

# **WORKING PAPER**

## **2004**

Department of Economics  
Tufts University  
Medford, MA 02155  
(617) 627 – 3560  
<http://ase.tufts.edu/econ>

## **Teen Childbearing and Community Religiosity**

Professor Linda Loury  
Economics Department  
Tufts University  
Medford, MA 02155  
Phone: 617-627-3346  
Fax: 617-627-3917  
Email: [Linda.loury@tufts.edu](mailto:Linda.loury@tufts.edu)

**Abstract****Teen Childbearing and Community Religiosity**

This paper shows that communities with larger fractions of Catholics and Conservative Protestants have lower rates of teen childbearing *ceteris paribus*. The pattern of results does not appear to result from spurious correlation with unobservables but rather can be explained by a modified version of Akerlof's conformity model. This research suggests that community variables that may affect individuals extend beyond the standard measures of neighborhood socioeconomic characteristics. It provides indirect evidence in favor of policy interventions that explicitly seek to alter attitudes and norms rather than relying solely on providing information or structuring financial incentives to change behavior.

## **I. Introduction**

While the effects of family background on later socioeconomic status are firmly established, uncertainty remains about the relative importance of neighborhood effects (Ginther, Haveman, and Wolfe, 2000). Some argue that the measured effects are largely due to unobserved family characteristics. Others point out that difficult-to-measure dimensions of neighborhood quality such as social norms and social cohesion may often be overlooked.

This paper supports the latter assertion. The evidence here indicates that teen childbearing is correlated with the fraction of the community's religious adherents who are Catholic or who belong to Conservative Protestant denominations. The results also show that this relationship is not simply due to unobserved family or individual characteristics but instead may reflect social norms about the appropriateness of teen sexual activity.

Clearly, denominational choices are not part of public policy discussions. However, at a general level, the results support claims (Becker and Murphy, 2001 and Akerlof and Kranton, 2000) that individual choices may be substantially skewed towards the norms of one's social group and potentially away from intrinsically optimal choices. At a more specific level, the results can help explain why teen pregnancy prevention programs that explicitly exploit the nature of social interactions tend to be more successful than others.

## II. Theoretical Model and Literature Review

Much previous work on sexual behavior, pregnancy, and childbearing has focused on how economic costs and benefits affect the individual's choice (see An et al, 1993; Ribar, 1994; Rosenzweig, 1999; Kane and Staiger, 1996; and Lundberg and Plotnick, 1995; Duncan and Hoffman, 1990). Others have considered a wider array of determinants (Plotnick, 1992; Thornton and Camburn, 1989; and Thornton and Camburn, 1987). In the same spirit, this analysis adapts Akerlof's conformity model (1997) to examine these issues. The model rests on the idea that

the key difference between social decisions and conventional economic decisions (e.g. the choice of fruits) is that social decisions have social consequences whereas economic decisions do not. [Social decisions] will affect who I am in an important way, and thus how I associate with my friends and relatives as well as who those friends may be.

According to the model (see appendix 1), individuals start with an inherited social position - in this case, endowment of abstention capital ( $x_{ei}$  for person type  $i$ ) - based largely on parent's characteristics. The term abstention capital is meant to denote all characteristics that affect the initial or endowed level of pregnancy prevention. For simplicity, assume that there are only three endowment possibilities – low ( $x_{e1}$ ), middle ( $x_{e2}$ ), and high ( $x_{e3}$ ) where  $x_{e1} < x_{e2} < x_{e3}$ . Assume also that the intrinsic optimum based on economic costs and benefits for all individuals is  $X^* > x_{e3}$ . Given her endowment, the individual chooses the level of abstention ( $x_{si}$ ) for her teen years. In the absence of community effects or other differences between groups, all types of individuals  $i=1,2,3$  would choose  $x_{si}=X^*$ .

If there are community effects, individuals with different endowments will choose different  $x_{si}$ . Intuitively, individuals gain utility by moving toward  $X^*$ , the intrinsic

optimum. Individuals, however, also gain (lose) utility by moving closer to (farther from) type  $j$  individuals. The lower is the initial social distance along the abstention or  $x$  dimension  $|x_{ej} - x_{ei}|$  the larger is the gain in utility for type  $i$  individuals from conforming to type  $j$ 's endowment. Low and middle endowment individuals may choose too little  $x$  relative to the optimum if the incentive to conform to those nearby exceeds the incentive to choose  $x$  for its intrinsic benefit and the incentive to choose  $x$  to conform to high endowment individuals.

Moreover, deviation from the intrinsic optimum may differ among individuals who begin at the same initial endowment level. The higher is the value of social exchange between a type  $i$  person and type  $j$  individuals (denoted by  $m_{ji}$  in appendix 1) the higher is the gain for the type  $i$  individual from conforming to type  $j$  endowments. The value of the social exchange,  $m_{ji}$ , depends on the fraction of the population who are type  $j$  individuals and on the level of degree of similarity between type  $i$  and type  $j$  individuals along other dimensions than  $x$  (in the case of this paper, religious beliefs). In this way, the value of the social exchange between low and high endowment individuals can, for example, counteract the attraction between low endowment individuals due to proximity in the  $x$  dimension.

At one level, this model merely justifies observed effects of individual characteristics on teen sexual behavior reported in other empirical work. Since higher abstention endowments ( $x_{ei}$ ) increase the choice of  $x$  ( $x_{si}$ ), the standard proxies for endowments such as more favorable parent's socioeconomic characteristics and individual religiosity should reduce teen premarital sexual activity.

Individual religiosity is often measured by church attendance and religious denomination. In particular, Catholic doctrine and teaching include strict prohibitions against premarital sex (U.S. Catholic Conference, 1977). Because of these prohibitions, Catholic girls may be less likely to be sexually active than others (see Cochran and Beeghley, 1991 and Petersen and Donnenwerth, 1997; Brewster et al, 1998). Similar disincentives may hold for Conservative Protestant denominations (Brewster et al, 1998; Thornton and Camburn, 1987). This means that, while members of each religious denomination will be found among low, middle, and high endowment positions, Catholic and Conservative Protestant teens would be less likely to have low endowments. Given variations in the costs of moving to the social optimum, differences in these inherited positions due to individual religiosity would explain some of the observed differences in teen sexual behavior.

This model also elaborates on this standard conclusion in several ways. Most importantly, teens with the same initial endowments ( $x_{ei}$ ) will choose different levels of abstention ( $x_{si}$ ) depending on whether or not they live in disproportionately Catholic or Conservative Protestant communities. Catholic and Conservative Protestant teens are more likely to be in high endowment positions and the model posits that the attraction to the high endowment position increases with the fraction of the population at that position.

The impact of higher Catholic/Conservative Protestant community fractions will not, however, be uniform for all teens. The greater is the value of social exchange (either due to proximity in abstention endowments or other aspects of social relations) the greater is the attraction among individuals. This would imply, for example, that low endowment Catholic teens in disproportionately Catholic communities would be more

attracted to their high endowment peers than low endowment Catholic teens in disproportionately Conservative Protestant communities. In contrast, low endowment Protestant teens in disproportionately Catholic communities would be less attracted to their high endowment peers than low endowment Protestant teens in disproportionately Conservative Protestant communities.

The hypothesized behavior for older women diverges sharply from that of teens. Given marital childbearing is desirable rather than taboo and older individuals are more likely to be married, religious denomination will have little effect on location across low, middle, and high endowment positions for women in their twenties<sup>1</sup>. In turn, disproportionately Catholic or Conservative Protestant communities would not have more high endowment individuals. As a result, the attraction to high endowment positions would not be greater in such communities and abstention choices for women in their twenties should not differ between predominantly Catholic/Conservative Protestant and other communities.

Previous empirical evidence that neighborhood characteristics alter teen sexual behavior is mixed. Brooks-Gunn et al (1993) and Crane (1991) found that “good” neighborhoods as measured by the fraction of families with high incomes or the fraction of workers who held professional or managerial jobs significantly reduced the likelihood of teen out-of-wedlock childbearing. These findings were echoed in the estimated effects of neighborhood disadvantage, racial composition, and neighborhood disorganization reported by South and Crowder (1999), Sucoff and Upchurch (1998), and Upchurch et al (1999).



Some of the estimated neighborhood effects are attributed to economic costs and benefits of alternative choices. These include access to contraceptives and abortions (Kane and Staiger, 1996; and Lundberg and Plotnick, 1995), labor market opportunities measured by income, occupation, and employment rates, and the generosity of transfer payments for female-headed households (see An et al, 1993; Ribar, 1994; Rosenzweig, 1999; and Duncan and Hoffman, 1990). In other work, neighborhood characteristics (including some of the ones listed above) are considered to be proxies for community norms. “Attitudes and values are the pathways through which contextual factors [median family income and women’s employment status] influence individual behaviors” (Brewster, 1994; p. 421). “In neighborhoods marred by physical deterioration, threats of violence, and other stressors, the social processes that reinforce adult norms are severely circumscribed” (Upchurch et al, 1999; p. 929). “Our finding that neighborhood racial composition is associated with adolescent childbearing regardless of neighborhood socioeconomic status provides indirect evidence that cultural norms are an important explanation of variation in rates of childbearing” (Sucoff and Upchurch, 1998; p. 582).

Other analysts have concluded that many of these effects may be spurious. Hogan and Kitagawa (1985) found only marginally significant effects of neighborhood quality on black teen pregnancy when controlling for a standard set of family background characteristics. Furthermore, these effects became insignificant when the analysis included parental control of dating. Ginther, Haveman, and Wolfe (2000) showed that the percent of persons who were white, the percent of households with high incomes, the percent of households with low incomes, and the percent of female heads seemed to have large significant effects on teen nonmarital births. These effects disappeared, however,

when an extensive list of family background variables was included in the analysis. Evans et al (1992) and Plotnick and Hoffman (1999) also reported insignificant neighborhood effects on out-of-wedlock childbearing when noncausal relationships were eliminated by using fixed-effects analysis or by treating neighborhood effects as endogenous.

### **III. Empirical Analysis**

This analysis uses data for women ages 14-20 in 1979 taken from the National Longitudinal Study of Youth (NLSY). The NLSY is a nationally representative panel of individuals ages 14-22 begun in 1979. Sample members were interviewed annually to determine information about schooling, work, and other experiences<sup>2</sup>. The individual data from the NLSY was merged with data on the county in which the individual resided in 1979. The county data included the fraction of religious adherents who were Catholic (i.e. Catholic adherents/total adherents) and the fraction of religious adherents who were Conservative Protestants (i.e. Conservative Protestants/total adherents). This data came from the 1980 Survey of Churches and Church Membership collected by the Glenmary Research Center (Quinn et al, 1982).

Self-reported data on teen sexual activity and pregnancy before marriage could be used to test these hypotheses in this paper. Such data may, however, contain measurement errors since many unmarried girls who are sexually active at young ages would be unwilling to report accurately (see Furstenberg et al, 1987). This reluctance may be especially prevalent in communities that more actively sanction teen pre-marital intercourse.

Other indicators of sexual behavior such as non-marital childbearing are less fraught with error. However, the effects of norms on teen pregnancy and childbearing may not be straightforward. Catholic and Conservative Protestant doctrine and teaching not only includes prohibitions against premarital sex, but also against contraception and abortion. In addition, premarital pregnancies may be resolved by marriage more often for Catholics and Conservative Protestants<sup>3</sup>. As a result, girls belonging to these denominations may be less likely to have premarital sex than others (see Cochran and Beeghley, 1991 and Petersen and Donnenwerth, 1997) but more likely to become pregnant, give birth, and/or get married if they do. According to Akerlof, Yellen, and Katz (1996), over 40 percent of the premaritally conceived births between 1980 and 1984 were resolved by marriage. In this case, non-marital childbearing would understate premarital sexual activity, once again especially in communities that actively sanction such choices. Because of these problems, this paper focuses on teen childbearing (marital and non-marital) to avoid the downward bias due to understatement of self-reported teen pre-marital pregnancy on one hand and some, though not all, of the problems due to confounding norms implicit in non-marital teen childbearing on the other.

Summary statistics for all variables used in the analysis are listed in Table 1. It shows that the mean age at first intercourse was approximately 18, about twenty percent of the sample gave birth as teenagers, and about 51 percent of the sample gave birth in their twenties. Table 1 also shows that about 30 percent of entire sample were Catholic<sup>4</sup> and 3 percent were Conservative Protestants as of 1979. Sample members lived in counties that were, on average, 42 percent Catholic and 6 percent Conservative Protestant. This analysis understates the prevalence of Conservative Protestants since

many denominations that fall into these categories of Holiness, Evangelicals, Pentecostals, Seventh-Day Adventists, Churches of Christ etc (see Roof and McKinney, 1987) did not provide data for the 1980 Glenmary Survey or were not separated listed in the NLSY survey. The specific denominations identified as Conservative Protestants for this analysis are listed in the Appendix 2. Similar to Brewster et al (1998), Baptists were not included among Conservative Protestant congregations due to heterogeneity in Baptist beliefs and practices. Fundamentalist Protestants made up 5 percent of the white sample and 11 percent of the black sample in the data used by Brewster et al.

Column 1 of Table 2 reports the teen childbearing probit results. In addition to the variables listed, the analysis included dummy variables for the state of residence. The results are largely consistent with those from other studies. African-Americans averaged significantly higher teen birth rates. More highly educated parents, white-collar fathers, frequent church attendance, residence in a household that received magazines (during the individual's adolescence) and residence in counties with large fractions of college-educated workers were all correlated with significantly lower chances of teen childbearing<sup>5</sup>.

Table 2 shows that Catholic and Conservative Protestant girls were less likely to give birth as teens. The  $-0.211$  coefficient implies 5 percentage points lower for teen birth rates for these girls than for others. Separate estimates for the two denominational groups were  $-0.218$  (0.079) for Catholics and  $-0.166$  (0.205) for Conservative Protestants. Although the point estimates are similar, the coefficient for Conservative Protestants is not precisely estimated because of the small sample size.

Consistent with the theoretical model predictions, individuals in communities with larger fractions of Catholics or Conservative Protestants were less likely to give birth as teens *ceteris paribus*. The  $-0.922$  and  $-2.161$  probit coefficients imply that each 10 percentage point difference in county fraction Catholic and county fraction Conservative Protestant would change teen birth rates by about 2 and 5 percentage points respectively<sup>6</sup>.

The larger Conservative Protestant effect may occur because those communities with large fractions of observed Conservative Protestant denominations may also have large fractions of other (though unobserved in the data used here) Conservative Protestant denominations. On the other hand, the larger effect may reflect behavioral differences between Catholics and Conservative Protestants. Petersen and Donnerwerth (1997) report that a large decline in support for traditional beliefs about premarital sex between 1972 and 1993 for Catholics but no fall for Conservative Protestants who attended church frequently. Iannoccone (1992) argues that strict churches rationally require conformity to a distinct morality and lifestyle. This would suggest that, holding constant the total fraction of Catholic and Conservative Protestant religious adherents, the proportion of high endowment individuals in the community increases with the latter.

Column 2 of Table 2 reports the childbearing results for the same women when they were in their twenties. It shows that parents' schooling and occupation variables have similar, though somewhat smaller, effects on childbearing for ages 20-29 as on teen births. In contrast, neither church attendance nor Catholics/Conservative Protestant denomination is statistically significant. In fact, both point estimates are small and positive. This confirms the earlier assumption that largely Catholic/Conservative

Protestant communities do not have disproportionately fewer women giving birth in their twenties. Consistent with this observation, neither Catholic or Conservative Protestants adherents fraction have significant negative effects on childbearing<sup>7</sup>, even though their coefficients were large, negative, and significant for these same women when they were teens.

Rows 2(a)-3(b) of Table 3 show the results from re-estimating column 1 of Table 2 with four separate community religiosity variables (Catholic adherents fraction for Catholics, Catholic adherents fraction for non-Catholics, Conservative Protestant fraction for Protestants, and Conservative Protestant adherents fraction for non-Protestants) instead of the two. Although the differences are not statistically significant, the effect of disproportionately Catholic communities on Catholics is higher than on all others. Similarly, the effect of disproportionately Conservative Protestant communities on Protestants is higher than on all others. This variation could result from proximity in abstention endowments ( $|x_{ej} - x_{ei}|$ ) and/or other components of social interaction ( $m_{ji}$ ). The closer individuals are to high endowment groups for either of these reasons the greater is the attractiveness of selecting high levels of abstention.

Row 4 of Table 3 suggests that the community religiosity variables do, in fact, operate changes in teen attitudes. The dependent variable is a dummy variable for whether girls ages 14-15 reported in 1979 that they expected to give birth as teens. Holding constant the same variables as in column 1 of Table 2, the coefficient of the combined county fraction of Catholic and Conservative Protestants is negative and significant (-1.108 (0.623)) at the 10 percent level.

Omitted-variable bias could account for the correlation between community religiosity and teen childbearing in Tables 2 and 3. For example, communities with large numbers of Catholics and/or Conservative Protestants may differ from other communities in a variety of ways (e.g. restrictions on purchasing contraceptives and availability of abortions) that are the true source of variations in teen behavior rather than differences in teen attitudes.

This paper uses several methods to determine the role of this source of omitted-variables bias. The probit analyses in Tables 2 and 3 control for state-level unobservables by including state dummies in the analysis. The results, therefore, show the effects of Catholic and Conservative Protestant county fractions holding state-wide characteristics constant. In addition, a variety of socioeconomic county-level variables (such as the unemployment rate, the average size of Aid to Families with Dependent Children payments, the percentage of female-headed families, the fraction of the population that was poor, the fraction of the population that was black, and average county income) and religiosity county-level variables (the number of churches per county square mile or the fraction of population who were religious adherents) had no large or significant effects of teen childbearing or on the sizes of the Catholic or Conservative Protestant adherents coefficients.

It is unlikely that other community characteristics would bias the results here. In a related paper, Lundberg and Plotnick (1995) analyzed the effects of county level variables measuring costs of contraception - availabilities of family planning services for teenage women, family planning services for Medicaid-eligible women, and general family planning services – for a sample of NLSY women similar to those included here.

They found that these costs had no effects on childbearing holding constant (as does Table 2 through state fixed-effects) statewide restrictions on public funding for abortion or the sale of contraceptives.

Furthermore, the Catholic/Conservative Protestant adherents fraction is measured at the county rather than at the neighborhood level. Among residential moves within state between 1975 and 1980, over 70 percent occurred within the same county<sup>8</sup>. This suggests that dissatisfaction with neighborhood characteristics is often resolved by choosing a different neighborhood in the same county. Given a wide variety of choices within metropolitan areas, moves across counties to select better residential environments (and thus selection problems) may be more likely for those outside of urban areas. The interaction term for community religiosity and urban residence was small and insignificant<sup>9</sup>.

In the absence of omitted community characteristics, the results may still be spurious if left-out individual or family variables are correlated with community religiosity. For example, parents who actively monitor their children's behavior may also more often live in Catholic/Conservative Protestant religious communities. Similarly, parental willingness to adhere to religious strictures may be correlated with denomination and with residence in Catholic/Conservative Protestant communities. The parents' monitoring, attitudes, and other individual or family unobserved variables rather than the community characteristics may account for lower teen childbearing.

Given the insignificant coefficients of Catholic and Conservative Protestant adherents fractions for childbearing during ages 20-29 (column 2 of Table 2), the possible sources of any remaining bias due to unobserved individual or family



characteristics would mainly come from variables that alter teen but not later childbearing. This suggests that the effects of such variables can be reduced by including age at first intercourse to the analysis. The same unobservables that affect teen childbearing (e.g. parent's monitoring behavior, reported parental understanding and support, perceived neighborhood safety, physical condition, and social relations, see Upchurch et al, 1999; Hogan et al, 1985) also affect age at the first intercourse. Moreover, the results including age at first intercourse may understate the reduced-form effects of community religiosity since changes in age at first intercourse may be one of the avenues through which community religiosity alters teen childbearing.

The column 3 of Table 2 adds age at first intercourse to the variables in column 1. The coefficients of the Catholic and Conservative Protestant adherence fractions are only slightly smaller than they were in column 1. The  $-0.894$  and  $-1.830$  probit coefficients imply that each 10 percentage point difference in county fraction Catholic and county fraction Conservative Protestant would change teen childbearing by about 2 and 4 percentage points respectively. The rough constancy of the community religiosity effects suggests that the estimated coefficients in column 1 were not mainly driven by unobserved variables correlated with age at first intercourse.

Goodness-of-fit measures such as pseudo R-squared would indicate whether age at first intercourse is actually capturing effects of unobserved variables. The pseudo R-squared compares the likelihood for the "constrained" model with only the constant included and the "unconstrained" model with all of the independent variables added to the analysis. While pseudo R-squared does not have a straightforward interpretation like the OLS R-squared, it is useful for comparing results of nested dependent variable models

(Maddala, 1983 and Windmeijer, 1995). Looking at columns 1 and 3 of Table 2 shows that the pseudo R-squared changes from 0.148 to 0.289. This implies that age at first intercourse is not merely condensing the effects of already included variables but, in fact, incorporates the influence of childbearing determinants omitted in column 1.

Summarizing the results of this paper shows that (1) teen abstention endowments depend on an individual's church denomination, (2) higher community endowments as measured by the Catholic and Conservative Protestant adherents fractions reduce teen childbearing, (3) the pattern of community endowment effects (by age and denomination) is consistent with the conformity theoretical model, (4) community religiosity is correlated with expectations about teen births among younger teens, and (5) omitted-variables bias does not appear to account for the results.

Decisions about denomination are well outside the purview of public policy. Nonetheless these results may have important policy implications. At a general level, the results support conclusions of other work that individual behavior is directly altered by the actions of others. Becker and Murphy (2001) argue that complementarities between social capital and closely related behavior result in multiplier effects so that social forces can severely constrain individual choice. Similarly, Akerlof and Kranton (2000) contend that "identity can explain behavior that appears detrimental" and that "because identity is fundamental to behavior, choice of identity may be the most important 'economic' decision people make." Such arguments indicate that the range of community characteristics that alter behavior may include a broader array of social influences than are typically analyzed (Sampson et al, 1999).

At a more specific level, the results suggest that some public policies and interventions to reduce teen childbearing may be more successful than others precisely because they alter social norms about acceptable behavior for those groups especially at-risk for unproductive behavior. Kirby (2001) summarized the evaluations of 250 programs aimed at reducing teen pregnancy and childbearing. These programs included school curricular-based programs, sex and HIV education programs for parents and families, clinic or school-based programs to provide reproductive health care, and a variety of others. Among the distinguishing characteristics of successful programs, he reported that effective “programs strive to go far beyond the cognitive level; they focus on recognizing social influences, changing individual values, changing group norms, and perceptions of those norms” (p. 92).

Similarly, Loury (1999) finds that, among intervention programs to limit second births among welfare mothers, only home visitation by nurses consistently resulted in fewer subsequent births. Evaluations of the program attribute part of its success of the program to unambiguous normative messages that becoming pregnant again was not desirable. Another part of the success of the program was attributed to empathetic relationship that the nurses explicitly developed with the mother and other family members. In terms of the conformity model, the program increased value of the social exchange between low and high endowment groups along other dimensions than sexual behavior. The program’s outcome contrasts with the negligible impact of other approaches which relied on direct or indirect monetary incentives to avoid future pregnancies and of the typical case management approach which simply provided information about birth control and which included only limited contact between case

workers and clients. These approaches do not directly alter perceptions of acceptable behavior.

#### **IV. Conclusion**

This paper shows that communities with larger fractions of Catholics and Conservative Protestants have lower rates of teen childbearing. The paper also presents evidence that the measured effects result from conforming to community norms rather than from spurious correlation with unobservables. This research suggests that the array of community variables that may affect individuals extends beyond the standard measures of community socioeconomic characteristics. It provides indirect evidence in favor of policy interventions that explicitly seek to alter attitudes and norms rather than relying solely on providing information or structuring financial incentives to elicit the desired behavior.

### Appendix 1

If individuals assume that the acquired social position of all other individuals is the same as their initial endowment, the utility of low endowment individuals is given by:

$$(1) \quad U_1 = [m_{11}/f][1/(g+|x_{11} - x_{e1}|)] + [m_{21}/(f+(x_{e2} - x_{e1}))][1/(g+|x_{11} - x_{e2}|)] + [m_{31}/(f+(x_{e3} - x_{e1}))][1/(g+|x_{11} - x_{e3}|)] + [-ax_{11}^2 + bx_{11} + c]$$

where  $x_{ei}$  is the endowment position of type  $i$  individuals and  $x_{11}$  is the low endowment person's choice of  $x$ . The first product is the conformist component of utility relative to other low endowment individuals, the second product is the conformist component of utility relative to middle endowment individuals, the third product is the conformist component of utility relative to high endowment individuals, and the last term is the intrinsic value of  $x$ . The intrinsic optimum occurs at  $b/2a$ . As indicated earlier,  $x_{e1} < x_{e2} < x_{e3} < b/2a$ . The utilities of persons 2 and 3 are similarly defined.

This model posits that individuals gain utility or satisfaction from conforming to those around them and that, as the initial or the chosen level of social distance between individuals falls, the value of conforming increases. For example, it can be shown that for  $x_{e1} < x_{11} < x_{e2}$ :

$$(2) \quad \partial U_1 / \partial x_{11} = -[m_{11}/f][1/(g+(x_{11} - x_{e1}))^2] + [m_{21}/(f+(x_{e2} - x_{e1}))][1/(g-(x_{11} - x_{e2}))^2] + [m_{31}/(f+(x_{e3} - x_{e1}))][1/(g-(x_{11} - x_{e3}))^2] + [-2ax_{11} + b]$$

The marginal utility of increases in  $x_{11}$  between  $x_{e1}$  and  $x_{e2}$  depends on opposing factors. The intrinsic value component of utility rises since  $x_{11}$  is moving closer to the intrinsic optimum ( $b/2a$ ). The conformist components of utility relative to middle and high endowment individuals also increase as low endowment individuals move  $x_{11}$  toward  $x_{e2}$  and  $x_{e3}$ . However, the conformist component of utility relative to other low endowment

individuals declines move  $x_{11}$  away from  $x_{e1}$ . The sizes of the conformist utility changes depend on  $m_{j1}$ . They also depend (negatively) on the initial social distances ( $|x_{ej} - x_{ei}|$ ). Changes in utility for low endowment individuals if  $x_{11} > x_{e2}$  as well as changes in utility for middle and high endowment individuals can be analyzed in a similar manner.

**Appendix 2**

## Conservative Protestant Denominations:

## Glenmary data

- Assemblies of God
- Berean Fundamental Church
- Bible Church of Christ
- Churches of Christ
- Congregational Holiness Church
- Fire Baptized Holines Church
- Pentecostal Free Will Baptist
- Pentecostal Holiness
- Seventh Day Adventist
- United Church of Christ
- Miscellaneous Evangelical Congregations

## NLSY data

- Apostolic Pentecostal
- Assembly of God
- Church of Christ
- Evangelical
- Evangelical Congregational
- Pentecostal Assembly of God
- Pentecostal Free Will Baptist
- Pentecostal Holiness
- Pilgrim Holiness
- Seventh Day Adventist
- United Holiness
- Witness Holiness
- Fundamental

## References

- Akerlof, George. 1997. "Social Distance and Social Decisions." *Econometrica* 65: 1005-1027.
- Akerlof, George and Rachel Kranton. 2000. "Economics and Identity." *The Quarterly Journal of Economics* 115 (3): 715-753.
- Akerlof, George; Janet Yellon; and Michael Katz. 1996. "An Analysis of Out-of-Wedlock Childbearing in the United States." *The Quarterly Journal of Economics* 111 (2): 277-317.
- An, Chong-Bum et al. 1993. "Teen Out-of-Wedlock Births and Welfare Receipt: The Role of Childhood Events and Economic Circumstances." *The Review of Economics and Statistics* 75: 195-208.
- Becker, Gary and Kevin Murphy. 2001. *Social Economics*. Cambridge, MA: Harvard University Press.
- Brewster, Karin. 1994. "Neighborhood Context and the Transition to Sexual Activity Among Young Black Women." *Demography* 31 (November): 603-614.
- Brewster, Karin; Elizabeth Cooksey; David Guilkey; and Ronald Rindfuss. 1998. "The Changing Effects of Religion on Adolescent Sexual and Contraceptive Behavior." *Journal of Marriage and the Family* 60 (2): 493-504.
- Brooks-Gunn, Jeanne; Duncan, Greg; Klebanov, Pamela; and Sealand, Naomi. 1993. "Do Neighborhoods Influence Child and Adolescent Development?" *American Journal of Sociology* 99: 353-395.



- Cochran, John and Beeghley, Leonard. 1991. "The Influence of Religion on Attitudes toward Nonmarital Sexuality: A Preliminary Assessment of Reference Group Theory." *Journal for the Scientific Study of Religion* 30: 45-62.
- Crane, Jonathan. 1991. "The Epidemic Theory of Ghettos and Neighborhood Effects on Dropping Out and Teen Childbearing." *American Journal of Sociology* 96: 1226-12259.
- Duncan, Greg and Hoffman, Saul. 1990. "Welfare Benefits, Economic Opportunities, and Out-of-Wedlock Births Among Black Teenage Girls." *Demography* 27: 519-535.
- Evans, William et al. 1992. "Measuring Peer Group Effects: A Study of Teenage Behavior." *Journal of Political Economy* 100: 966-991.
- Furstenberg, Frank et al. 1987. "Racial Differences in Timing of Adolescent Intercourse." *American Sociological Review* 52 (4): 511-518.
- Ginther, Donna; Robert Haveman; and Barbara Wolfe. 2000. "Neighborhood Attributes as Determinants of Children's Outcomes: How Robust are the Relationships?" *The Journal of Human Resources* 35 (4): 603-642.
- Greeley, Andrew. 1989. *Religious Change in America*. Cambridge, Mass: Harvard University Press.
- Hogan, Dennis; Astone, Nan; Kitagawa, Evelyn. 1985. "Social and Environmental Factors Influencing Contraceptive Use Among Black Adolescents." *Family Planning Perspectives* 17: 165-169.
- Iannaccone, Laurence. 1992. "Sacrifice and Stigma: Reducing Free-Riding in Cults, Communes, and Other Collectives." *Journal of Political Economy* 100 (2): 271-292.

- Jones, E. F. and Westoff, C. F. 1979. "The End of 'Catholic' Fertility." *Demography* 16:209-218.
- Kane, Thomas and Staiger, Douglas. 1996. "Teen Motherhood and Abortion Access." *The Quarterly Journal of Economics* 111: 467-506.
- Kirby, Douglas. 2001. *Emerging Answers: Research Findings on Programs to Reduce Teen Pregnancy*. Washington, DC: National Campaign to Prevent Teen Pregnancy.
- Loury, Glenn. 1999. "Preventing Subsequent Births to Welfare Recipients" Working Paper, Institute on Race and Social Division, Boston University.
- Lundberg, Shelly and Plotnick, Robert. 1995. "Adolescent Premarital Childbearing: Do Economic Incentives Matter?" *Journal of Labor Economics* 13: 177-200.
- Maddala, G. S. 1983. *Limited Dependent and Qualitative Variables in Econometrics*. Cambridge, England: Cambridge University Press.
- Mosher, William and Hendershot, Gerry. 1984. "Religious Affiliation and Fertility of Married Couples." *Journal of Marriage and Family* 46: 671-677.
- Mosher, William et al. 1992. "Religion and Fertility in the United States: New Patterns." *Demography* 29:199-214.
- Petersen, Larry and Donnenwerth, Gregory. 1997. "Secularization and the Influence of Religion on Beliefs about Premarital Sex." *Social Forces*: 1071-1089.
- Plotnick, Robert. 1992. "The Effects of Attitudes on Teenage Premarital Pregnancy and Its Resolution." *American Sociological Review* 57: 800-811.
- Plotnick, Robert and Hoffman, Saul. 1999. "The Effect of Neighborhood Characteristics on Young Adult Outcomes." *Social Science Quarterly* 80: 1-18.

- Quinn, Bernard et al. 1982. *Churches and Church Membership in the United States 1980*. Atlanta, GA: Glenmary Research Center, 1982.
- Ribar, David. 1994. "Teenage Fertility and High School Completion." *The Review of Economics and Statistics* 76:413-424.
- Roof, Wade and William McKinney. 1987. *American Mainline Religion*. New Brunswick, NJ: Rutgers University Press.
- Rosenweig, Mark 1999. "Welfare, Marital Prospect, and Nonmarital Childbearing." *Journal of Political Economy*. 107: S3-S32.
- Sampson, Robert; Jeffrey Morenoff; and Felton Earls. 1999. "Beyond Social Capital: Spatial Dynamics of Collective Efficacy for Children." *American Sociological Review* 64: 633-660.
- South, Scott and Kyle Crowder. 1999. "Neighborhood Effects of Family Formation: Concentrated Poverty and Beyond." *American Sociological Review* 64:113-132.
- Suoff, Clea and Dawn Upchurch. 1998. "Neighborhood Contest and the Risk of Childbearing among Metropolitan-Area Black Adolescents." *American Sociological Review* 63: 571-585.
- Thorton, Arland and Camburn, Donald. 1987. "The Influence of the Family on Premarital Sexual Attitudes and Behavior." *Demography* 24: 323-340.
- Thorton, Arland and Camburn, Donald. 1989. "Religious Participation and Adolescent Sexual Behavior," *Journal of Marriage and Family* 51:641-653.
- Upchurch, Dawn, Carol Aheshensel, Clea Suoff, and Lene Levy-Storms. 1999. "Neighborhood and Family Context of Adolescent Sexual Activity." *Journal of Marriage and Family* 61: 920-933.

U.S. Bureau of the Census. 1983. *County and City Data Book, 1983* Washington, DC:

U.S. Government Printing Office, 1983.

U.S. Catholic Conference. 1977. *Declaration on Sexual Ethics: Sacred Congregation for the Doctrine of the Faith*. Washington, D.C.: Persona Humana.

Windmeijer, F. A. 1995. "Goodness-of-fit measures in binary choice models." *Econometric Reviews* 14: 101-116.

**Table 1. Means and Standard Deviations of Selected Variables**

Whether gave birth during ages 13-19 (0-1 dummy variable measured as of 1985)	0.209 (0.406)
Whether gave birth during ages 20-29 (0-1 dummy variable measured as of 1992)	0.513 (0.500)
Age at first intercourse (in years measured as of 1983)	17.899 (2.299)
Catholic (0-1 dummy variable)	0.303 (0.460)
Conservative Protestant (0-1 dummy variable)	0.026 (0.158)
Mother - highest grade completed (in years)	10.970 (3.644)
Don't know mother's schooling (0-1 dummy variable)	0.047 (0.212)
Father - highest grade completed (in years)	10.487 (4.944)
Don't know father's schooling (0-1 dummy variable)	0.106 (0.308)
Father - professional worker (0-1 dummy variable)	0.234 (0.423)
Father - clerical worker (0-1 dummy variable)	0.082 (0.275)
Number of siblings	3.413 (2.332)

**Table 1. (cont.)**

Female-headed family at age 14 (0-1 dummy variable)	0.133 (0.339)
Household regularly received magazines when respondent was age 14 (0-1 dummy variable)	0.648 (0.478)
African-American (0-1 dummy variable)	0.145 (0.352)
Hispanic (0-1 dummy variable)	0.068 (0.251)
Urban residence at age 14 (0-1 dummy variable)	0.777 (0.416)
Weeks attended church in past year	23.144 (25.325)
County - percent attended college	10.348 (4.205)
County - percent of religious adherents who were Catholics (measured as of 1980 by Glenmary survey)	0.418 (0.255)
County - percent of religious adherents who were Conservative Protestant (measured as of 1980 by Glenmary survey)	0.062 (0.046)
Number of observations	3693

All variables were taken from the 1979 NLSY data  
unless otherwise indicated

Standard deviations are in parentheses.

**Table 2. Probit Childbearing Estimates**

<b>Explanatory variables</b>	<b>Ages 13-19</b>	<b>Ages 20-24</b>	<b>Ages 13-19</b>
Conservative Protestant or Catholic (0-1 dummy variable)	-0.211 (0.075)	0.059 (0.062)	-0.155 (0.082)
County - percent of religious adherents who were Catholics (measured as of 1980 by Glenmary survey)	-0.922 (0.218)	-0.131 (0.191)	-0.894 (0.242)
County - percent of religious adherents who were Conservative Protestant (measured as of 1980 by Glenmary survey)	-2.161 (0.863)	0.0001 (0.717)	-1.830 (0.934)
Mother - highest grade completed (in years)	-0.056 (0.013)	-0.022 (0.012)	-0.064 (0.014)
Father - highest grade completed (in years)	-0.032 (0.011)	-0.028 (0.010)	-0.039 (0.012)
Father - professional worker (0-1 dummy variable)	-0.246 (0.093)	-0.178 (0.073)	-0.191 (0.103)
Father - clerical worker (0-1 dummy variable)	-0.263 (0.137)	-0.018 (0.100)	-0.273 (0.144)
Number of siblings	0.014 (0.012)	0.006 (0.011)	-0.0004 (0.013)
Female-headed family at age 14 (0-1 dummy variable)	0.038 (0.075)	0.083 (0.072)	-0.043 (0.082)
Household regularly received magazines when respondent was age 14 (0-1 dummy variable)	-0.328 (0.064)	0.043 (0.058)	-0.285 (0.070)

Table 2. (cont)

	<b>Ages 13-19</b>	<b>Ages 20-24</b>	<b>Ages 13-19</b>
African-American (0-1 dummy variable)	0.284 (0.074)	-0.043 (0.065)	0.178 (0.080)
Hispanic (0-1 dummy variable)	0.166 (0.106)	-0.035 (0.095)	0.347 (0.110)
Urban residence at age 14 (0-1 dummy variable)	0.023 (0.076)	0.086 (0.064)	0.039 (0.082)
County - percent attended college	-0.017 (0.008)	0.003 (0.007)	-0.017 (0.009)
Weeks attended church in past year	-0.006 (0.001)	0.0001 (0.001)	-0.0008 (0.001)
Age at first intercourse	-	-	-0.355 (0.019)
Intercept	1.140 (0.237)	0.596 (0.216)	7.112 (0.427)
Log likelihood	-1611.4	-2479.9	-1345.2
$\chi^2$	522.9	112.9	734.8
Pseudo R <sup>2</sup>	0.1477	0.0307	0.2886

---

Standard errors are in parentheses. Other variables included in the analysis were dummy variables for don't know mother's schooling and don't know father's schooling, and dummy variables for state of residence (1979).



**Table 3. Supplementary Probit Estimates of Community Religiosity**

	Catholic Adherents Fraction	Conservative Protestant Adherents Fraction
(1) Teen birth: All (column 1, Table 2)	-0.922 (0.218)	-2.161 (0.863)
(2a) Teen birth: Catholics	-1.049 (0.029)	
(2b) Teen birth: Non-Catholics	-0.842 (0.230)	
(3a) Teen birth: Protestants		-2.639 (0.934)
(3b) Teen birth: Non-Protestants		-0.746 (1.330)
(4) Teen birth expectations: Ages 14-15 (N=601)	-1.108 (0.623)	-1.108 (0.623)

---

Standard errors are in parentheses.

## Footnotes

<sup>1</sup> A variety of analysts have found small or no differentials in marital fertility or total births expected for Catholics and non-Catholics (Jones and Westoff, 1979; Mosher and Hendershot, 1984; and Mosher et al, 1992).

<sup>2</sup>The entire sample of NLSY females for this age group with nonzero 1993 weights equals 3743. Fifty observations were dropped because they could not be matched with the Glenmary data.

<sup>3</sup> Brewster et al (1998) found that Catholics and Protestant Fundamentalists were less likely to use any method of contraception at first intercourse. Plotnick (1992), however, found that, for Catholics, lower rates of church attendance were associated with greater probabilities of resolving teen pregnancies through marriage.

<sup>4</sup> This is slightly higher than figures from national samples of adults of 28 percent in 1985. See Greeley (1989).

<sup>5</sup> Other variables included in the analysis (such as number of siblings and female-headed family, and urban residence) were not significant. They are left in to provide comparability with related research work.

<sup>6</sup> If the dependent variable is changed to non-marital childbearing, the coefficients are less precisely estimated. They equal -0.735 (0.272) and -1.713 (1.152) for the Catholic and Conservative Protestant adherents fractions respectively.

<sup>7</sup> This is not just an artifact of the effect on community religiosity on teen births. Results are similar if the sample excludes women who gave birth as teens.

<sup>8</sup> U.S. Bureau of the Census. County and City Data Book, p. 2. Evans et al (1992) make a similar argument to justify using metropolitan area variables as instruments for the percentage of students in the respondent's school who were economically disadvantaged.

<sup>9</sup> The interaction of the dummy variable for urban and the sum of the fractions of Catholic and Conservative Protestant adherents was added to the analysis. The coefficient for this variable was -0.244 (0.310).

## WORKING PAPER SERIES 2004

[ase.tufts.edu/econ/papers](http://ase.tufts.edu/econ/papers)

- 2004-01** EGGLESTON, Karen & Winnie Yipp; Hospital Competition under Regulated Prices: Application to Urban Health Sector Reforms in China
- 2004-02** EGGLESTON, Karen & Chee-Ruey Hsieh; Health Care Payment Incentives: A Comparative Analysis of Reforms in Taiwan, Korea and China
- 2004-03** EGGLESTON, Karen; Competition, Altruism, and Provider Payment
- 2004-04** LOURY, Linda; Some Job Contacts are More Equal Than Others: Earnings and Job Information Networks
- 2004-05** LOURY, Linda; Teen Childbearing and Community Religiosity
- 2004-06** LOURY, Linda; Religiosity and High School Misbehavior
- 2004-07** MUKAND, Sharun & Sumon Majumdar; Policy Gambles
- 2004-08** MUKAND, Sharun & Sanjay Jain; Public Opinion and the Dynamics of Reform
- 2004-09** MUKAND, Sharun, Sumon Majumdar & Anandi Mani; Politics, Information and the Urban Bias
- 2004-10** BIANCONI, Marcelo; Aggregate and Idiosyncratic Risk and the Behavior of Individual Preferences under Moral Hazard
- 2004-11** BIANCONI, Marcelo; Transfer Programs and Consumption under Alternative Insurance Schemes and Liquidity Constraints

- 2004-12** BIANCONI, Marcelo; Heterogeneity, Adverse Selection and Valuation with Endogenous Labor Supply
- 2004-13** BIANCONI, Marcelo; The Welfare Gains from Stabilization in a Stochastically Growing Economy with Idiosyncratic Shocks and Flexible Labor Supply
- 2004-14** SHIMSHACK, Jay P. and Michael B. Ward; Enforcement and Environmental Compliance: A Statistical Analysis of the Pulp and Paper Industry
- 2004-15** NORMAN, George and Joel P. Trachtman; The Customary International Law Supergame: Order and Law
- 2004-16** BROWN, Drusilla K. and George Norman; Optimal Intellectual Property Rights Protection and Humanitarian Assistance during and International Health Emergency
- 2004-17** LOURY, Linda; Job Tenure and Personal Contacts: Good Matches or Limited Choices?
- 2004-18** KUTSOATI, Edward and Sharun Mukand; Expectations and the Central Banker: Making Decisions the Market Expects to See?
- 2004-19** RICHARDS, Daniel; Price Discrimination and the Long Boom.
- 2004-20** HARDMAN, Anna and Yannis Ioannides; Income Mixing and Housing in U.S. Cities: Evidence From Neighborhood Clusters of the American Housing Survey.
- 2004-21** HARDMAN, Anna and Yannis Ioannides; Neighbors' Income Distribution: Economic Segregation and Mixing in US Urban Neighborhoods. [revised]
- 2004-22** EGGERS Andrew and Yannis Ioannides; The Role of Output Composition in the Stabilization of the U.S. Output Growth
- 2004-23** SHIMSHACK Jay; Are Mercury Advisories Effective? Information, Education, and Fish Consumption.