THE CYCLE OF POVERTY: NEW INSIGHTS TO AN OLD PROBLEM

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ABSTRACT

The purpose of this paper is to empirically test the teen pregnancy-economic growth nexus for the United States in the 1990's. Fixed effects panel data estimation indicates a significantly negative relationship between pregnancy rates and income growth. The second part of this paper examines the determinants of teenage pregnancy itself. Although there are many factors that influence teenage pregnancy in America, this paper analyzes three main channels: economic, educational, and demographic. Education and economic channels have the most significant impact on teenage pregnancy rates.

INTRODUCTION

Despite national goals and strong economic growth in the 1990's, teenage pregnancy rates, defined as the sum of live births and legal induced abortions per 1000 women aged 15-19, in the United States remain high. In fact, the U.S. rate of teenage pregnancy and childbearing is more similar to developing rather than modern economies (Akerlof, Yellen, and Katz, 1996). The personal and societal impact of teenage pregnancy is substantial. Several studies have documented that young women who have children or become pregnant experience lower levels of employment (Becker, 1981; Byrne, Myers, and King, 1991), education (Moore and Waite, 1977; Coverdill and Kraft, 1996), health (U.S. Department of Health and Human Services, 2000), and income (Levy and Murnane, 1992). In an effort to reduce the teenage pregnancy rate, federal and state governments have employed vast resources on reproductive, poverty, and welfare programs (Blank, 1995; Kirby, 1999, 2001).

There is little doubt that teenage pregnancy has a negative relationship on the welfare of the adolescent, but are there measurable welfare effects to the public as a whole? The purpose of this article is to estimate the effect of teenage pregnancy on national and regional income growth rates. Using annual data from 1992-1998 for forty-three states, the cycle of poverty hypothesis is tested and confirmed; high teenage pregnancy rates are associated with lower per capita income growth.

The second part of this paper is investigative and focuses on several of the potential determinants of teenage pregnancy rates, see for example Altman-Palm and Tremblay (1998) and Levine (2000). As expected, economic, educational, and demographic variables all impact the rate of pregnancy to some extent. Public policy issues are also found to be important; state funding on high school student support programs, efforts to reduce unemployment and income inequality, and the promotion of female participation in athletics is found to significantly dampen national and regional teenage pregnancy rates. The findings of this article are intended to provide insight into what policy actions can be used to reduce the cycle of poverty.

PER CAPITA GDP GROWTH REGRESSION

The regression equation in this article is an extension of Mankiw, Romer and Weil's (1992) augmented Solow model that allows for conditional convergence. Specifically, the equation of interest is in per capita terms, shown below as:

$$\begin{aligned} GPCY_{it} = a_0 + a_1(PCY_{t-1,it}) + a_2(GLABOR_{it}) + a_3(HUMAN_{it}) \\ + a_4(PREG\ RATES_{it}) + u_{it} \end{aligned} \tag{1}$$

where $GPCY_{it}$ is the growth of real gross state product per capita for state i in time t, $PCY_{t-1,\ it}$, the conditional convergence term, is state i's previous period real income level, $GLABOR_{it}$ is the growth of state i's labor force for time t, $HUMAN_{it}$, a proxy for human capital, is the level of secondary attainment for state i, measured as a percentage of population of the corresponding age group, and PREG RATES is the growth of teenage pregnancy rates for state i in time t, and u_{it} is the error term.

Annual data for forty-three states were collected from 1992-1998 to test the cycle of poverty hypothesis. State selection was tempered by the fact that several states do not yet report teenage pregnancy in Center for Disease Control (CDC) format. The CDC requires information on both live births and legal induced abortions for women aged 15-19. As a result, Alaska, California, Delaware, Florida, Iowa, New Hampshire, and Oklahoma were not included in the study.

Panel data methodology in this study follows the pooling technique described by Kmenta (1986). Estimation procedures allow for heteroskedasticity over cross-sections (i.e. allows for the error terms for each cross section to differ as one might expect from very large to smaller states) and timewise autocorrelation over time within cross-sections. This approach allows for state-specific differences through dummy variables (D), as it is implicitly assumed that the coefficient estimates for the included variables are identical across all states. Equation (2) becomes the model of interest:

$$\begin{aligned} GPCY_{it} = a_0 + \sum_{j=2}^{43} \gamma_j D_{jt} + a_1(PCY_{t-1,it}) + a_2(GLABOR_{it}) \\ + a_3(HUMAN_{it}) \quad + a_4(PREG\ RATES_{it}) + u_{it} \end{aligned} \tag{2}$$

The national results from equation (2) are presented in the second row of Table 1 below. Notice that the results are as theoretically expected. Conditional convergence is found for the forty-three states, meaning that low-income states (i.e. Mississippi and West Virginia) experience faster income growth than high-income states (i.e. Connecticut and Massachusetts). Labor growth and human capital are positive and significantly associated with income growth. And as expected, the coefficient on teenage pregnancy rates is negative and significant at the 95 percent level for the forty-three states tested.

Next, states are grouped into their respective region: the Northeast, South, Midwest, and West. This paper uses the regional methodology of the U.S. Department of State and the Bureau of Labor Statistics (see, http://www.bls.gov/eag/ for more details). There are substantial regional differences in teenage pregnancy rates. According to the U.S. Department of Health and Human Services (2000), the South has the highest teenage pregnancy rates in the country, averaging 98 live births and legal induced abortions per 1,000 women aged 15-19. The Midwest has the lowest with 74 per 1,000.

Table 1
The Growth Of Per Capita Income

	A_0	Pcy_{t-1}	Glabor	Human	Preg Rates	Buse R^2
National	-0.198	-0.00003	0.028	0.351	-0.001	0.633
	(-1.82)*	(-3.43)**	(2.92)**	(3.51)**	(-5.13)**	
South[1]	-0.231	-0.00001	0.056	0.537	-0.001	0.599
	(-1.50)	(-4.62)**	(3.54)**	(2.91)**	(-3.52)**	
Northeast[2]	-0.499	-0.00001	0.034	0.107	0.0001	0.874
	(-3.67)**	(-6.18)**	(2.00)**	(0.77)	(0.33)	
Midwest[3]	0.651	-0.00001	0.077	0.861	-0.001	0.634
	(1.97)*	(-2.69)**	(3.18)**	(2.27)**	(-2.12)**	
West[4]	-0.269	-0.00001	0.121	0.246	-0.001	0.704
	(-0.79)	(-2.14)**	(2.65)**	(1.76)*	(-1.05)	

Notes: Figures in parentheses are *t*-statistics. **Significant at the 95% level. *Significant at 90% level. The joint hypothesis of the cross-section units having a common intercept is rejected for all cases.
[1] Southern states include: Alabama, Arkansas, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, South Carolina, Tennessee, Texas, Virginia, and West Virginia.
[2] Northeastern states include: Connecticut, Maine, Massachusetts, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont.
[3] Midwestern states include: Illinois, Indiana, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin.
[4] Western states include: Arizona, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming.

Table 1 presents the regional results from equation (2). The coefficient for the PREG RATES is negative for all regions except the Northeast, and is significant for the South and Midwest. One explanation of why teenage pregnancy rates are significant in the South and the Midwest and not elsewhere is that these two regions have seen the greatest changes (downward trend from 1992-1998) in teenage pregnancy rates among the four geographic regions (Center for Disease Control and Prevention, 1999). The lack of variable fluctuation in the Northeast and West may have dampened the coefficient's significance. In general, the regional findings serve to reinforce national estimates.

FACTORS INFLUENCING TEENAGE PREGNANCY RATES

The previous empirical results indicate that pregnancy rates reduce overall economic performance, but what about the reverse association, do low income levels, *Ceteris paribus*, cause teenage pregnancy to increase? The following regression model is used to test this hypothesis

$$\text{PREG RATES}_{it} = a_0 + \sum_{j=2}^{43} \gamma_j D_{jt} + a_1(\text{PCY}_{it}) + a_2(\text{SCHOOL}_{it}) + a_3(\text{UNEMP}_{it}) + a_4(\text{MIN}_{it}) + a_5(\text{STATE}_{it}) + a_6(\text{GINI}_{it}) + u_{it} \quad (3)$$

where PCY_{it} is state i's level of per capita income in time t, $SCHOOL_{it}$ is equal to the percentage of the population aged 10-18 enrolled in secondary education for state i in period t, $UNEMP_{it}$ is state i's unemployment rate during time t, MIN_{it} is the fraction of state i's population that is classified as minority in time t (i.e. all other than white non-Hispanic), $STATE_{it}$ is state i's funding per pupil on school support programs at the high school level for time t, and $GINI_{it}$ is the calculated Gini coefficient for state i in time t.

Although there are many determinants of teenage pregnancy, equation (3) captures three main channels of influence: the economic channel, the educational channel, and the demographic channel. The economic channel is primarily income related. It is hypothesized that higher per capita income levels, lower unemployment rates, and a smaller Gini index will reduce the prevalence of teenage pregnancy. The Gini index ranges from 0, when all families have equal shares of income, to 1, when one family has all the income and the rest have none. The educational channel involves high school enrollment rates and state appropriation on student support programs, both of which are theoretically expected to depress the pregnancy rate for teens. The STATE variable encompasses many additional school programs that are not related to health and reproductive issues, but it is an official measure of pupil support program funding, and some appropriations flow into youth reproductive programs. The last channel is demographic, which seeks to examine the relationship between minority status and teenage pregnancy rates.

Table 2
Teenage Pregnancy Rates

	A_0	Pcy	School	Unemp	Min	State	Gini	Buse R^2
National	169.13	-0.002	-0.014	60.128	18.606	-0.021	41.050	0.984
	(8.75)**	(-12.12)**	(-2.09)**	(2.81)**	(0.86)	(-2.74)**	(4.09)**	
South[1]	47.488	-0.004	-0.029	65.979	20.805	-0.021	43.686	0.991
	(1.24)	(-16.96)**	(-2.26)**	(2.46)**	(4.28)**	(-0.14)	(3.44)**	
Northeast[2]	144.97	-0.002	-0.025	25.941	13.093	-0.004	50.328	0.982
	(8.59)**	(-3.55)**	(-0.94)	(6.50)**	(1.26)	(-0.39)	(2.09)**	
Midwest[3]	183.36	-0.002	-0.102	79.900	5.039	-0.029	6.529	0.993
	(8.05)**	(-7.86)**	(-4.09)**	(2.05)**	(0.12)	(-2.79)**	(2.31)**	
West[4]	183.31	-0.001	-0.121	8.003	38.864	-0.058	54.155	0.989
	(8.29)**	(-1.82)*	(-4.54)**	(1.23)	(1.29)	(-2.03)**	(2.94)**	

Notes: Figures in parentheses are *t*-statistics. **Significant at the 95% level. *Significant at 90% level. The joint hypothesis of the cross-section units having a common intercept is rejected for all cases.
[1] Southern states include: Alabama, Arkansas, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, South Carolina, Tennessee, Texas, Virginia, and West Virginia.
[2] Northeastern states include: Connecticut, Maine, Massachusetts, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont.
[3] Midwestern states include: Illinois, Indiana, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin.
[4] Western states include: Arizona, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming.

Row two of Table 2 presents the results for the entire panel of forty-three states. The negative and highly significant PCY coefficient confirms that the cycle of poverty works in both directions. This relationship held true in the 1990's even as pregnancy rates fell during the long economic expansion (Center for Disease Control and Prevention, 1999). The large and significant coefficients on the unemployment rate and the Gini index indicate the importance of income potential and distribution on teenage pregnancy rates, respectively. School enrollment and state funding on pupil support programs negative and significantly reduce pregnancy at the 95% level. The fraction of state population that is classified as minority is not significant. One explanation of this result is that not all minorities have a higher pregnancy rate than white non-Hispanic. While CDC (1999) statistics confirm that Hispanic Americans, African Americans, and Native Americans all have higher teenage pregnancy averages than white non-Hispanic, it also shows that Asian and/or Pacific islanders have a much lower rates than their white non-Hispanic counterparts.

Table 2 also presents the results from dividing the states into their regional groupings. Again, the coefficients for the PCY variable are negative and significant for all regions. The other economic variables, UNEMP and GINI, continue to remain significant. When comparing the demographic base for the four regions, the South has the highest concentration of at-risk minorities. It is not surprising to see that MIN is significant at the 99 percent level for this region. The coefficients on high school enrollment and state funding are generally significant, suggesting that education and educational funding together are a powerful tool to combat teenage pregnancy.

THE ROLE OF FEMALE PARTICIPATION IN HIGH SCHOOL ATHLETICS

How important is participation in after school programs like athletics on the rate of teen pregnancy? Several surveys have attempted to answer this question, the most famous being Sabo, *et al.* (1998), but none have analyzed this issue with a complete national data set. Athletics serve as an additional support mechanism for young people, and it is expected that participation would have a corresponding negative influence on pregnancy rates. Using data from the National Federation of State High School Associations (NFHS), the number of female participants in high school sports (SPORT) is obtained for each state in the year 1998. This was the first year that the (NFHS) recorded comprehensive data. Adding this variable to equation (3) yields

$$\begin{aligned} \text{PREG RATES}_i = {} & a_0 + a_1(\text{PCY}_i) + a_2(\text{SCHOOL}_i) + a_3(\text{UNEMP}_i) \\ & + a_4(\text{MIN}_i) + a_5(\text{STATE}_i) + a_6(\text{GINI}_i) + a_7(\text{SPORT}) + u_i \end{aligned} \tag{4}$$

The cross-sectional results are suggestive and indicate that female participation in after school athletics significantly reduces pregnancy rates among high school aged females. See Table 3 below for complete results. It is interesting to

Table 3
The Impact Of Female Participation In Athletics

TEST	a_0	PCY	SCHOOL	UNEMP	MIN	STATE	GINI	SPORT	R^2
Cross	-23.107	-0.0001	-0.033	25.423	38.14	-0.044	17.096	-0.207	0.646
Section	(-0.65)	(-3.21)**	(-3.57)**	(1.33)	(2.39)**	(-2.60)**	(2.05)**	(-2.08)**	

Notes: Figures in parentheses are *t*-statistics. **Significant at the 95% level. *Significant at 90% level. n = 43. Durbin-Watson = 2.14.

note that with the addition of SPORT, the coefficient for UNEMP falls by about two-thirds and loses its significance level. This result suggests that after school activities, like sports, where youth interact with each other may be more important in reducing the rates of pregnancy among teens than simply holding a job. Further research on differentiating the impact of after school activities (like sports) and employment is needed.

CONCLUSION

The purpose of this article is to test the bi-directional cycle of poverty hypothesis stemming from teen teenage pregnancy. Using fixed effects panel data for forty-three states in the 1990's, support for a negative and significant relationship between teenage pregnancy rates and economic growth is found. The reverse association between income levels and the rate of pregnancy for teens is also empirically established.

The results of this paper indicate that economic conditions play a significant role in the continuance of the cycle of poverty. The combination of low income, high unemployment, and the presence of income inequality are positively associated with teenage pregnancy levels. Educational factors such as, high school enrollment rates, state funding on pupil support programs, and after school activities for female students (i.e. for example athletics) significantly reduce the pregnancy cycle. In fact, this article reveals that education enhances economic performance both directly and indirectly. Education directly increases human capital, productivity, and income growth rates, but it also works as a deterrent of teenage pregnancy rates.

Although the determinants of teenage pregnancy are complex and no single solution to this problem exists, the results of this paper indicate several areas for policy makers to focus on. However, further research is needed on this topic, especially around possible educational solutions and the impact of after school initiatives.

DATA SOURCES

The source for real per capita income (PCY) is real Gross State Product, which comes from the U.S. Bureau of Economic Analysis, see http://www.bea.doc.gov/bea/regional/gsp/action.cfm, divided by state population, see U.S. Census Bureau at http://www.census.gov/population/estimates/state/. The Bureau of Labor Statistics was the source for labor force (LABOR) and unemployment (UNEMP), see http://www.bls.gov/data/. The fraction of the state population classified as minority (MIN) comes from various years of the U. S. Census Bureau's, *Statistical Abstract of the United States*. The number of females participating in high school athletics (SPORT) comes from the National Federation of State High School Association at http://www.nfhs.org/. The U.S. Census Bureau, *Annual Survey of Government Finances*, is the source of state expenditures on student support services (STATE). (HUMAN) and (SCHOOL) are calculated by the enrollment in public secondary schools by state, which comes from various years of the U.S. Department of Education, National Center for Education Statistics, *Statistics of Public Elementary and Secondary School Systems*, divided by the estimated population aged 10-18 years old come from the U.S. Census Bureau, *Current Population Report*, Series P-15, No. 1095. The source for state-by-state teenage pregnancy rates (PREG RATES) comes from various years of the Center for Disease

Control and Prevention's *Morbidity and Mortality Reports*. (GINI) coefficient data and methodology comes from Langer (1999).

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