EXPLAINING THE TREND IN TEENAGE BIRTH RATES FROM 1981-1999

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Abstract

We investigate the influence of changes in demography, the strength of the economy, and social policies on teen birth rates in the U.S. from 1981 to 1999, a period of wildly fluctuating rates. We find that demographic and social policy changes largely counteracted one another during this period with the growth in the Hispanic population as the primary factor driving rates up, and the tightening of the Child Support Enforcement program as the primary factor pushing rates down. Our results suggest that if the demographic variables that we measure had remained at their 1981 levels, teens would have had 340,000 (or 3.6 percent) fewer births than were observed over this period. At the same time, if welfare benefits and Child Support Enforcement expenditures had remained at their 1981 levels, teens would have had almost 484,000 (or 5.2 percent) more births than observed. Although related to teen birth rates, the economy does not appear to have played much of a role in the trend in teen birth rates.

Keywords: teenage childbearing, social policy

INTRODUCTION

In 2000, the teenage birth rate was the lowest ever recorded in the U.S., 48.7 births per 1,000 females aged 15 to 19 (Ventura, Mathews, and Hamilton 2001). This rate followed nearly a decade of declining birth rates for teenagers of all races. Interestingly, the drop in the 1990s came on the heels of a four-year interval of rapid growth, producing an inverted "V" pattern in teenage birth rates from the mid 1980s through the 1990s (see Figure 1). The rise in the late 1980s was a dramatic reversal of the long-term trend in teenage childbearing that had started in the mid 1950s. Between 1957 and 1975, teenage birth rates declined from 96.3 to 55.6 per 1,000 women, before leveling out in 1975 and then turning upward after 1986. Given the flat rates during the early 1980s and the resumption of the long-term downward trend in the 1990s, the key question for researchers to answer may be why rates *increased* in the late 1980s rather than why they *declined* in the 1990s.

[Figure 1 about here]

We know that teenage sexual activity rose during the 1980s and fell during the 1990s (Ku et al. 1998; Sawhill 2001; Singh and Darroch 1999) and that contraceptive use increased throughout the 1980s and 1990s (Hogan, Sun, and Cornwell 2000; Manlove et al. 2000; Piccinino and Mosher 1998; Sawhill 2001). These proximate determinants could certainly explain, at least in part, some of the trend in teenage birth rates during this unusual period.

Much less is known, however, about why these behavioral changes occurred during the last two decades. In the analysis that follows, we examine the influence of three sets of factors – changes in the demographic composition of the teenage population, changes in the strength of the economy, and changes in the benefits of social policies – on the birth rates for teenagers between 1981 and 1999. Teenage fertility statistics in the United States are typically reported for females between the ages of 15 and 19. We know that 18- and 19-year-old females are far more likely to have a child than 15- and 16-year-old females (Moore et al. 2001). If the proportion of 15- and 16-year-olds in the population changed relative to the proportion of 18- and 19-year-olds, this compositional change could explain some of the trend. In addition to the age

composition, the racial and ethnic composition of the U.S. may have played a role. The teenage birth rate of African Americans and Hispanics is higher than the rate for whites (Moore et al. 2001; Ventura et al. 2001). If the proportion of teenagers that is African American or Hispanic increased over time, due to differential fertility or immigration, this would increase aggregate birth rates.

Economic factors may also explain some of the trend. Median female wages increased throughout this period, and the economy was booming during a large portion of the 1990s. Because these factors increased the opportunity cost of a birth, young women may have become less likely to have a child. Although this explanation has rarely been tested, it is frequently offered as a possible explanation, particularly during the 1990s. For instance, Richard Freeman (2001) writes,

> I know of no estimates of the extent to which the booming job market contributed to this change in behavior [teenage childbearing], but certainly the better opportunities for young women and for the men in their lives must have led some to postpone having children until later in life (pp. 123-126).

Similarly, Ventura et al. (2001) consider the economy a likely suspect. They write,

> The long economic expansion during the 1990s likely played a role as well, increasing economic opportunities for teenagers as well as older women and men. Enhanced economic opportunity may have encouraged teenagers to strive for greater educational achievement and better career opportunities, while postponing early pregnancy and parenthood (p. 8).

Also, the late 1980s through the mid 1990s was a period of remarkable change in the social policies in the U.S. Real AFDC benefits declined, while work requirements, family caps, and time limits were implemented in various states. All of these welfare changes increased the costs of nonmarital teenage childbearing for women[1] making these changes potential candidates

[1] Nonmarital births constituted a large percentage of teenage births, particularly among African American women, during the period we are investigating. In 1981, 49 percent of all teenage births were nonmartial. By 1999, the

for the trend in teenage childbearing (Sawhill 2001). Further, Child Support Enforcement (CSE) policies tightened during the 1980s and 1990s making it more expensive for men to father a child out-of-wedlock. At the same time, stricter CSE reduced the expected cost of bearing a child for a single mother. Therefore, the effect of CSE is ambiguous theoretically.

For policymakers who are interested in reducing teenage childbearing, it is important to understand this unusual period. If the explanation is improving economic opportunities for women, the policy implications would be entirely different from what they would be if the explanation is social policy changes. Similarly, if the explanation is purely demographic, policies and resources targeting either of these alternatives may prove fruitless.

Using natality data from the National Center for Health Statistics (NCHS), population data from the Census Bureau, as well as other state level data from a variety of sources, we find that demographic factors, particularly the growth in the Hispanic population, drove teen birth rates up. We conclude that if the demographic factors we investigate had remained at the 1981 levels, teens would have had 340,000 fewer births, a decline of 3.6 percent, over this 19-year period. We also conclude that, despite the fact that the trends coincide during the 1990s, teen birth rates are positively related to the strength of the economy. Further, even if they were negatively related, the variance in state unemployment rates is too small to explain much of the trend. Next, our results suggest that changes in welfare benefits and CSE policies were very important during this period. Had they remained at their 1981 levels, teens would have had nearly 484,000 more births, an increase of 5.2 percent over what was observed. Together these demographic and social policy changes largely counteracted one another. Finally, and perhaps most importantly, even after controlling for many of the most obvious potential causes of teenage childbearing, the overall trend in teenage birth rates remains, i.e., birth rates continue to rise in the late 1980s and fall thereafter.

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percentage reached 78.6. Among white teenagers, 35 percent of births were nonmarital in 1981. By 1999, that percentage had grown to 72.6. Among African American teenagers the comparable percentages were 86.7 (1981) and 95.5 (1999) (Ventura and Bachrach 2000; Table 4, pp. 28-31).

This paper proceeds as follows: In the next section, we review some of the relevant literature on teenage childbearing. In the third section, we describe our data sources. In the fourth section, we detail our empirical strategy. In the fifth section, we report our results and illustrate the impact these demographic, economic, and policy determinants had on the trend. In the sixth section, we briefly explore the possibility that changes in abortion costs can explain some of the trend. In the final section, we discuss our findings and conclude.

PREVIOUS RESEARCH

Several branches of the literature on the causes of teenage childbearing point to factors that may have contributed to the trend. The descriptive demographic literature notes that birth rates are consistently higher among "older" teenagers than "younger" teens. In 1990, for instance, the birth rate among 15- to 17-year-olds was 37.5 per 1,000 teenagers compared to 88.6 per 1,000 teenagers aged 18 to 19 (Moore et al. 2001). Older teens are more likely to have children than younger teens because they are more likely to be sexually active and married or cohabiting (Singh and Darroch 2000). This literature also shows that teen birth rates are much higher for African American and Hispanic females compared to non-Hispanic, white females (Moore et al. 2001; Ventura et al. 2001). If over time the proportion of teenagers who are African American or Hispanic changed, then these compositional changes may have played some role in the teen childbearing trend.

Economists have also contributed to this literature consistently showing that the greater their potential economic status, the less likely teenage women are to have children (Duncan and Hoffman 1990; Leibowitz, Eisen, and Chow 1986; Michael and Joyner 2000; Mincer 1963; Wolfe, Wilson, and Haveman 2001). There is evidence that the economic position of women improved throughout this interval. For instance, from 1980 to 1998, the median weekly wage for women between the ages of 20 and 44 in the U.S. grew from $329 to $397 in constant 1998 dollars (Authors' calculations using the March CPS). If opportunity costs are negatively related to the likelihood of teenage childbearing, then increases in female economic opportunities over

this time could have reduced teen birth rates. In addition to this substitution effect, Levine (2002) and Matthews, Ribar, and Wilhelm (1997) claim that a strong economy may also have produced an income effect, which operates in the other direction. In other words, they argue that as the wages and potential earnings of women grew, they were more likely to have the resources available to afford children.

The current empirical research on teenagers using state level data (similar to our empirical strategy) is ambiguous on which effect dominates. Colen, Geronimus, and Phipps (2002) investigate the influence of unemployment rates on the trend in teenage childbearing using the NCHS detailed natality files and a panel of state level data. They find a positive association between teenage births and state unemployment rates for African Americans in the 1990s and a negative association for African Americans in the 1970s and 1980s. Among whites, they find a negative association in the 1970s and 1980s. Levine (2002), also using the NCHS natality data, found evidence of pro-cyclical fertility among teenagers aged 15-19.

Social policies were also changing dramatically during this period, which may have influenced teen birth rates. First, real AFDC/TANF benefits fell during the entire interval (U.S. House of Representatives 1996, 2000), which lowered the benefits of nonmarital childbearing. Moffitt (2001) summarizing the welfare literature concludes that there is a consensus that "…variation in AFDC benefits across states, provided only to single mothers and not to two-parent families, tends to be positively correlated with the rate of single motherhood (p. 26)." Thus the declining real benefits of welfare should have reduced the likelihood that teenagers would have nonmarital births.

Recent work on this topic has been relatively consistent. Levine (2002) finds a positive, statistically significant relationship between welfare benefit levels for teens aged 15 to 17 and a positive, but insignificant relationship for teens aged 18-19. Kaestner, Korenman, and O'Neill (2003) use a difference-in-differences model with the both the NLSY79 and the NLSY97 and conclude that welfare reform is associated with a reduction in teenage fertility.

In addition to the changes in the welfare program, Child Support Enforcement (CSE) policies became stricter throughout the 1980s and 1990s.[2] Because these changes were designed to increase the cost of paternity to men who do not marry the mothers of their children, several researchers have hypothesized that they should have affected young men's decisions to engage in unprotected sexual intercourse, thereby lowering the likelihood of a teenage birth. As explained earlier, CSE policies should have reduced the cost of bearing a child out-of-wedlock for mothers so, theoretically, the effect of CSE is ambiguous.

Despite the theoretical ambiguity, the empirical research has consistently shown that efforts to expand CSE reduce teenage childbearing. Aizer and McLanahan (2003) use a difference-in-differences model to show that increases in state expenditures on CSE, led to decreases in teenage childbearing. Using state level data and an instrumental variables model, Case (1998) shows that states that allowed paternity establishment at age 18 and had presumptive guidelines for child support awards had lower rate of nonmarital births (among women 15 to 44) than states that did not pass such laws. Plotnick et al. (1999) found some "tentative" evidence that CSE policies in the early 1980s reduced nonmarital teenage childbearing in the NLSY.

To explain the trend in teen birth rates, one not only has to establish links between covariates and teenage childbearing, but also show that during the period under investigation that there has been enough change (in the proper direction) in a covariate (or several covariates) to produce the trend. To our knowledge, there is only one study that attempts to do both. Using data from the 1995 wave of the National Survey of Family Growth, Manlove et al. (2000) used predicted probabilities from an event history model to determine the influence of several factors on the trend in teenage childbearing from 1980 to 1995. These researchers compared three cohorts of women who were between 12 and 19 in 1980-1986, 1987-1991, and 1992-1995 and found that, although the racial and ethnic composition of the population was related to teen childbearing, changes in the composition across cohorts were insufficient to explain much of the

[2] See Garfinkel, Meyer, and McLanahan (1998) for a complete history of the CSE program.

trend. They also found a significant association between dropping out of high school and teenage childbearing, although, again, changes in dropout status were not large enough to explain much of the trend in teenage childbearing. Finally, they found that increases in maternal education could account for part of the trend. It seems reasonable to believe that the measure of maternal education may be capturing some of the change in the economic consequences of a teenage birth.

This study improves upon the extant literature by first establishing links between covariates and teenage childbearing. Next, we attempt to show if changes in the covariates could have produced the trend observed from 1981 to 1999. Our study differs from Manlove et al. (2000) in that we use NCHS data, which is the population of births in the U.S. from 1981 to 1999[3], whereas Manlove et al. used a sample of births drawn at three points in time between 1980 and 1995. Although some of our covariates overlap with theirs, such as race and ethnicity, we also include measures for the age composition, the strength of the economy, and social policy measures.

DATA

To measure teen birth rates, demographic characteristics of the U.S., the strength of the economy, and social policies, we use several data sources. First, we use data from the NCHS detailed natality series to obtain population data on the number of births to females aged 15 to 19 in each state from 1981 to 1999. We also use the Census Bureau's population estimates for females aged 15 to 19 in each state from 1981 to 1999. In addition to these data, we cull state level data from a variety of sources (see the Data Appendix for variable definitions and sources). Table 1 contains descriptive statistics for this data set.

[Table 1 about here]

[3] For 1985-1999, the National Center for Health Statistics reports the population of births from each state. For 1981-1984, they report the population of births from most states, but a handful of states only reported a random sample of 50 percent of all births. In all of the analyses in this paper, we have adjusted the rates in the states with incomplete population counts.

We generated age-specific teen birth rates by dividing the total number of births to females of a given age in each state each year by the total number of women of the same age. Given that these are the "official" birth numbers, we were able to duplicate the overall trend in teen birth rates reported by Ventura et al. (2001). Figure 2 shows the mean age of females aged 15 to 19 using Census Bureau data. After falling from 1983 until 1986, the mean age of teenagers rose, coinciding with the rapid increase in teenage birth rates in the late 1980s. In 1989, the mean age of teenagers peaked at 17.12 before falling every year until 1995 when they began to rise again. Thus, the rise in the mean age of teenagers in the late 1980s appears to coincide roughly with the rise in teen birth rates, and the decline in the mean age in the early 1990s coincides with the fall. The trends diverge, however, in the mid to late 1990s, indicating that age alone cannot explain the trend in teen birth rates. In Figure 3, we report age-specific trends; this evidence also suggests that age alone cannot explain the trend: the age-specific rates, particularly for the older teens, show the same inverted "V" pattern as the overall rate from the late 1980s through the 1990s.

[Figures 2 and 3 about here]

To measure the racial composition of the teenage population, we divided the number of African American teenagers in each state by the total number of teenagers. This ratio is shown in Figure 4. From 1981 to 1999, the proportion of the teen population that was African American increased from 14.4 to 14.8. This increase was not monotonic, however. From 1981 to 1984, the proportion of teens that was African American rose before falling in 1985 and 1986. In 1987 the rates began to increase again climbing until 1992. Interestingly, this rise coincides with the increase in teen birth rates. After a decline in 1993, the proportion continued to grow until 1995. From 1995 to 1999, the proportion that is African American fell from a high of 15.1 to 14.8 in 1999.

[Figure 4 about here]

The Census Bureau does not report on the Hispanic population in every year from 1981 to 1999. Therefore, to obtain a consistent measure of the Hispanic composition of the population

in each state, we used data from the March CPS. Because the sample sizes for teenagers were too small to estimate the proportion Hispanic with any accuracy, we calculated the proportion of the state population 35 and younger that reported being Hispanic. The percentage of the population 35 and younger that is Hispanic increased monotonically from a low of 7.3 in 1981 to 14.6 in 1999 (see Figure 5). The increase in the late 1980s is consistent with rising birth rates. However, the continued rise in the proportion of the population Hispanic during the 1990s should have produced upward pressure on teen birth rate, which, of course, is the opposite of the observed trend.

[Figure 5 about here]

To measure economic influences on teenage childbearing, we follow many in the literature and use state unemployment rates.[4] The rates in the late 1980s and 1990s suggest a positive correlation between state unemployment rates and teen birth rates. However, the data from the early to mid 1980s does not appear to correspond to the teen birth rate pattern as well.

[Figure 6 about here]

We use the natural logarithm of the maximum welfare benefit (either AFDC or TANF) for a family of four to measure the relationship between welfare benefits and teen birth rates. Figure 7 shows the average national real benefit level from 1981 to 1998 reported in 1999 dollars. From 1981 to 1986, the welfare benefits were U-shaped. After 1986, the real benefits fell consistently from a high of $653 in 1986 to a low of $468 in 1998. Since the welfare benefits should be positively related to teen birth rates, one may expect to see some relationship in the 1990s. However, welfare benefits were falling in the late 1980s while teen birth rates were rising, calling into question the importance of this influence.

[Figure 7 about here]

[4] In preliminary analyses, we tried a variety of measures of the strength of the economy. Namely, we used female labor force participation rates, the state median wage for women, the 20th percentile of the wage distribution for women, and the mean wage for females aged 25 to 64. We chose state unemployment rates because this is the standard in much of the literature, and because they seemed to fit the data best.

As explained earlier, Child Support Enforcement policies (CSE) were tightening throughout much of this period. We use the total state expenditures on CSE as a measure of the impact this policy had on teenage fertility.[5] Figure 8 shows the average state expenditure on CSE from 1980 to 1998 (in 1000s of 1999 dollars). This figure shows the rapid growth in the program in the two decades we observed. From 1981 to 1999, the total expenditure increased nearly fourfold from just over 44 million dollars to roughly 156 million dollars. Again, based on previous research, we believe this should reduce teenage childbearing.

[Figure 8 about here]

EMPIRICAL STRATEGY

Underlying our estimation strategy is an assumption that teenagers maximize their utility subject to constraints. To estimate the influence of the demographic characteristics, the strength of the economy, and the benefits of social policies on young women's decisions, we estimate the following weighted least squares (WLS) model[6] using the state level data set:

$$\textit{Teen Birth Rate}_{ast} = \alpha_a + \beta_s + \gamma_t + \delta' \mathbf{W}_{st} + \zeta' \mathbf{Z}_{s(t-1)} + \varepsilon_{ast}, \qquad (1)$$

where *a* represents age, *s* represents the state, and *t* the year.[7] The vector, α_a, represents a common age effect (for ages 15 through 19), β_s is a vector of state fixed effects, and γ_t is a vector of year fixed effects. **W** is a vector that includes a linear and quadratic term for the proportion of teenagers in the state that is African American and the proportion of the population in the state 35 and younger that is Hispanic. The matrix **Z** contains aggregate measures of the economic factors and social policies that should affect a teen's decision; therefore, we measure these in t-1, the period in which she is making her decision. Specifically, **Z** contains the state unemployment rate, the real welfare benefit, and the total state expenditures on the CSE program.

[5] This measure is identical to the one used by Aizer and McLanahan (2003).
[6] All weights in the models are based on the age-specific population of teenagers in the state.
[7] To account for the heterogeneity produced by using grouped data with a different number of teenagers in each state, we report robust standard errors for all state models.

After estimating the coefficients in Model 1, we use these coefficients to estimate the national birth rate. More formally, we assume that the following model describes the trend:

$$\overline{TBR}_{\bullet\bullet t} = \kappa + \alpha_a + \gamma_t + \delta'\overline{W}_{\bullet t} + \zeta'\overline{Z}_{\bullet(t-1)} \quad (2)$$

where $\overline{TBR}$ is the teen birth rate in the U.S, κ is a constant[8], α is an age effect that is weighted by the proportion of teenagers across the country of a given age, γ represents the year effect, $\overline{W}$ is a vector containing the proportion of the teenage population in the U.S. that is African American, its square, the proportion of the U.S. population 35 and younger that is Hispanic, and its square, and $\overline{Z}$ is a vector containing the mean state unemployment rate, the mean welfare benefit, and the average state expenditures on CSE. Given this model, we predict the teen birth rates in each year.

Next, we calculate the rate that could have been observed if the covariates had remained at their 1981 (1980 for the factors in matrix **Z)** levels. We choose the 1981 values since it precedes the sudden ascent in teen birth rates. If unusual patterns in the covariates surfaced after 1981 and this caused the inverted "V" pattern, then this strategy would remove these influences.

RESULTS

We begin by trying to duplicate the rates published by Ventura et al. (2002) in the Baseline Model (see Table 2). This model contains a series of indicators for the year. Although we are able to reproduce the *numbers* of teen births reported by Ventura et al. (2001), our birth *rates* appear to deviate slightly in the 1990s. As explained in the Data Appendix, we use Census Bureau population estimates retrieved from the Web. Obviously, these numbers are slightly different from those used by Ventura et al. Nevertheless, the overall pattern is identical and the deviations are trivial.

[Table 2 about here]

[8] To properly weight the estimation model while including the state fixed effects, we use the areg command in STATA 8.0. This estimation model generates a constant such that product of the means of the independent variables and the estimated coefficients runs through the mean of the dependent variable for the entire period. As such, this constant is some combination of the average of the state fixed effects and the other omitted indicator variables.

In Model 2, we estimate the weighted least squares fixed effects model described in equation 1. The year effects continue to show the inverted "V" pattern suggesting that even after controlling for the demographic, economic, and policy measures, other unmeasured variables are largely responsible for the shape of the trend. The age effects are large, very precisely measured, and increase monotonically. For example, relative to 15-year-olds, the rate among 16-year-olds is 17.3 births per 1,000 teens higher. The relationship between the proportion African American and teen birth rates is positive and jointly significant.[9] Similarly, the relationship between the proportion Hispanic and the teen birth rates is positive and jointly significant. We find a negative and statistically significant point-estimate for the unemployment rate. This result is similar to the result reported by Colen et al. (2002) for teens in the 1970s and 1980s and Levine (2002). We find a positive and statistically insignificant coefficient for the welfare benefit ($p=0.104$). The welfare benefits coefficient is consistent Kaestner et al. (2003) and Levine (2002), however. We also find a statistically significant negative relationship between CSE expenditures and teen birth rates, a finding that is consistent with Aizer and McLanahan (2003), Case (1998), and Plotnick et al. (1999).

Next, in Table 3, we construct hypothetical birth rates using all of the demographic, economic, and social policy coefficients from Model 2. The first column shows the rates reported by Ventura, et al. (2001). Column 2 shows the rates we calculated with the raw data observed at the means. In column 3, we provide the rates one would have observed if the age composition of teenagers had remained at their 1981 levels. In 1986, for example, the rate would have been higher (51.9) than observed (50.2) or predicted (50.5). In columns 4 and 5, we calculated the rates that would have been observed if the racial and ethnic composition of the population had remained at their 1981 levels. In column 6, we combine all of these demographic changes at once. In the next column, we compare these rates with those calculated at the means. This column clearly shows that in most years, the birth rates would have been lower if the

[9] We estimated the joint significance of the linear and quadratic terms due to the high collinearity of these two measures.

demographic changes had not taken place. In columns 7, we report the rates if the state unemployment rate had remained at its 1980 level. In the following column, we show the difference one would observe if unemployment rates had remained at their 1980 levels. This column shows some small differences, sometimes larger and sometimes smaller, than observed in the data. In column 8, we report rates if the welfare benefits had remained at its 1980 levels, and in column 9, we report the rates one would have observed if CSE expenditures had remained at their 1980 levels. In column 10, we report the rates one would have observed if both of these social policy measures had remained at their 1980 levels. In the next column we report the difference between the rates in column 10 and in column 2, which clearly show that rates were lower than they would have been if there had been no changes in social policy benefits. In the penultimate column, we show predicted rates if all of the factors had remained at their 1981 levels. The final column shows the difference between what was observed with changes over time and what would have been observed if there had been no changes. This last column shows that some years would have been higher while others would have been lower, and that overall the two factors appear to have counteracted one another.

[Table 3 about here]

We translate these predicted rates into visuals in Figures 9-11. Figure 9 clearly shows that rates would have been much lower, particularly in the 1990s if the demographic factors had remained at their 1981 levels. Also evident in this figure is the importance of the change in the Hispanic population. In fact, it is this demographic change that most impacted the rates. For instance, in 1999, teen birth rates would have been 4.9 percentage points lower had the Hispanic population remained at its 1981 level. In Figure 10, we show similar hypothetical birth rates controlling the state unemployment rate. This figure illustrates that, although it certainly matters, changes in the state unemployment rate (at least a change from 1981) does not produce much of a change in teen birth rates. In Figure 11, we show the trend one would have observed if social policy benefits had remained at their 1981 levels. In this diagram, both the changes in welfare

benefits and the change in the CSE expenditures are important.[10] Finally, in Figure 12, we combine show the trend line when controlling only demographic factors (Pred_DEM), only economic factors (Pred_ECON) and all factors at once (Pred_ALL). It is this diagram that shows how the demographic changes and the social policy changes appear to have counteracted one another over this period.

[Figures 9 – 12 here]

In Table 4, we translate these rates into actual birth numbers. In the first column of Table 4 we report the observed number of teenage births reported by Ventura et al. (2001). In the second column of Table 4, we calculate the number of births one would have observed if the demographic characteristics had remained at their 1981 levels. This table shows that teens would have had 340,092 fewer births if the demographic factors had not changed. In the third column, we predict the number of births had the economic factors remained at their 1980 levels. These results suggest that teens would have had 54,159 fewer births under this scenario. In column 4, we show the numbers of births one would have observed if the social policy measures had remained stationary throughout the nineteen year interval at the 1981 values: teens would have had an extra 483,664 births. The last two columns show the difference if all of the factors are held constant at the same time. The last column reports that teens would have had 89,413 more births than observed if all of the measures had remained at their 1981 levels.

[Table 4 here]

ABORTION

Until now, this paper has been silent on abortion. Obviously, changes in abortion policy would affect the cost of a teen birth. During the 1980s several states stopped funding abortions through Medicaid and started to require parental consent for an abortion (Klerman 1998). Lundberg and Plotnick (1995) find that, at least for white teenagers, the relative ease with which one can attain an abortion increases the likelihood that a pregnant teen will choose that option. Thus, the

[10] We have emphasized the CSE findings since both policy changes seem to produce the same trend, but the CSE coefficient was statistically significant while the welfare benefit coefficient was not.

tightening of abortion policy may have led to the decline in abortion rates observed during the period and the subsequent rise in teenage birth rates.

To test this explanation, we report coefficient estimates from a model controlling for the same demographic, economic, and policy factors as used in Model 2 in Table 2 as well as state policy variables for the enactment of a parental consent or parental notification law as well as the implementation of a mandatory delay law. Results from this model (see Table 5) suggest that neither variable appears to be related to teen birth rates, which is consistent with Levine (2002).

[Table 5 about here]

This result should not be too surprising. If one takes a historical perspective, teen birth rates and changes in the cost of abortion do not appear to coincide. Immediately following Roe v. Wade, the teen birth rates began to stabilize after nearly 20 years of decline. If the costs of abortion are negatively related to birth rates, the rates should have dropped more precipitously after this decision, not become stable. Obviously, this is not a comprehensive analysis of changes in abortion, but this simple analysis and description of rates suggests that changes in the abortion policy environment that occurred during the period of investigation probably did not influence the teen birth rates.

CONCLUSIONS/DISCUSSION

The period from 1981 to 1999 was quite unusual in terms of teenage fertility. After a decade of relatively flat teen birth rates from the mid 1970s to the mid 1980s, rates began to escalate. Around 1991, birth rates again changed course and have been falling ever since. This paper looks at the extent to which changes in demographic composition, the strength of the economy, and social policy can account for this unusual trend. We begin by using weighted least squares models to estimate the relationships between teen birth rates and these factors. Next, in an attempt to determine if these factors have changed enough over this time period to produce these

trends, we created hypothetical trends in teenage birth rates comparing the observed rate to that which would have been observed had the various covariates remained at their 1981 levels.

Several findings from this study are noteworthy. First, demographic changes and social policy changes appear to have largely counteracted one another. In particular, Child Support Enforcement expenditures were pushing teen birth rates down, while growth in the Hispanic population was forcing rates up. If all of the demographic factors we consider had remained at their 1981 levels, teens would have had about 340,000 fewer births. At the same time, if our measures of social policy had remained at their 1980 levels, teens would have had about 484,000 more births. Second, contrary to the speculation of many researchers, our results suggest that the economy did not reduce rates during the 1990s, and if anything, increased them. Further, even if the unemployment rates had been positively associated with teen birth rates, the variation in state unemployment rates is not large enough to explain the dramatic changes. Finally and perhaps most important, despite the variety of controls we used, we were unable to explain much of the trend leaving the topic open for investigations using other data sources, methods, and potential explanations.

Although beyond the scope of this paper, in the future researchers may want to consider other factors including the influence of the AIDS epidemic. Since AIDS should have exerted downward pressure on the trend, it cannot explain the increase in the late 1980s. But as AIDS became increasingly prevalent, it may have reached a critical point in the early 1990s, triggering the downturn. Manlove et al. (2000) find evidence that AIDS education was important to the downward trend in the 1990s. The sudden decline in the onset of sexual activity among teenagers during the 1990s (Ku et al. 1998; Sawhill 2001; Singh and Darroch 1999) and the rise in contraceptive use during the 1980s and 1990s (Manlove et al. 2000; Piccinino and Mosher 1998; Sawhill 2001) are consistent with this evidence as well.

APPENDIX

Data Appendix for State Sample

Age-specific teen birth rate: total number of births to teenage mothers of a given age/total population of females of the same age in the state; We generate a teen birth rate for fifteen-, sixteen-, seventeen-, eighteen-, and nineteen year-olds separately; Source: Birth numbers were extracted from the National Center for Health Statistics Natality Data Series CD-ROMs. Population of teenagers was downloaded from the U.S. Census Bureau Web page. 1990 numbers are located at the following URL: http://eire.census.gov/popest/archives/state/st-99-10.php. 1980 numbers are located at the following URL: http://eire.census.gov/popest/archives/state/st_stiag.php

Age: a set of indicator variables from age 16 to age 19 (15 is omitted) equal to one for the observations with the comparable age-specific teen birth rate, e. g., Age 16 equals one for age 16 teen birth rates, zero for fifteen-, seventeen-, eighteen-, and nineteen-year-old birth rates.

Percentage of All Teenagers that is African American: total number of African American females aged 15 to 19/total number of females aged 15 to 19 (x 100); Source for numerator in the 1980s: U.S. Census Bureau Web Page located at URL: http://eire.census.gov/popest/archives/state/st_81asrh.php; Source for the numerator in the 1990s: http://eire.census.gov/popest/archives/state/st_sasrh.php; Source for the denominator: see teen birth rate variable

Percentage of Population 35 and Under that is Hispanic: proportion of state population under age 36 that reports their ethnicity as Mexican American, Chicano, Mexican, Mexicano, Puerto Rican, Cuban, Central/South American, or Other Spanish (x 100); Source: authors' calculations using the March CPS.

State Unemployment Rate: Source: U.S. Bureau of the Census' *Statistical Abstract of the United States* (various years).

Welfare Benefits: Maximum AFDC/TANF amount per month for a family of four, inflated to 1999 dollars; Source: Robert Moffitt's publicly available data: http://www.econ.jhu.edu/People/Moffitt/DataSets.html.

Total State CSE Expenditures: the total amount of expenditures eligible for federal funding that is claimed by the states during the year for the administration of the child support program. (includes all amounts claimed during the current or a previous fiscal year. The amounts being reported have been reduced by the amount of program income – fees and costs recovered in excess of fees and interest earned and other program income received—by the states). Source: Bendheim-Thoman Center for Research on Child Wellbeing/Columbia University School of Social Work Data Base of State Information

Parental Notification/Consent Laws: an indicator variable equal to one in the years a woman, 18 or younger, was required either to notify or obtain parental consent before obtaining an abortion; Source: Phillip Levine.

Mandatory Delay: an indicator variable equal to one in the years a state required a mandatory waiting period before allowed to obtain an abortion; Source: Phillip Levine.
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Table 1. Weighted Descriptive Statistics of the State Sample

Variable	Full Sample	1981	1985	1990	1995	1999
Age 15 Teen Birth Rate (per 1,000 Females Aged 15)	15.15 (5.36)	14.02 (5.55)	13.63 (4.95)	17.05 (5.43)	16.62 (5.43)	12.32 (4.37)
Age 16 Teen Birth Rate (per 1,000 Females Aged 16)	32.31 (9.92)	30.39 (10.22)	29.74 (8.98)	36.31 (9.46)	35.20 (10.03)	27.08 (8.41)
Age 17 Teen Birth Rate (per 1,000 Females Aged 17)	52.70 (14.27)	50.05 (14.25)	50.25 (13.74)	58.63 (14.30)	56.83 (14.36)	45.89 (12.33)
Age 18 Teen Birth Rate (per 1,000 Females Aged 18)	75.68 (18.51)	71.16 (17.92)	71.66 (17.97)	82.58 (17.96)	80.35 (18.51)	71.04 (16.58)
Age 19 Teen Birth Rate (per 1,000 Females Aged 19)	91.20 (20.62)	88.04 (20.27)	86.95 (20.51)	96.25 (20.67)	96.31 (20.27)	88.93 (19.65)
Teen Birth Rate (per 1,000 Females Aged 15-19)	54.17 (13.45)	52.17 (13.53)	50.96 (12.74)	60.31 (13.19)	56.52 (13.44)	49.60 (12.34)
Mean Age of Females Aged 15-19	17.04 (0.054)	17.08 (0.022)	17.03 (0.033)	17.11 (0.049)	16.97 (0.021)	17.03 (0.036)
Percentage of Teenagers that is African American	14.77 (10.03)	14.38 (9.92)	14.51 (9.86)	14.91 (10.02)	15.06 (10.46)	14.81 (10.36)
Percentage of Population Aged 35 and Younger that is Hispanic	10.49 (12.01)	7.32 (8.72)	8.49 (9.75)	10.06 (11.49)	12.79 (14.47)	14.60 (14.66)
State Unemployment Rate	6.52 (2.14)	7.66 (1.78)	7.26 (1.67)	5.53 (0.85)	5.55 (1.29)	4.24 (0.853)
Welfare Benefits (in 1999 $)	583.28 (238.49)	678.60 (266.63)	638.97 (248.53)	599.22 (249.99)	503.89 (142.05)	468.27* (169.87)
Total State CSE Expenditures (in 1000s of 1999 $)	90031.5 (98064.5)	46454.9 (55537.1)	58017.5 (64058.9)	86763.4 (75791.5)	132221.2 (118431.6)	155741.0 (147811.4)
N [unless noted otherwise]	969	51	51	51	51	51

Notes: * 1998 data. All descriptive statistics are weighted by the state population of females aged 15 to 19. Welfare benefits and total state CSE expenditures are missing for 1999.

Table 2. Weighted Least Squares Models of Teenage Births Rates from 1981to 1999

	Baseline Model	Model 2
Independent Variables	Coefficient (Standard Error)	Coefficient (Standard Error)
1981	3.789***	4.525*
	(0.646)	(2.686)
1982	3.912***	5.294**
	(0.640)	(2.510)
1983	3.021***	6.240**
	(0.574)	(2.548)
1984	2.001***	5.219**
	(0.461)	(2.290)
1985	2.301***	4.948**
	(0.441)	(2.082)
1986	1.393***	3.992**
	(0.459)	(1.990)
1987	1.680***	3.483*
	(0.559)	(1.873)
1988	3.964***	4.374***
	(0.694)	(1.619)
1989	8.165***	7.340***
	(0.927)	(1.494)
1990	11.071***	10.381***
	(1.278)	(1.498)
1991	12.597***	13.107***
	(1.385)	(1.568)
1992	11.098***	13.459***
	(1.435)	(1.614)
1993	9.909***	13.258***
	(1.447)	(1.776)
1994	9.183***	11.497***
	(1.363)	(1.380)
1995	7.044***	9.259***
	(1.228)	(1.149)
1996	4.573***	6.308***
	(0.855)	(0.927)
1997	2.401***	3.847***
	(0.516)	(0.714)
1998	1.483***	2.381***
	(0.205)	(0.334)
Age 16		17.277***
		(0.871)
Age 17		37.710***
		(1.719)
Age 18		60.734***
		(2.580)

Independent Variables	Baseline Model Coefficient (Standard Error)	Model 2 Coefficient (Standard Error)
Age 19		76.224***
		(3.112)
Proportion of Teenagers in State that is African American		1.296*[a]
		(0.848)
(Proportion of Teenagers in State that is African American)^2		-0.019***[a]
		(0.008)
Proportion of Population 35 and Younger that is Hispanic		0.911***[a]
		(0.253)
(Proportion of Population 35 and Younger that is Hispanic)^2		-0.003[a]
		(0.003)
State Unemployment Rate		-0.673***
		(0.175)
Welfare Benefits (ln)		6.762
		(4.154)
Total State CSE Expenditures (ln)		-1.634*
		(0.970)
Constant	49.090***	-22.270
	(0.619)	(24.968)
N	4845	4845

Notes: * $p < 0.05$; ** $p < 0.01$; [a] Linear and quadratic terms jointly significant at the 0.01 level; Model 2 includes state fixed effects. All observations are weighted by the population of teenage females in the state. Standard errors are corrected for intra-state correlations.

Table 3: Hypothetical Birth Rates using Model 2 Results

Year	Published Rate (1)	Predicted Rate at Means (2)	Predicted Rate at 1981 Age Comp. (3)	Predicted Rate at 1981 Ethnic Comp. (4)	Predicted Rate at 1981 Racial Comp. (5)	Predicted Rate 1981 Dem. Comp. (6)	Diff. Control. Dem. Factors (6)–(2)	Predicted Rate at 1981 Unemp. Rate (7)	Diff. Control. Econ. Factor (7)–(2)	Predicted Rate at 1981 Welfare Benefit Levels (8)	Predicted Rate at 1981 CSE Expend. Level (9)	Predicted Rate at 1981 Social Policy Levels (10)	Diff. Control. Social Policy (10) – (2)	Predicted Rate at 1981 Dem., Econ. , and Social Policy Levels (11)	Diff. Control. All Factors (11)–(2)
1981	52.2	52.6	52.6	52.6	52.6	52.6	0	52.6	0	52.6	52.6	52.6	0	52.6	0
1982	52.4	52.8	52.5	52.7	52.7	52.3	-0.5	53.2	0.5	53.3	53.0	53.5	0.7	53.4	0.6
1983	51.4	52.0	51.6	51.8	51.8	51.3	-0.7	53.8	1.8	52.8	52.3	53.2	1.2	54.3	2.3
1984	50.6	51.0	51.2	50.0	50.8	50.1	-0.9	52.7	1.7	52.0	51.5	52.5	1.5	53.3	2.3
1985	51.0	51.3	52.3	50.4	51.2	51.2	-0.1	51.6	0.3	52.3	51.8	52.8	1.5	53.0	1.7
1986	50.2	50.5	51.9	49.1	50.4	50.5	0	50.6	0.1	51.3	51.1	52.0	1.5	52.1	1.6
1987	50.6	50.8	51.8	49.2	50.6	50.0	-0.8	50.8	0	51.5	51.7	52.4	1.6	51.6	0.8
1988	53.0	53.1	53.0	51.3	52.9	51.1	-2.0	52.6	-0.5	54.0	54.2	55.1	2.0	52.4	-0.7
1989	57.3	57.3	56.5	55.3	57.1	54.3	-3.0	56.3	-1.0	58.3	58.5	59.5	2.2	55.4	-1.9
1990	59.9	60.3	59.7	58.1	59.9	57.1	-3.2	59.1	-1.2	61.4	61.7	62.8	2.5	58.5	-1.8
1991	62.1	61.8	62.0	59.4	61.4	59.3	-2.5	60.7	-1.1	63.2	63.4	64.7	2.9	61.2	-0.6
1992	60.7	60.3	61.4	57.7	59.9	58.5	-1.8	60.0	-0.3	61.9	62.0	63.6	3.3	61.5	1.2
1993	59.6	59.0	60.5	56.3	58.8	57.5	-1.5	59.2	0.2	60.9	60.9	62.7	3.7	61.3	2.3
1994	58.9	58.3	59.9	54.4	58.0	55.8	-2.5	58.1	-0.2	60.3	60.3	62.3	4.0	59.6	1.3
1995	56.8	56.1	58.1	51.9	55.8	53.7	-2.4	55.4	-0.7	58.4	58.3	60.5	4.4	57.3	1.2
1996	54.4	53.7	55.5	49.1	53.4	50.7	-3.0	52.6	-1.1	56.1	56.0	58.5	4.8	54.4	0.7
1997	52.3	51.5	53.3	46.6	51.3	48.1	-3.4	50.4	-1.1	54.1	53.9	56.5	5.0	51.9	0.4
1998	51.1	50.7	52.1	45.4	50.5	46.6	-4.1	49.2	-1.5	53.5	53.2	56.0	5.3	50.5	-0.2
1999	49.6	49.3	50.2	43.6	49.1	44.4	-4.9	47.5	-1.8	52.1	51.8	54.7	5.7	48.1	-1.2
Label in Figures	Pub_BR	Model_ BR	Pred_ Age	Pred_ Hisp	Pred_AA	Pred_ Dem		Pred_ Econ		Pred_ Wel	Pred_ CSE	Pred_ Policy		Pred_ ALL	

Table 4: Difference in Number of Births by Year Based on Hypothetical Trends

Year	No. of Teen Births Observed (1)	No. of Births Predicted Assuming 1981 Demographic Levels (2)	Difference (2) – (1)	No. of Births Predicted Assuming 1981 Economic Levels (3)	Difference (3) – (1)	No. of Births Predicted Assuming 1981 Social Policy Levels (4)	Difference (4) – (1)	No. of Births Predicted Assuming 1981 Demographic, Economic, and Social Policy Levels (5)	Difference (5) – (1)
1981	527,392	527,392	0	527,392	0	527,392	0	527,392	0
1982	513,758	508,709	-5,049	517,236	3,478	520,863	7,105	519,292	5,534
1983	489,286	482,770	-6,516	506,290	17,004	500,913	11,627	511,401	22,115
1984	469,582	461,099	-8,483	485,444	15,862	483,440	13,858	490,820	21,238
1985	467,485	466,477	-1,008	470,287	2,802	481,016	13,531	482,810	15,325
1986	461,905	461,855	-50	462,725	820	475,633	13,728	476,404	14,499
1987	462,312	454,777	-7,535	461,981	-331	477,036	14,724	469,170	6,858
1988	478,353	459,879	-18,474	473,306	-5,047	495,845	17,492	472,324	-6,029
1989	506,503	479,328	-27,175	497,454	-9,049	525,655	19,152	489,432	-17,071
1990	521,826	494,751	-27,075	511,406	-10,420	543,530	21,704	506,035	-15,791
1991	519,577	498,590	-20,987	510,572	-9,005	544,405	24,828	514,413	-5,164
1992	505,415	490,396	-15,019	503,172	-2,243	533,193	27,778	515,930	10,515
1993	501,093	488,092	-13,001	502,505	1,412	532,094	31,001	520,505	19,412
1994	505,488	483,575	-21,913	503,623	-1,865	540,364	34,876	516,587	11,099
1995	499,873	477,780	-22,093	493,699	-6,174	538,792	38,919	510,524	10,651
1996	491,577	463,866	-27,711	481,905	-9,672	535,370	43,793	497,987	6,410
1997	483,220	451,251	-31,969	472,360	-10,860	529,579	46,359	486,751	3,531
1998	484,895	446,011	-38,884	470,918	-13,977	535,570	50,675	482,709	-2,186
1999	476,050	428,900	-47,150	459,156	-16,894	528,561	52,511	464,517	-11,533
Total	9,365,590	9,025,498	-340,092	9,311,431	-54,159	9,849,254	483,664	9,455,003	89,413

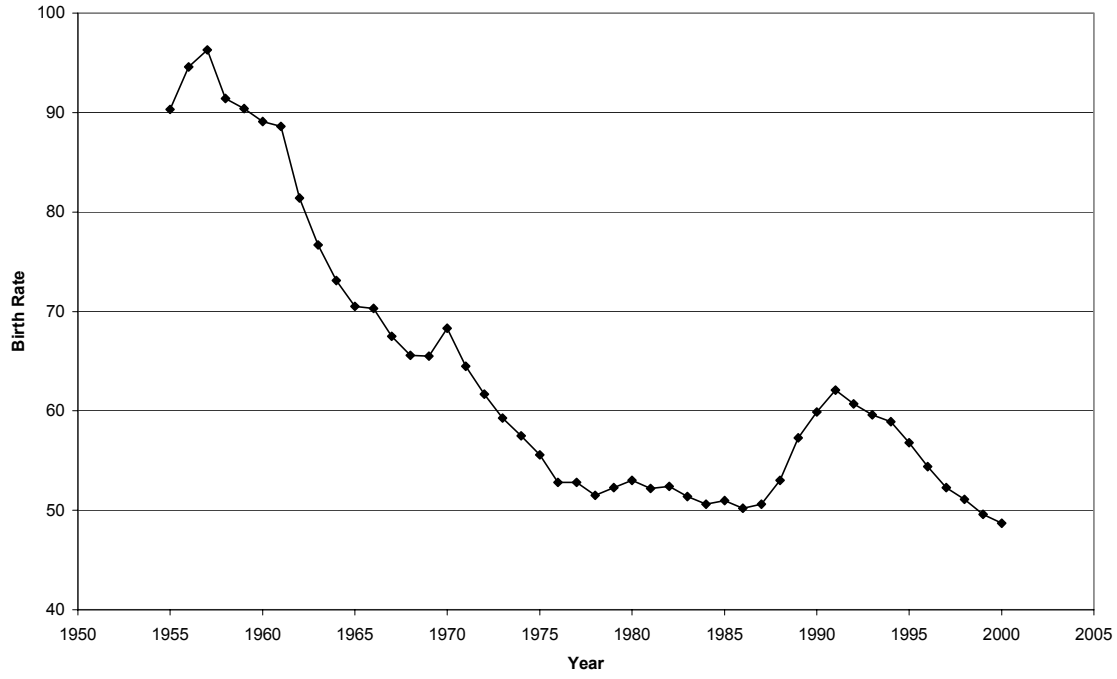
Table 5: Weighted Least Squares Model of Teenage Births Rates from 1981 to 1999 including Abortion Policy Variables

Independent Variables	Coefficient (Standard Error)
1981	4.772*
	(2.695)
1982	5.518**
	(2.547)
1983	6.435**
	(2.595)
1984	5.402**
	(2.348)
1985	5.138**
	(2.154)
1986	4.161**
	(2.011)
1987	3.649*
	(1.903)
1988	4.549***
	(1.685)
1989	7.522***
	(1.600)
1990	10.559***
	(1.681)
1991	13.265***
	(1.788)
1992	13.569***
	(1.810)
1993	13.345***
	(1.949)
1994	11.564***
	(1.526)
1995	9.294***
	(1.215)
1996	6.329***
	(0.967)
1997	3.859***
	(0.739)
1998	2.381***
	(0.336)
Age 16	17.277***
	(0.871)
Age 17	37.710***
	(1.719)
Age 18	60.734***
	(2.580)
Age 19	76.224***
	(3.112)
Proportion of Teenagers in State that is African American	1.293[a]
	(0.849)

Independent Variables	Coefficient (Standard Error)
(Proportion of Teenagers in State that is African American)^2	-0.020***[a] (0.007)
Proportion of Population 35 and Younger that is Hispanic	0.923***[a] (0.262)
(Proportion of Population 35 and Younger that is Hispanic)^2	-0.003[a] (0.003)
State Unemployment Rates	-0.659*** (0.171)
Welfare Benefits (ln)	6.788 (4.183)
Total State CSE Expenditures	-1.633* (0.971)
Parental Consent/Notification	0.389 (0.676)
Mandatory Delay Law	0.116 (1.015)
Constant	-22.917 (24.877)
N	4845

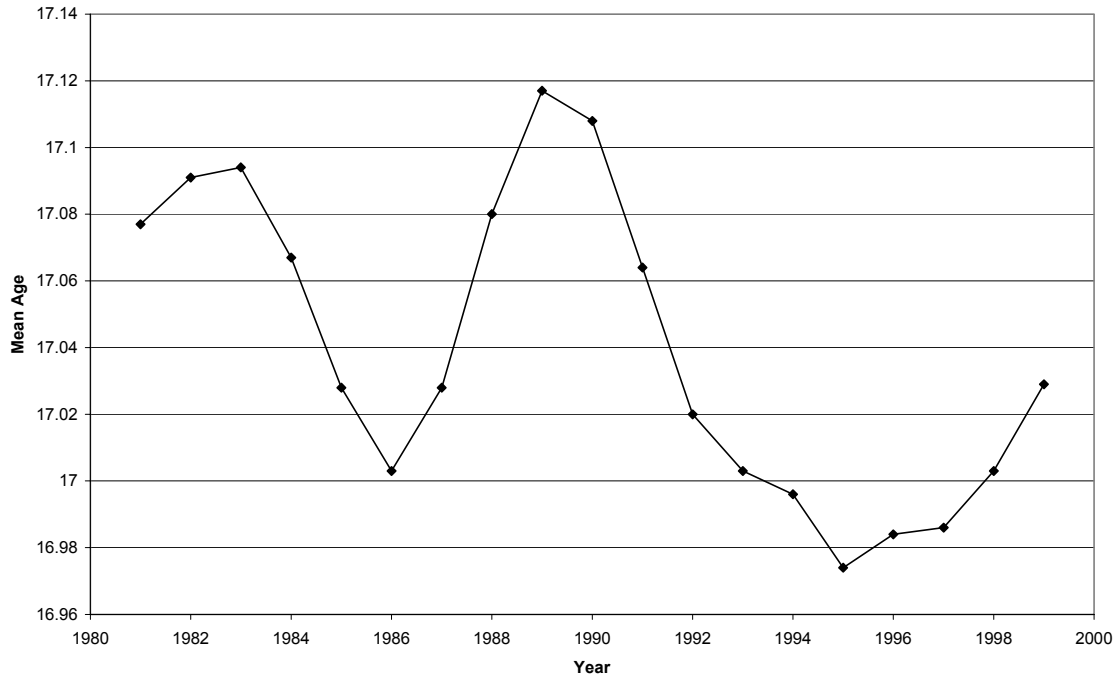
Notes: * $p < 0.05$; ** $p < 0.01$; [a] Linear and quadratic terms jointly significant at the 0.01 level; Model includes state fixed effects. All observations are weighted by the population of females in the state. Standard errors are corrected for intra-state correlations. Abortion policy laws have been lagged one year

Figure 1: Teenage Birth Rates per 1,000 Females Aged 15-19



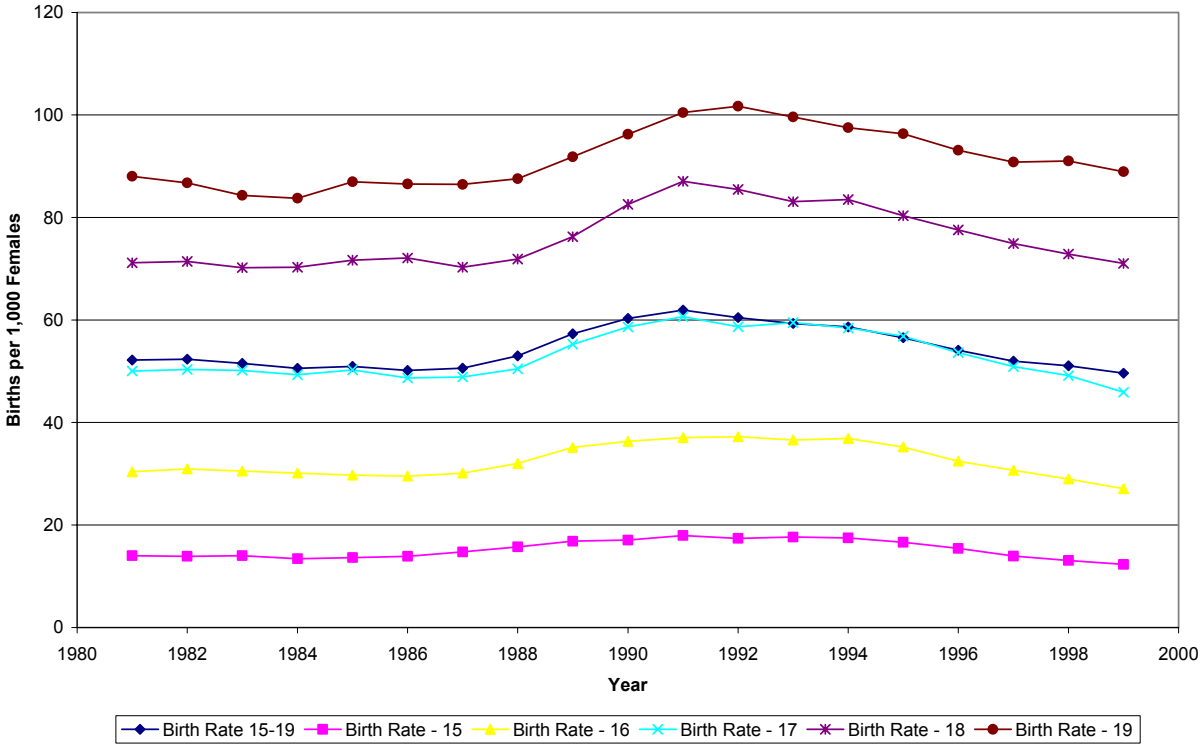
Source: Ventura et al. (2001); Table 1, p. 10.

Figure 2: Mean Age of Females Aged 15-19



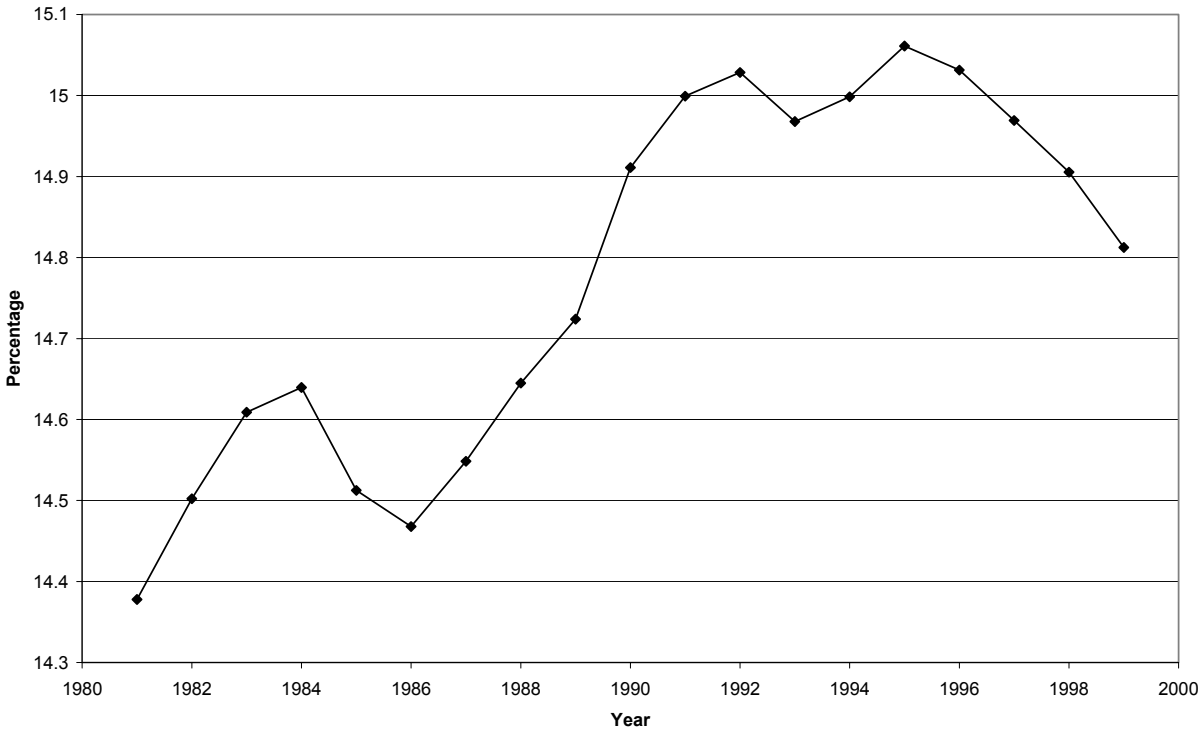
Source: Authors' calculations using Census Bureau Population Estimates

Figure 3: Age-Specific Trends in Teenage Birth Rates



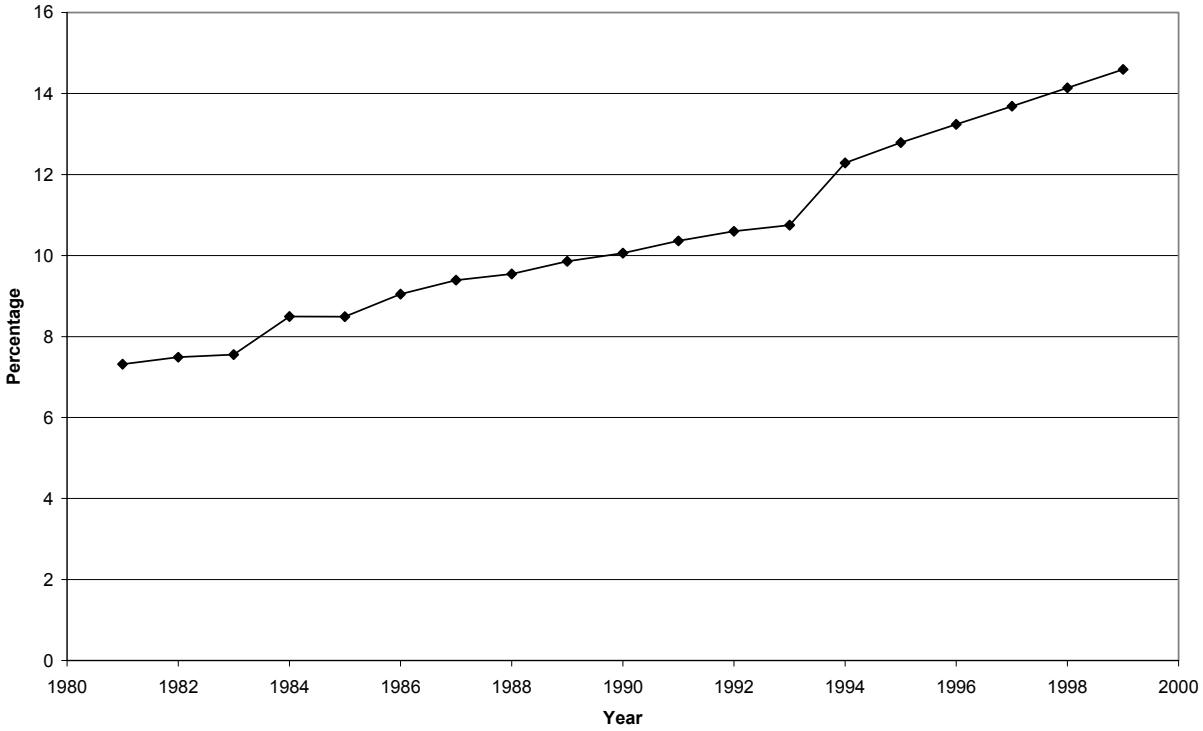
Source: Authors' calculations using NCHS and Census Bureau data.

Figure 4: Average Percentage of Teens that is African American



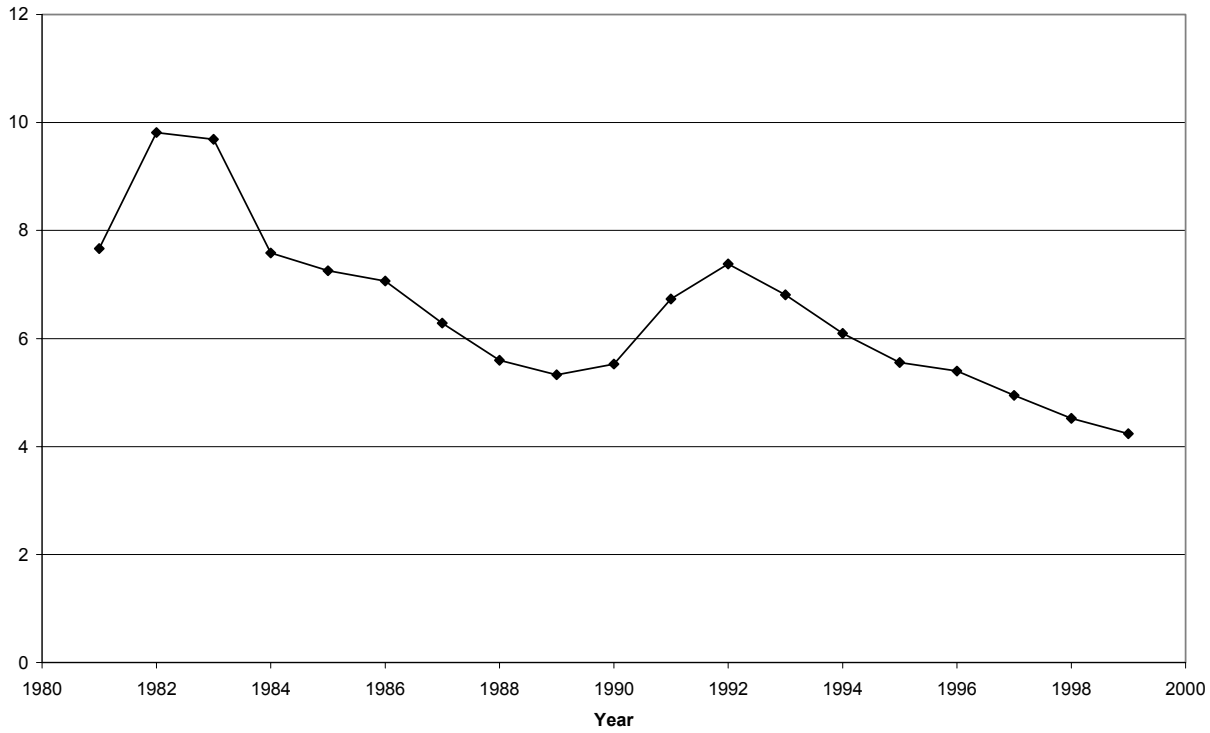
Source: Authors' calculations using Census Bureau data.

Figure 5: Average Percentage of Population 35 and Younger Reporting Hispanic Ethnicity



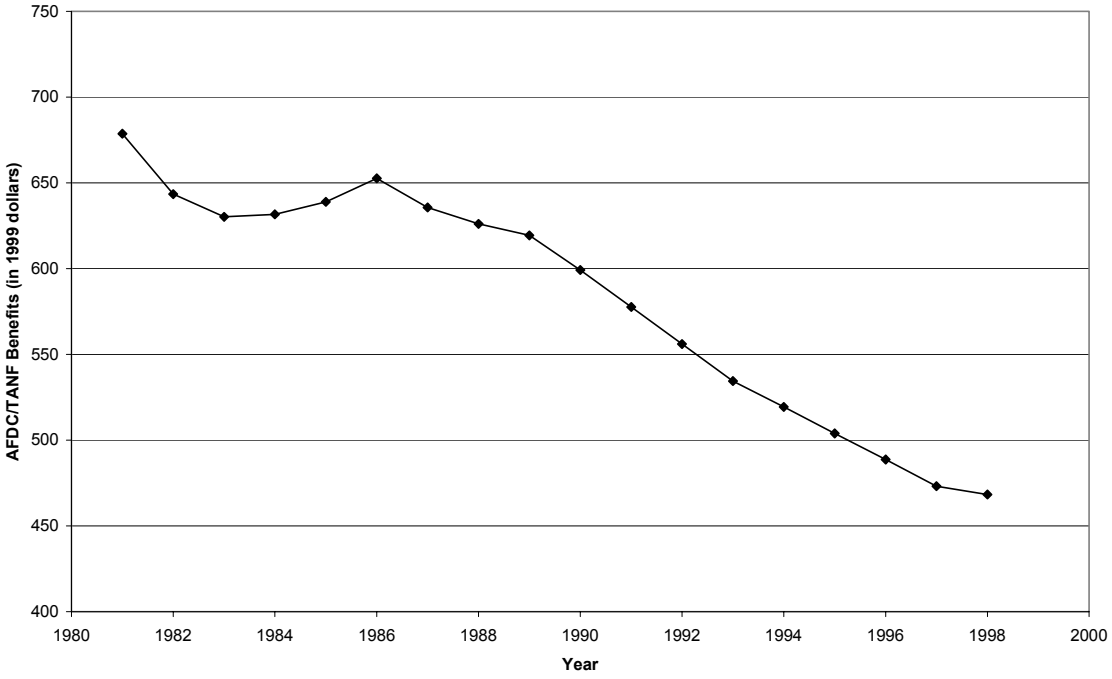
Source: Authors' calculations using the March CPS

Figure 6: Average State Unemployment Rates



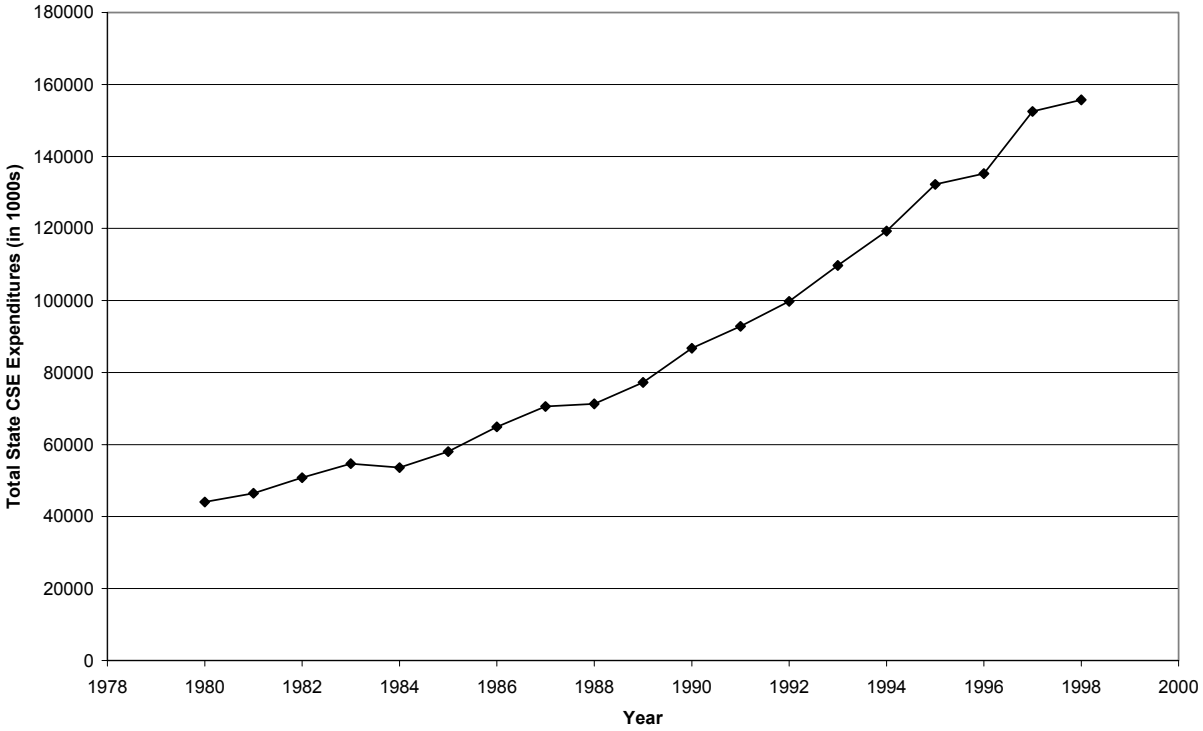
Source: Statistical Abstract of the United States (U.S. Bureau of the Census, various years)

Figure 7: National Average of AFDC/TANF Benefits for a Family of Four



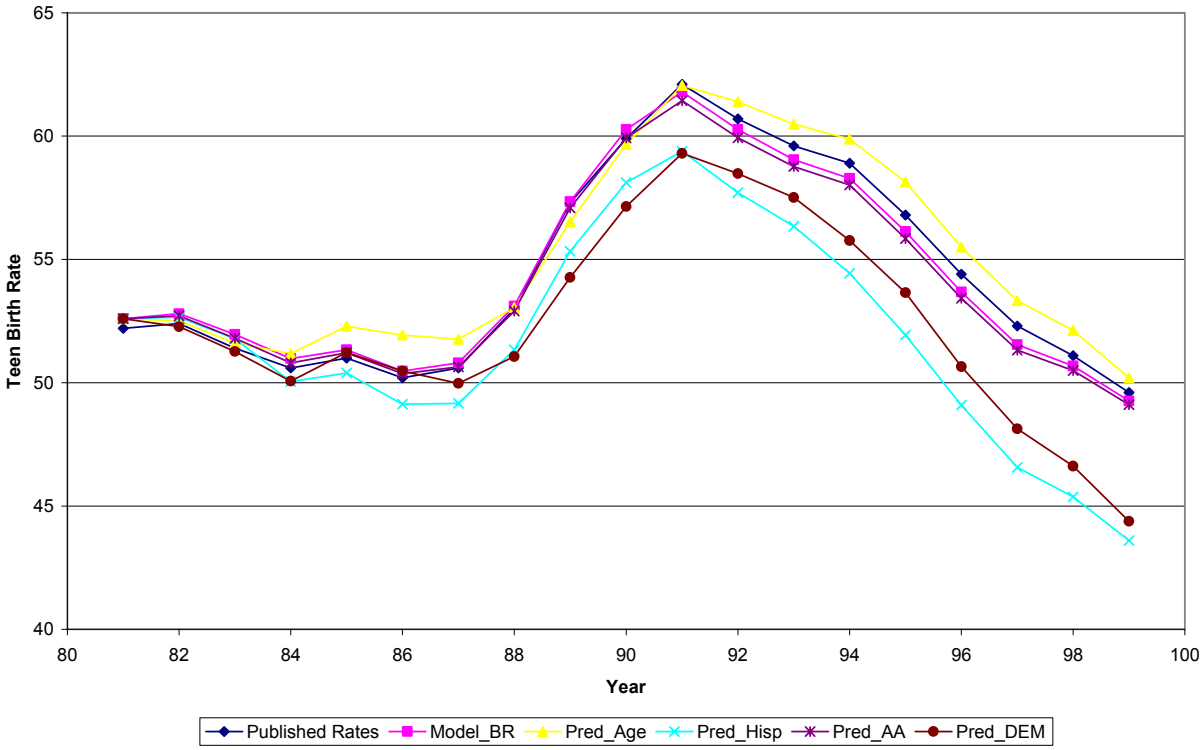
Source: Author's calculations using Robert Moffitt's publicly available welfare data.

Figure 8: Average Total State CSE Expenditures



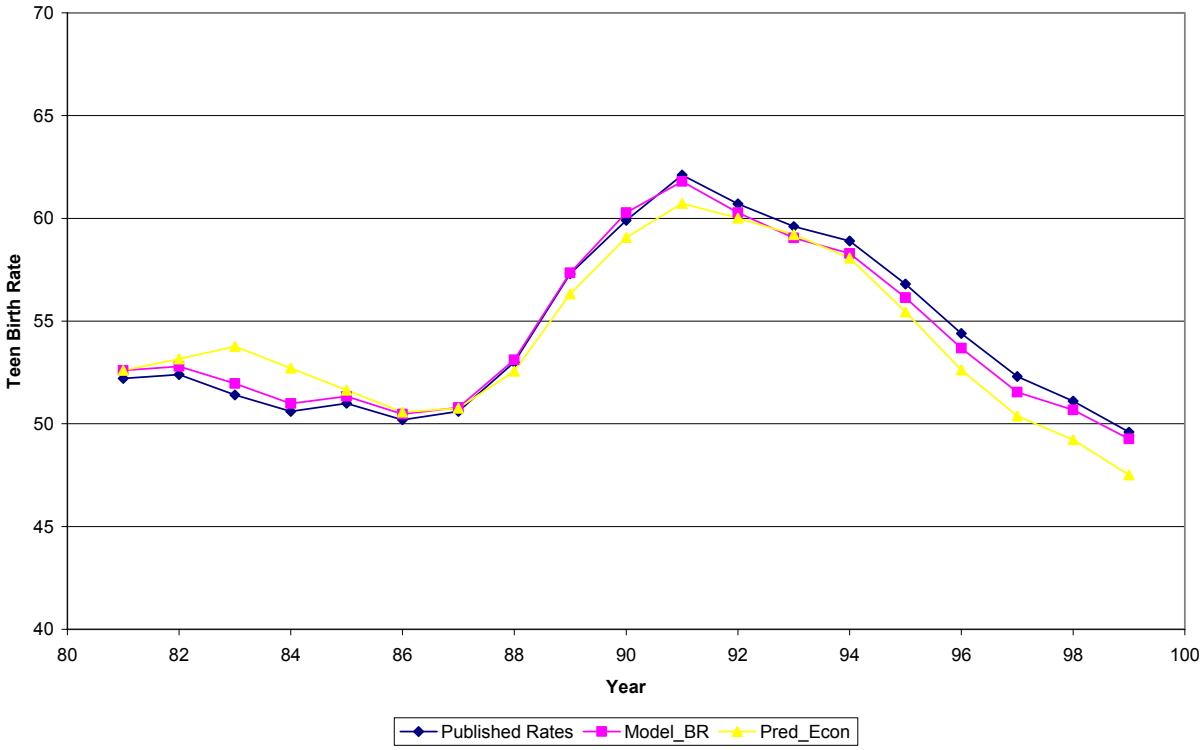
Source: Bendheim Thoman Center for Child Wellbeing/Columbia University School of Social Work State Data Base of State Information.

Figure 9: Hypothetical Birth Rates Controlling Demographic Factors at Their 1981 Values



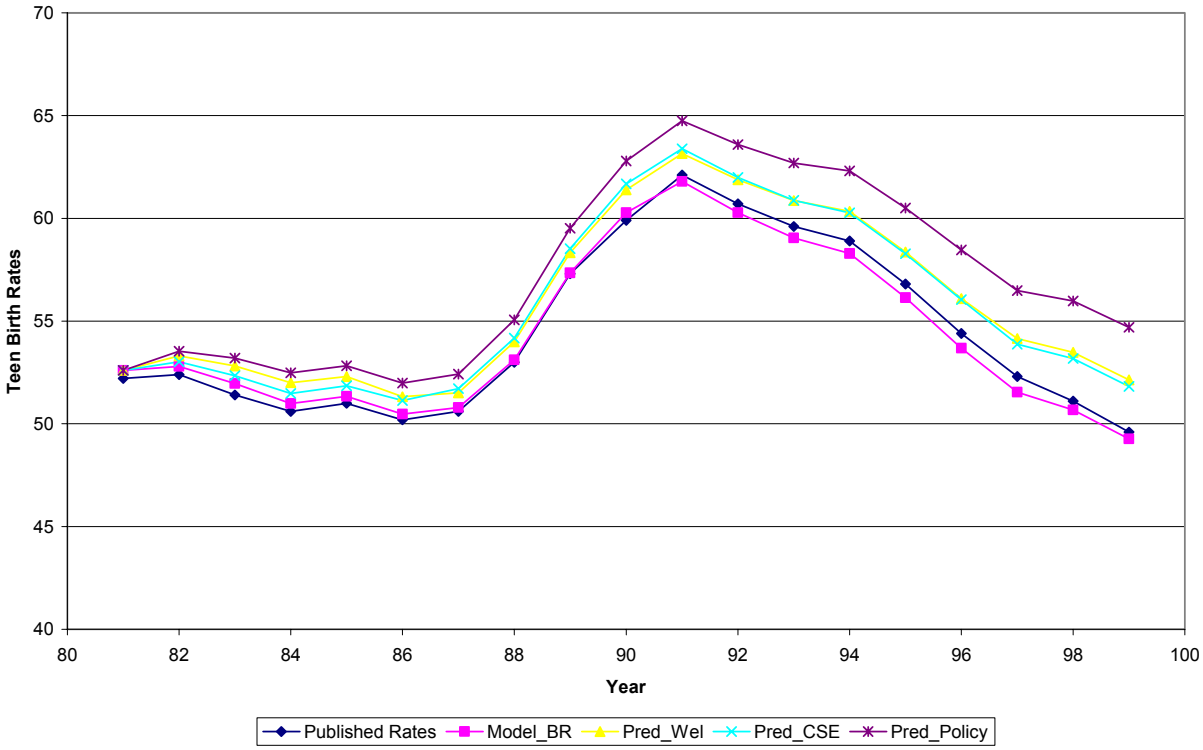
Source: Authors' calculations using the state panel.

Figure 10: Hypothetical Birth Rates Controlling Economic Factors at Their 1981 Values



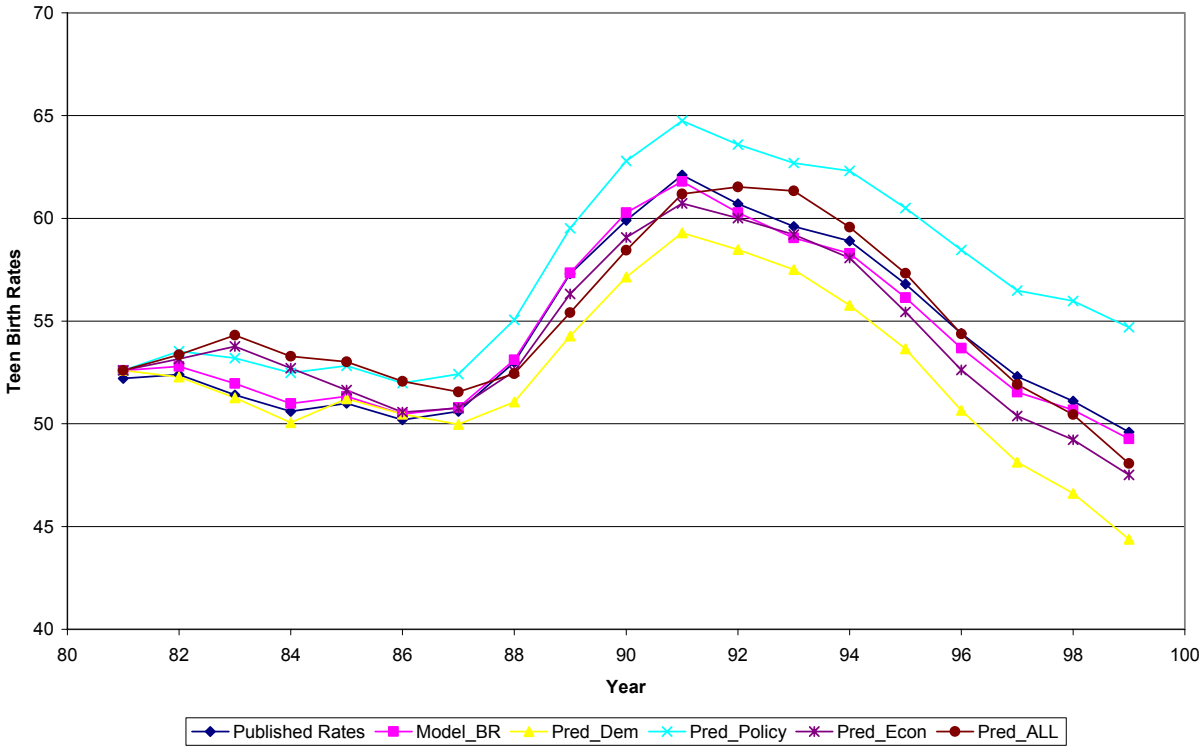
Source: Authors' calculations using the state panel.

Figure 11: Hypothetical Teen Birth Rates Controlling Social Policies at Their 1981 Levels



Source: Authors' calculations using the state panel.

Figure 12: Hypothetical Birth Rates



Source: Authors' calculations using the state panel.