of an increase in employment on teen birth rates. Counties that win the bid for a plant are in the treatment group while those that lose the bid by a narrow margin are in the comparison group. A potential threat to identification of the impact of employment shocks is endogeneity. The literature (See e.g. Moretti (2003) and Giannone (2016)) indicates that firms often choose to locate in geographic areas where there is an existent high skilled labor force. The bias in the OLS coefficients would then depend on the trends in fertility of high skilled workers.

In order to ensure that the comparison counties are a valid counterfactual, I do a baseline comparison of economic characteristics of the treatment versus counterfactual counties. I check the average teen birth rates by race as well as other economic characteristics that could possibly affect teen birth rates.

As another check to ensure the validity of counterfactual counties, I examine the pre-trends of the outcome variable. The key identifying assumption in this difference in difference analysis is that the county pairs have similar trends prior to entry. I perform a placebo check to confirm that the trends prior to entry are similar. This involves a difference in difference estimation prior to entry where a time period prior to entry (t=-3 in this case) is assumed to be the date of entry (See e.g., Fitzpatrick and Jones (2016)). Two periods before and after t=-3 are assumed to be the pre and post treatment periods. If there are no pretrends in the data, the difference in difference estimate should not be different from zero.

The difference in difference strategy in this paper attempts to take care of the selection issue as firms were also likely to establish their plants in the comparison group counties and thus their labor force is presumably similar in characteristics. However, there are other factors that determine a firm's location decision (**?**). These include future lower costs of production and the value of the subsidies that the firms received. There could be a threat to identification if a county that bid higher, due to a higher expected net gain, is also one that invests larger amounts in public health or public education that could impact teen birth rates. The results would be upward biased. Therefore, in the future it would be beneficial to compare these variables at baseline for the treatment and comparison group counties data permitting.

For the main specification, I use the following econometric model:

$$tbr_{ct} = \beta_0 + \beta_1 Post + \beta_2 Post * Winner + \beta_3 X + \kappa_c + \epsilon_{ct} \tag{2.1}$$

The teenage birth rate in time period t in county c is (tbr_{ct}). There are five periods before and after entry of the plant (t = -5 to +5). Post is a dummy variable and assumes the value of 1 after time period 0. I include the average $ value of food stamps per capita in the county, X, as a control variable as a measure of the economic prosperity of the county. County fixed effects are κ_c. To check the robustness of my results, I also estimate the regression with time fixed effects instead of the post variable as specified in equation 2.2 below.

$$tbr_{ct} = \gamma_0 + \gamma_2 Post * Winner + \gamma_3 X + \delta_c + \phi_t + \upsilon_{ct} \tag{2.2}$$

2.4 Data and Descriptive Statistics

I use data from vital statistics natality files for teenage birth rates at the county level. The data is available by race for the entire time period when the population of the county is greater than 100,000. For counties with a population less than 100,000, teen birth rate data was not available from vital statistics. I was able to get the data from the individual county's health statistics departments. For some small counties, the data was not reported by race by the health statistics departments due to the small population of certain races.

The teen population numbers to calculate teen birth rates are from the NIH Surveillance, Epidemiology, and End Results (SEER) Program for which data is available until 2012.[4] For some counties, such as Boulder and Weld Counties in Colorado, population data was not available in this dataset. I then used the intercensal estimates of population from the U.S. Census Bureau. As per convention in the literature, teen birth rates by race are calculated per 1,000 15-19 year old women

4. Downloaded from the NBER website.

of the particular race. Food stamps per capita, employment and earnings by sector data are from the Regional Economic Information System (REIS). Unemployment rates are from the Bureau of Labor Statistics.

The group of winner and loser counties is from Greenstone and Moretti (2003). The dataset consists of 82 winner-loser county groupings. My sample consists of 81 county groupings because I was unable to get data on teen birth rates for Henrico county in Virginia. In addition, I exclude teen birth rates for a race in any year if the county has a teen population that is less than 500. This is to avoid fluctuations in teen birth rates due to small teen population sizes.

Table 2.2 compares the baseline characteristics of the winner and loser counties. The overall and white teen birth rate appear to be slightly lower in the loser counties. The black teen birth rate is not statistically different between the two groups. The winner counties also have lower per capita income, lower earnings in retail and higher per capita earnings from farm income. They also have lower levels of employment, population at entry and education on average. Since there is a lower percent of individuals with a high school or college degree in the winner counties, it does not appear to be that winner counties were more likely to influence teen birth rates through the channel of public education.

I compare the trends in teen birth rates in Figure 2.2. The pre-treatment trends appear to be similar. However, I report the results from the placebo check in Table 2.3. There does not appear to be any difference in pre-trends between the winner and comparison groups in the data. The Post (Placebo)*Winner variable is not statistically different from zero for any of the regressions.

I also show the pre and post trends in employment and earnings for winner versus comparison group counties to check as to whether there was any impact of plant entry. I weight the means for each time period by the population at entry. As Figures 2.3(b) and 2.3(c) show, there appears to be a break in trend in employment in the construction and retail sectors. Figures 2.4(b) and 2.4(c) indicate a change in earnings per capita in the construction and retail sectors.

2.5 Results

Results are in Tables 2.4 and 2.5. The estimates suggest that teen birth rates decline by approximately 2 per 1,000 15-19 year old women after the entry of plants. The results suggest that the decline is higher for black teens at 6 per 1,000 15-19 year old women. The findings are consistent with the past literature that indicates that black teen birth rates decrease more when employment rates increase Colen, Geronimus, and Phipps (2006). However, the coefficients are not statistically significant. In Table 2.4, I include the Post variable and in Table 2.5, I include time fixed effects. The results are robust to either specification. The regressions are weighted by population at entry and standard errors are clustered at the county and id level.

It is likely that the plant investment impacted counties with demographic characteristics differentially. Both winner and loser counties varied by various demographic variables including population, pre-treatment income, pre-treatment teen birth rates. I would like to assess the impacts for these different sub-groups. Given the same dollar investment, presumably the impact was larger in counties with smaller populations. Similarly, the employment shock might affect counties that had previously lower employment or lower average levels of earnings to a greater extent. My next step in the analysis is to estimate heterogenous effects for different subdivisions of counties.

Also as a next step, I would like to understand the mechanism through which teen birth rates change as a result of the employment shocks. I propose to check the decennial census data to check for the changes in employment rates for the different sub-populations such as different age and gender groups. I am limited to using the decennial data because for the years in my study, county employment data is not available by age and/or gender. The insights from this analysis will help in determining the explanatory variables in the econometric specification.

2.6 Conclusion

In this paper, I attempt to estimate the impact of permanent employment shocks on teen birth rates. I use exogenous variation that arises from the entry of large industrial plants into counties. To the best of my knowledge, there previous research has not examined the impact of these investments on teen birth rates. I use a difference in differences analysis to estimate the causal impact. The counterfactual group consists of counties that lose the bid by a small margin. My findings suggest that black teen birth rates respond negatively to increasing employment opportunities. White teen birth rates decrease to a lesser degree.

There are important policy ramifications of these results. Local governments often spend large amounts to create incentives for firms to locate in their counties. The overall welfare to the community of these large investments remains unclear. While my current results are only suggestive of an impact, the change in teen birth rates is a variable to possibly include in a welfare analysis that studies the net benefit of attracting large corporations.

Figure 2.1: Teenage Birth Rates

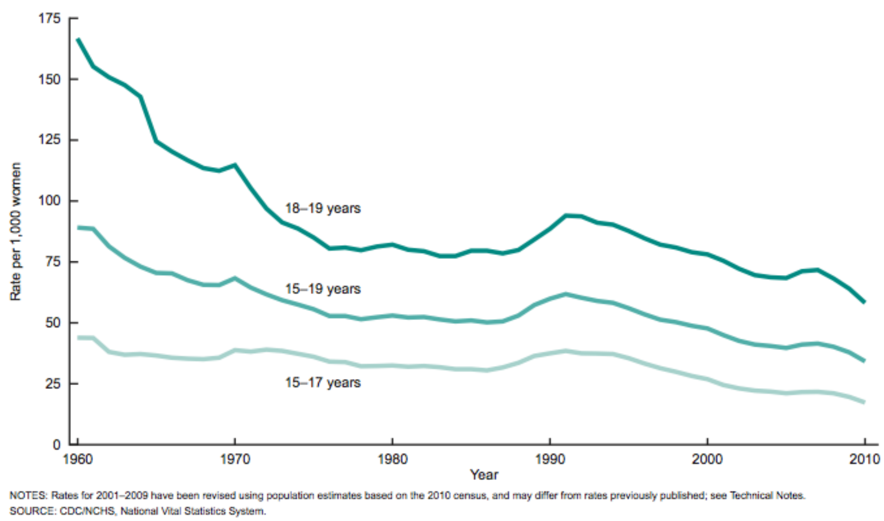

Figure 2.2: Teenage Birth Rates (TBR) Before and After Entry

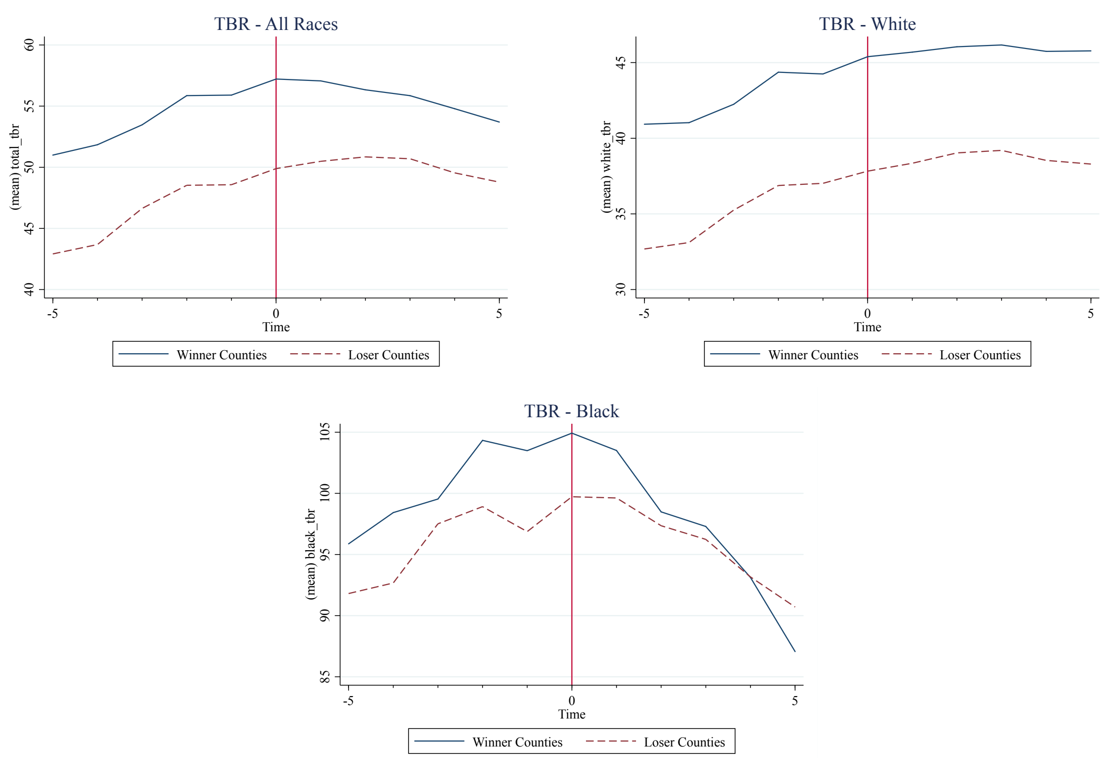

Figure 2.3: Employment by Sector

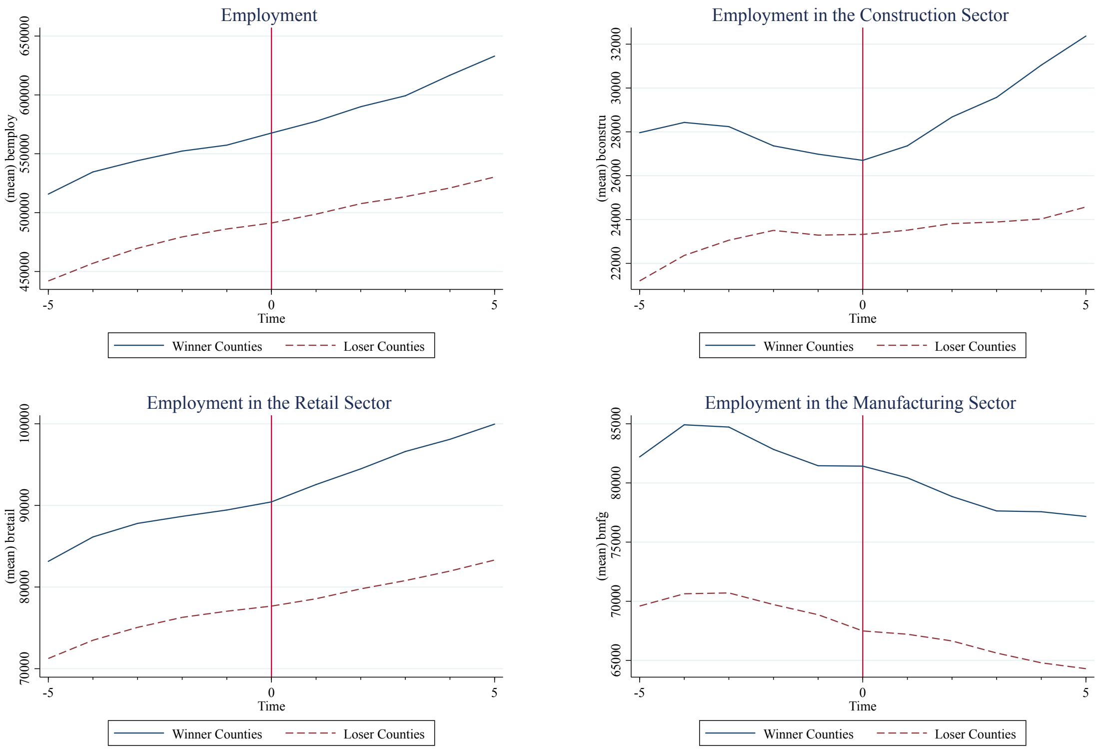

Figure 2.4: Earnings Per Capita by Sector

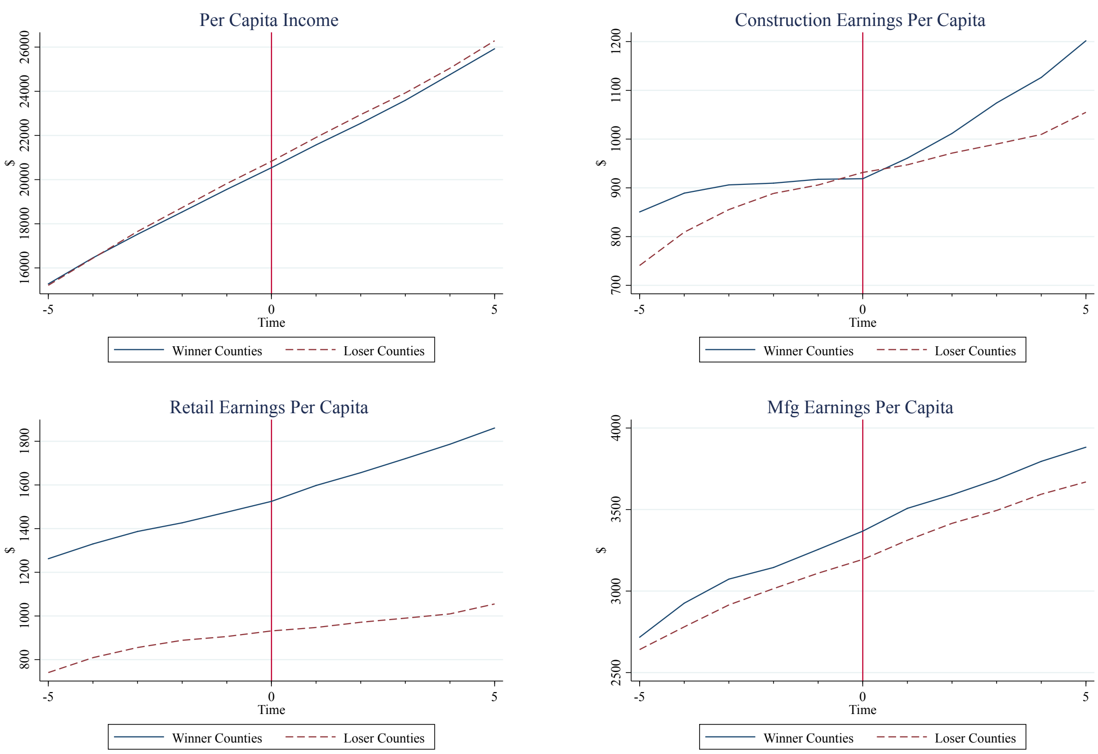

Table 2.1: Sample

	Company	Id	Winner	Year	Pop	Investment($ mn)	Employment
Montgomery County, VA	Timken	1	0	1982	65395	.	.
Stark County, OH	Timken	1	1	1982	375921	500	.
Posey County, IN	General Electric	2	0	1982	26600	.	.
Lowndes County, AL	General Electric	2	1	1982	12810	325	750
Pasco County, FL	Racal-Milgo	3	0	1982	217305	.	.
Broward County, FL	Racal-Milgo	3	1	1982	1076760	.	1230
Hamilton County, OH	Pitney-Bowes	4	0	1982	871032	.	.
Fayette County, GA	Pitney-Bowes	4	1	1982	33701	.	.
Montgomery County, KY	Corning/Kroger	5	0	1982	20081	.	.
Clark County, KY	Corning/Kroger	5	1	1982	28750	.	50
Wake County, NC	Verbatim	6	0	1983	327628	.	.
Mecklenburg County, NC	Verbatim	6	1	1983	428248	.	.
Suffolk County, MA	American Solar King	7	0	1983	670824	.	.
McLennan County, TX	American Solar King	7	1	1983	179175	2	.
King County, WA	Hewlett-Packard	8	0	1983	1374020	.	.
Santa Clara County, CA	Hewlett-Packard	8	0	1983	1316336	.	.
Larimer County, CO	Hewlett-Packard	8	0	1983	161821	.	.
Snohomish County, WA	Hewlett-Packard	8	1	1983	359922	.	11000
St. Louis County, MO	General Motors	9	0	1984	981028	.	.
St. Charles County, MO	General Motors	9	1	1984	164585	.	6000
Vanderburgh County, IN	Whirlpool	10	0	1984	167154	.	.
Rutherford County, TN	Whirlpool	10	1	1984	94648	.	.
Bristol County, MA	Codex (Motorola)	11	0	1984	479923	.	.
Middlesex County, MA	Codex (Motorola)	11	1	1984	1389511	.	.
Phillips County, AR	Tubular Corp	12	0	1985	32323	.	.
Muskogee County, OK	Tubular Corp	12	1	1985	70259	350	1500
Loudoun County, VA	TRW	13	0	1985	652949	.	.
Montgomery County, MD	TRW	13	0	1985	67221	.	.
Fairfax County, VA	TRW	13	1	1985	714935	25	1000
Bernalillo County, NM	Kyocera	14	0	1985	530508	.	.
Travis County, TX	Kyocera	14	0	1985	291728	.	.
Nueces County, TX	Kyocera	14	0	1985	389282	.	.
East Baton Rouge Parish, LA	Kyocera	14	0	1985	452559	.	.
Clark County, WA	Kyocera	14	1	1985	205610	30	925
El Paso County, CO	AiResearch	15	0	1985	370270	.	.
Bernalillo County, NM	AiResearch	15	0	1985	452559	.	.
Pima County, AZ	AiResearch	15	1	1985	602646	.	.
Jasper County, SC	Ft. Howard Paper	16	0	1985	14781	.	.
Effingham County, GA	Ft. Howard Paper	16	1	1985	21393	950	1000
Linn County, IA	Rockwell International	17	0	1985	164835	.	.
Johnson County, IA	Rockwell International	17	1	1985	88539	.	.
Kalamazoo County, MI	Saturn	18	0	1986	96785	.	.
Shelby County, KY	Saturn	18	0	1986	216220	.	.
Grayson County, TX	Saturn	18	0	1986	23847	.	.
Maury County, TN	Saturn	18	1	1986	52550	3500	6000
Wyandotte County, KS	Toyota	19	0	1986	62197	.	.
Wilson County, TN	Toyota	19	0	1986	169587	.	.
Scott County, KY	Toyota	19	1	1986	22141	1000	2000

Sample (contd)

	Company	Id	Winner	Year	Pop	Investment($ mn)	Employment
Durham County, NC	DuPont/Phillips	21	0	1986	168503	.	.
Cleveland County, NC	DuPont/Phillips	21	1	1986	83656	.	.
Buncombe County, NC	Nippon Columbia	22	0	1986	168424	.	.
Morgan County, GA	Nippon Columbia	22	1	1986	12364	.	.
Richland County, SC	Mack	23	0	1986	280040	.	.
Lehigh County, PA	Mack	23	0	1986	281316	.	.
Fairfield County, SC	Mack	23	1	1986	21587	80	1200
Sangamon County, IL	Fuji/Isuzu	24	0	1987	87545	.	.
Hardin County, KY	Fuji/Isuzu	24	0	1987	176188	.	.
Tippecanoe County, IN	Fuji/Isuzu	24	1	1987	126712	500	.
Duval County, FL	Boeing	25	0	1987	648790	.	.
Oklahoma County, OK	Boeing	25	0	1987	601241	.	.
Calcasieu Parish, LA	Boeing	25	1	1987	170477	53	1400
Kendall County, IL	Yamaha	26	0	1987	37811	.	.
Coweta County, GA	Yamaha	26	1	1987	47549	40	375
Stanislaus County, CA	Carnation	27	0	1987	323379	.	.
Kern County, CA	Carnation	27	1	1987	497911	80	.
Muscogee County, GA	Knauf Fiber Glass	28	0	1987	47505	.	.
Troup County, GA	Knauf Fiber Glass	28	0	1987	54050	.	.
Russell County, AL	Knauf Fiber Glass	28	0	1987	179225	.	.
Chambers County, AL	Knauf Fiber Glass	28	1	1987	37752	.	.
Pierce County, WA	Nippon Kokan (NKK)	29	0	1987	545011	.	.
Linn County, OR	Nippon Kokan (NKK)	29	1	1987	88071	60	300
Hartford County, CT	Dresser Rand (Ingers)	30	0	1987	843158	.	.
Allegany County, NY	Dresser Rand (Ingers)	30	1	1987	49771	.	.
Daviess County, KY	Worlmark	31	0	1987	87185	.	.
Perry County, IN	Worlmark	31	0	1987	19225	.	.
Hancock County, KY	Eastman Kodak	31	1	1987	7966	.	.
Delaware County, PA	Eastman Kodak	32	0	1988	530696	.	.
Bucks County, PA	Eastman Kodak	32	0	1988	548664	.	.
Philadelphia County, PA	Eastman Kodak	32	0	1988	673295	.	.
Montgomery County, PA	Eastman Kodak	32	0	1988	1627499	.	.
Chester County, PA	Eastman Kodak	32	1	1988	366448	31	.
Washington County, OR	Albertson's	33	0	1988	1440287	.	.
King County, WA	Albertson's	33	0	1988	292475	.	.
Multnomah County, OR	Albertson's	33	1	1988	573019	70	350
Rock County, WI	Metal Container (A-B)	34	0	1988	136597	.	.
DeKalb County, IL	Metal Container (A-B)	34	0	1988	75790	.	.
Jefferson County, WI	Metal Container (A-B)	34	1	1988	66914	.	120
DeKalb County, GA	Anheuser-Busch	35	0	1988	329927	.	.
Knox County, TN	Anheuser-Busch	35	0	1988	91586	.	.
Hall County, GA	Anheuser-Busch	35	0	1988	538476	.	.
Bartow County, GA	Anheuser-Busch	35	1	1988	52539	300	500
Rogers County, OK	Kimberly-Clark	36	0	1988	54426	.	.
Tulsa County, OK	Kimberly-Clark	36	1	1988	499462	150	250
San Mateo County, CA	Alumax	37	0	1988	636605	.	.
Gwinnett County, GA	Alumax	37	1	1988	323527	.	.
Alameda County, CA	Toyota	38	0	1988	1251097	.	.
Scott County, KY	Toyota	38	1	1988	22853	.	.
Bergen County, NJ	Wella	39	0	1988	831345	.	.
Henrico County, VA	Wella	39	1	1988	212490	10	.

Sample (contd)

	Company	Id	Winner	Year	Pop	Investment($ mn)	Employment
Suffolk County, MA	Reebok International	40	0	1988	677894	.	.
Middlesex County, MA	Reebok International	40	1	1988	1397268	.	.
Mercer County, NJ	Squibb	41	0	1989	326244	.	.
Camden County, NJ	Squibb	41	1	1989	501868	.	.
Hillsborough County, FL	GTE	42	0	1989	104821	.	.
Hamilton County, IN	GTE	42	0	1989	827378	.	.
Ventura County, CA	GTE	42	0	1989	664688	.	.
Dallas County, TX	GTE	42	1	1989	1832112	.	3500
Galveston County, TX	Formosa Plastics	43	0	1989	213304	.	.
Nueces County, TX	Formosa Plastics	43	0	1989	289745	.	.
Calhoun County, TX	Formosa Plastics	43	1	1989	19070	.	10000
Wood County, OH	Philips Display	44	0	1989	464021	.	.
Lucas County, OH	Philips Display	44	0	1989	33525	.	.
Seneca County, NY	Philips Display	44	0	1989	113126	.	.
Washtenaw County, MI	Philips Display	44	1	1989	279332	116	400
Weld County, CO	Wal-Mart Stores	45	0	1989	223510	.	.
Boulder County, CO	Wal-Mart Stores	45	0	1989	73665	.	.
Laramie County, WY	Wal-Mart Stores	45	0	1989	132205	.	.
Larimer County, CO	Wal-Mart Stores	45	1	1989	183504	.	.
Ramsey County, MN	Ideal Security Hardw	46	0	1989	485639	.	.
Washington County, TN	Ideal Security Hardw	46	1	1989	91469	.	.
Allen County, IN	Burlington Air Express	47	0	1989	300656	.	.
Lucas County, OH	Burlington Air Express	47	1	1989	464021	.	720
Washington County, MS	Boeing	48	0	1990	67826	.	.
Wichita County, KS	Boeing	48	1	1990	2739	.	3000
Richland County, SC	Tennessee Eastman	49	0	1990	287491	.	.
Sullivan County, TN	Tennessee Eastman	49	1	1990	143886	150	.
Orange County, FL	Bass	50	0	1990	685768	.	.
Shelby County, TN	Bass	50	0	1990	828446	.	.
DeKalb County, GA	Bass	50	1	1990	549655	.	.
Rensselaer County, NY	Allied Signal	51	0	1990	154680	.	.
Kershaw County, SC	Allied Signal	51	1	1990	43638	60	100
Cumberland County, ME	Borden	52	0	1990	243865	.	.
Cape May County, NJ	Borden	52	1	1990	95368	15	.
Westchester County, NY	Reichhold Chemicals	53	0	1990	875578	.	.
Durham County, NC	Reichhold Chemicals	53	1	1990	183145	50	.
Delaware County, PA	Ford	54	0	1991	550327	.	.
Montgomery County, PA	Ford	54	1	1991	687827	117	.
Johnson County, KS	Burlington Northern	55	0	1991	365507	.	.
Ramsey County, MN	Burlington Northern	55	0	1991	488277	.	.
Tarrant County, TX	Burlington Northern	55	1	1991	1205887	.	.
Shelby County, TN	Holiday	56	0	1991	837508	.	.
DeKalb County, GA	Holiday	56	1	1991	562513	.	.
Somerset County, NJ	Adidas USA	57	0	1991	245810	.	.
Spartanburg County, SC	Adidas USA	57	1	1991	230786	150	1500
Fairfax County, VA	American Auto	58	0	1991	836580	.	.
Seminole County, FL	American Auto	58	1	1991	301800	.	.
Fairfax County, VA	United Airlines	59	0	1991	61582	.	.
Guilford County, NC	United Airlines	59	0	1991	356433	.	.
Oklahoma County, OK	United Airlines	59	0	1991	870139	.	.
Jefferson County, KY	United Airlines	59	0	1991	811733	.	.
Berkeley County, WV	United Airlines	59	0	1991	175468	.	.
Champaign County, IL	United Airlines	59	0	1991	669393	.	.
Marion County, IN	United Airlines	59	0	1991	836580	.	.
Hamilton County, OH	United Airlines	59	0	1991	606535	.	.
Denver County, CO	United Airlines	59	1	1991	478352	1000	7000

Sample (contd)

	Company	Id	Winner	Year	Pop	Investment($ mn)	Employment
Lauderdale County, TN	Sterilite	60	0	1991	23880	.	.
Jefferson County, AL	Sterilite	60	1	1991	656878	10	.
Polk County, FL	Wal-Mart Stores	61	0	1991	415136	.	.
Hernando County, FL	Wal-Mart Stores	61	1	1991	106966	.	150
Bergen County, NJ	Volvo North America	62	0	1991	829599	.	.
Chesapeake city, VA	Volvo North America	62	1	1991	158127	100	3500
Middlesex County, MA	AMF/Reece	63	0	1991	1398475	.	.
Hanover County, VA	AMF/Reece	63	1	1991	65528	.	.
Kitsap County, WA	Boeing	64	0	1991	199636	.	.
Snohomish County, WA	Boeing	64	1	1991	484450	1500	10000
Denver County, CO	United Airlines	65	0	1991	478352	.	.
Marion County, IN	United Airlines	65	1	1991	811733	1000	7000
Posey County, IN	Scott Paper	66	0	1992	26185	.	.
Daviess County, KY	Scott Paper	66	1	1992	88653	500	550
Sacramento County, CA	Safeway	67	0	1992	1121523	.	.
San Joaquin County, CA	Safeway	67	1	1992	500278	.	.
Placer County, CA	AT&T	68	0	1992	63010	.	.
Berkeley County, WV	AT&T	68	0	1992	187268	.	.
Mecklenburg County, NC	AT&T	68	1	1992	542185	.	.
Fairfield County, CT	GE Capital Services	69	0	1992	834372	.	.
Fulton County, GA	GE Capital Services	69	1	1992	677768	.	250
Douglas County, NE	BMW	70	0	1992	428612	.	.
Greenville County, SC	BMW	70	1	1992	330074	350	1200
Allegheny County, PA	National Steel	71	0	1992	1340919	.	.
St. Joseph County, IN	National Steel	71	1	1992	251724	.	.
Duval County, FL	MCI Communications	72	0	1992	707797	.	.
Dade County, FL	MCI Communications	72	1	1992	2011174	.	.
Ventura County, CA	Everest & Jennings	73	0	1992	684143	.	.
St. Louis County, MO	Everest & Jennings	73	1	1992	1003544	.	.
New Castle County, DE	Swearingen Aircraft	74	0	1992	457210	.	.
Berkeley County, WV	Swearingen Aircraft	74	1	1992	63010	100	800
Cuyahoga County, OH	Evenflo Products	75	0	1992	1422812	.	.
Cherokee County, GA	Evenflo Products	75	1	1992	101246	.	300
Rensselaer County, NY	Sterling Drug	76	0	1993	156232	.	.
Montgomery County, PA	Sterling Drug	76	1	1993	701715	300	1200
Fairfield County, CT	JLM Industries	77	0	1993	838945	.	.
Hillsborough County, FL	JLM Industries	77	1	1993	879024	.	40
Jefferson County, KY	B&W Tobacco	78	0	1993	676735	.	.
Bibb County, GA	B&W Tobacco	78	1	1993	153382	.	3000
Polk County, IA	Greyhound Lines	79	0	1993	345143	.	.
Dallas County, TX	Greyhound Lines	79	1	1993	1969978	.	.
Westchester County, NY	Transkrit	80	0	1993	890061	.	.
Roanoke County, VA	Transkrit	80	1	1993	81343	8	70
Durham County, NC	Mercedes-Benz	81	0	1993	114678	.	.
Chester County, SC	Mercedes-Benz	81	0	1993	196046	.	.
Alamance County, NC	Mercedes-Benz	81	0	1993	136735	.	.
Clarke County, GA	Mercedes-Benz	81	0	1993	32388	.	.
Douglas County, NE	Mercedes-Benz	81	0	1993	432261	.	.
Berkeley County, SC	Mercedes-Benz	81	0	1993	70837	.	.
Anderson County, TN	Mercedes-Benz	81	0	1993	91963	.	.
Tuscaloosa County, AL	Mercedes-Benz	81	1	1993	155558	30	1500
Guilford County, NC	Schlegel	82	0	1993	370568	.	.
Rockingham County, NC	Schlegel	82	1	1993	87605	37	800

Table 2.2: Baseline Characteristics

	Loser	Winner	Difference	t
Teen Birth Rate	49.5	52.3	-2.8	-1.90
Black Teen Birth Rate	96.9	99.7	-2.7	-0.98
White Teen Birth Rate	40.1	43.7	-3.7	-2.69
Per Capita Income	$15,828	$14,774	$1,053	3.1
Manufacturing Earnings Per Capita	$2,667	$2,648	$19	0.18
Construction Earnings Per Capita	$742	$748	-$6	-0.25
Earnings Per Capita in Retail	$1,126	$1,063	$63	2.27
Farm Income Per Capita	$81	$127	-$47	-3.4
Employment	261,079	220,775	40,304	2.34
Employment in Manufacturing	38,711	34,311	4,400	1.52
Employment in Construction	13,235	12,060	1,176	1.39
Employment in Retail	42,298	36,073	6,226	2.30
Food Stamps Per Capita	$41	$43	-$1	-0.7
Population at Entry	447,427	366,853	80,573	3.11
Percent with High School Degree	34%	33%	1.29	3.84
Percent with College or More	19%	17%	2%	4.77

Table 2.3: Check for Pre-Trends: t<0

	(1) **Total**	(2) **Black**	(3) **White**
Post(Placebo)*Winner	0.64	1.39	0.94
	(1.69)	(3.66)	(1.72)
Post(Placebo)	4.08***	5.86**	3.12***
	(0.94)	(2.74)	(0.86)
Constant	46.53***	94.57***	37.76***
	(0.46)	(1.13)	(0.45)
R^2	0.10	0.05	0.08
N	820	465	785
F-Stat	15	7	10
County Fixed Effects	Y	Y	Y

Table 2.4: Difference-In-Differences Analysis

	(1) Total	(2) Black	(3) White
Post*Winner	-2.46	-6.21	-0.61
	(1.57)	(4.22)	(1.37)
Post	1.61	-3.96	2.33**
	(1.10)	(3.52)	(1.03)
Food Stamps Per Capita	0.09***	0.15***	0.05***
	(0.02)	(0.05)	(0.01)
Constant	45.93***	92.85***	36.29***
	(0.86)	(2.16)	(0.63)
R^2	0.10	0.03	0.10
N	1777	1015	1677
F-Stat	15	5	17
County Fixed Effects	Y	Y	Y

Table 2.5: Difference-In-Differences Analysis (with Time Fixed Effects)

	(1) Total	(2) Black	(3) White
Post*Winner	-2.46	-6.32	-0.59
	(1.55)	(4.28)	(1.36)
Food Stamps Per Capita	0.06**	0.12*	0.02
	(0.02)	(0.07)	(0.02)
Constant	48.09***	85.01***	40.20***
	(1.79)	(5.91)	(1.63)
R^2	0.17	0.07	0.16
N	1777	1015	1677
F-Stat	7	5	8
County Fixed Effects	Y	Y	Y
Time Fixed Effects	Y	Y	Y

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