The Effect of Sexual Education on Women's Labor Force Participation

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May 15, 2008

Abstract

This paper examines the connection between sexual education and labor force participation. I hypothesize that sexual education may enhance women's knowledge about and access to contraception and abortion. This may affect women's work behavior by altering their uncertainty about the risk of becoming pregnant or by changing their actual childbearing behavior. With more certainty about the number and timing of their children, women might be more likely to invest in careers.

I use sibling groups in the National Longitudinal Survey of Youth to eliminate unobserved family or regional factors that might influence a correlation between sexual education and work behavior. I compare the labor force participation of sisters who have taken sexual education to those who haven't. I do the same for brother groups as an extra control; if the mechanism through which sexual education affects work behavior is changes in expected or actual childbearing, then women's and men's patterns should differ.

I find that sex ed has different effects on the work behavior of men and women. While for men sexual education is correlated with a fixed upward shift in labor force participation rates, the gap for women mirrors fertility patterns. During teen years, sexual education increases girls' probability of working. This gap narrows over time and as they reach the end of their biological fertility around age 40, women who have taken sex ed and those who haven't work at the same rate. I conclude that sexual education changes women's expected or actual fecundity, thereby altering their future work behavior.

Introduction

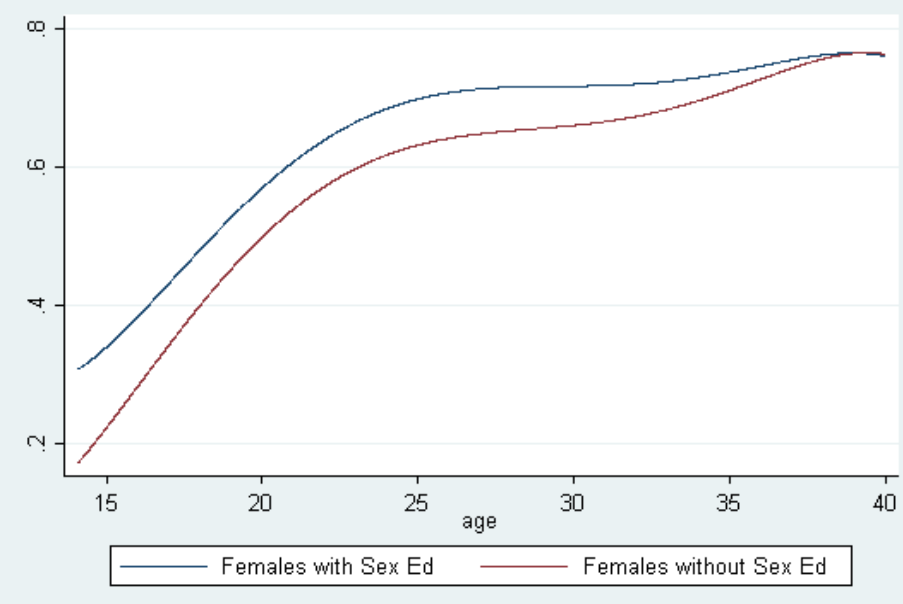
This paper empirically examines the relationship between sexual education and labor force participation of girls and women between the ages of 14 and 40. One possible mechanism for such a relationship is that sexual education could alter women's childbearing patterns which would in turn influence their labor force participation. Another is that by reducing women's uncertainty about the risk of becoming pregnant, sexual education could encourage human capital investment and career-building. If women are surer that they will not have to take time off work due to pregnancy, then they can be surer that they will have the time necessary in the labor force to make such investments worthwhile. Thus by influencing actual fertility or expected fertility, sexual education could alter women's life-cycle work behavior.

In this paper, fertility refers to a woman's outcomes regarding pregnancy and childbearing. Thus it encompasses aspects both of biological fertility and of choices regarding sexual behavior and birth control. Work behavior is measured using weekly labor force participation data, so labor force status is defined as whether a person is working or not working each week.

The results indicate that work behavior patterns do differ substantially for women; females who have taken a sexual education course have higher labor force participation during their fertile years than those who have not. The trends for these two groups converge at the end of the fertility period, supporting the hypothesis that the mechanism by which sexual education affects work behavior is through the timing and control of pregnancy. As seen in Graph 1, in a simple regression of labor force status on age terms women without sexual education have a substantially higher labor force participation rate

than women who have not had such a course. This gap narrows at the tail end of women's main fertility years, and the two trends meet just before age 40. This graph shows that there is some correlation between sexual education and work behavior in the data. The graph is simplistic, however, and in the main estimation this analysis seeks to control for the unobserved heterogeneity that exists in the form of family and regional characteristics that may influence both the likelihood that a girl receives sexual education and the likelihood that she later works outside the home.

Graph 1. **Labor Force Participation of Females Separated by Sex Ed Status Regressed only on Age Terms**



Background

For most people who were teenagers and young adults in 1979, abortion has been legal and chemical birth control has been on the market for their entire sexual lives. During their youth, sexual education was a contentious issue but nonetheless many people received some form of a sex ed course. The information in this sex ed course probably included the use of contraception, as this was before the strong push towards

abstinence-only education in the 1980s. The cohort of people who received this education has lived in a time of greater sexual and reproductive freedom than the generation that preceded them, but not everyone within the cohort has had equal access to the options and knowledge relating to sexuality and pregnancy that existed at this time. This paper seeks to determine if differences in exposure to sexual education matters for women's subsequent work behavior.

Over the past decades, some reproductive options have widened, while others have narrowed. The Family and Medical Leave Act of 1993 allowed for parents to take a "reasonable unpaid leave" upon the birth of a child and not be penalized in the workplace for doing so. Although this provision applies to both men and women, it is still mainly women who are expected to shoulder the burden of childcare, and thus it is mainly women who take advantage of this provision. Before this law, the possible consequences of becoming pregnant were drastic; a woman risked losing her job permanently by having a child. The consequences of doing so today are still significant, but less severe. Given that this law guarantees unpaid leave, women may keep a job but often still lose the ability to support themselves when they take time off to be with a newborn.

In addition, the federal government now only funds abstinence-till-marriage sex education, so that schools who receive this funding are only allowed to discuss contraceptives in the context of their failure rates. Since the 1980s, all states except California have accepted these funds for some period of time. At least fifteen states will reject this funding for the upcoming year, but up until this point generally more than forty-five states have accepted it. Thus many young people, male and female, have not learned about the proper use of contraceptive methods. From a political perspective, it is

important to know how policies and expenditures relating to sexual behavior affect social outcomes, such as women's labor force participation. This study attempts to address that issue.

Today, about half of all pregnancies in the United States are unintended. Of these, over half end in induced abortion and about a third are carried to term.[1] The labor force consequences of unintended pregnancy for women can range from minimal to having to leave work for several months. But even women who do not actually become pregnant are likely affected by the possibility of an unintended pregnancy. The uncertainty associated with whether she will be able to work for an extended period of time may affect a woman's career decisions as well as her human capital investments. As she plans her life, she may make different choices than a man in a similar position might due to the expectation that, if she becomes pregnant, she will need to take time off to give birth and take care of the child.

The expectation of unemployment or lack of wages resulting from pregnancy may have significant economic consequences in terms of the type of human capital investment and work a woman will choose to pursue. Thus, her perceived risk of pregnancy will likely affect these decisions. This study investigates how perceived and real changes to the chance of pregnancy due to sexual education change women's life-cycle labor force supply. In particular it examines how the reproductive knowledge provided by sexual education affects women's lifetime work behavior as compared to men's.

[1] Henshaw, 1998.

Literature Review

This analysis stems from two separate previous veins of work. One connects reproductive options such as contraception and abortion with women's work behavior while the other examines the effects of sexual education on sexual activity. Before merging these two threads into one cohesive landscape, I summarize the relevant existing research in each.

Studies of Effects on Labor Force Participation

The data on the connection between reproductive options and women's labor force participation has only recently begun to be examined. All of the following studies are based off of data from the first legal availability of contraception and abortion. Like the present paper, they propose changes in fertility patterns as the mechanism for the connection between the explanatory variable and women's labor force participation.

David Kalist (2004) analyzes data from the years before *Roe v. Wade* when some states allowed abortion while others kept it illegal. Only comparing states within the same area to minimize regional differences, Kalist finds that women's labor force participation increased in those states with early legalization. He concludes that access to abortion reduced fertility rates, and therefore allowed women to remain in or enter the labor force. This effect was especially strong for single, black women.

In a 2006 study Martha Bailey finds that the introduction of the first birth control pill led to no changes in total number of children, but did affect the timing of fertility. In turn, this increased women's total life-cycle labor force supply. Bailey works with data from 1960s, when the first chemical birth control was introduced. She exploits the

differences in state definitions of legal adulthood as an exogenous variable that affected women's access to the pill. Because a state's recognized age of adulthood varied without relation to its public support or lack thereof for contraception, Bailey is able to use this variable as an instrument to determine how access to the pill affected women's work behavior. In those states with a lower age of adulthood and therefore earlier legal access to the pill, women's labor force participation increased as compared to those living in states with higher ages of adulthood. Bailey concludes that birth control allowed women to plan pregnancy more effectively, allowing them to work more total weeks without altering their total fertility.

Using a similar technique, Goldin and Katz (2002) find that women with earlier access to the pill were more likely to marry later, make career investments, and be represented in traditionally male occupations. They conclude that the pill "immediately lowered the costs to women of engaging in long-term career investments" while it also encouraged a delay in marriage among all young people that reduced the social costs to women who postponed matrimony to invest in careers. Thus, the pill augmented women's ability, both directly and indirectly, to make human capital investments and to plan lifelong careers.

Studies on the State of Abortion, Contraception and Sexual Education since 1979

It is clear that there are concrete labor force consequences for women who become pregnant. Whether it's through a few days off or a choice to leave the labor force entirely, being pregnant and the possibility of having children affects women's work

behavior. As such, it is important to understand the landscape in which women become pregnant and choose either to maintain or to terminate their pregnancies.

More than 40 percent of women in the United States become pregnant at least once by the time they reach age 20.[2] According to a review by Stanley Henshaw, unintended pregnancy has declined slowly over time but still made up about half of all pregnancies in 1994. So, a large number of women become pregnant when they aren't planning to have children. Henshaw found that half of these unplanned pregnancies ended in abortion, and that thirty percent of women between the ages of 15 and 44 had already had an abortion. From this data, he estimated that at 1994 rates, "women can expect to have 1.42 unintended pregnancies by the time they are 45, and at 1992 rates, 43 percent of women will have had an abortion" by that age.[3]

In 2006, the Guttmacher Institute published a more conservative estimate, predicting that 40 percent of unintended pregnancies would be terminated and about a third of American women would have an abortion by age 45. But not all populations use abortion services equally. According to the Institute, women of color are 2.5 to 4 times more likely than white women to have abortions, and over half of all women who seek abortions are younger than 25. Two-thirds of women who have abortions have never been married, but 60 percent have had one or more children[4]. This study does not elucidate the size of the overlap between these two groups. Interestingly, teenagers are now more likely to maintain unplanned pregnancies than those over the age of 20.[5]

[2] Kirby, 1994.
[3] Henshaw, 1998.
[4] Guttmacher Institute, 2006.
[5] Henshaw, 1998.

Almost 90 percent of the women who procure abortions are living in "metropolitan" areas, meaning that the abortion rate in these areas is twice as high as the rate in non-metropolitan areas.[6] This is probably due, in part, to the availability of providers, but it is also likely correlated with views on the morality of abortion as well as the likelihood that women work. Thus, it is critical to take regional characteristics into account in a study on the connection between reproductive options and women's labor force participation; otherwise there will almost certainly be unobserved heterogeneity due to the differing social climates of urban and non-urban areas.

Other factors that could play into a woman's decision to get an abortion include education and religious affiliation. Jones found that those who completed college were about half as likely as women with any lower education level to get an abortion. She also found that Protestants and Catholics made up the majority of people who sought abortions, but that their abortion rates were about 10 percentage points lower than people with another religious affiliation or none at all.[7] Since these factors seem to influence birth rates among different populations, they are included in this study as controls.

The reasons women cite for choosing to have an abortion reveal how access to reproductive options could affect their work behavior. Two of the main explanations given are not being able to afford a child and a fear that responsibility for a child would interfere with work, school, or the ability to care for dependents.[8] Thus, access to abortion services may allow women who become pregnant unintentionally to remain in the labor force and maintain or work towards their financial solvency.

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[6] Jones, 2002.
[7] Ibid.
[8] Guttmacher Institute, 2006.

The Guttmacher Institute, a research center focused on reproductive health, also found that income levels are correlated with unintended pregnancy rates and with abortion rates. The abortion rate among women living below the federal poverty level is four times that of women living at over 300 percent of the FPL. Over the past few decades, unintended pregnancy rates have decreased among wealthy women but have increased among low-income women. In other words, women who tend to have less information about and less access to contraceptive methods are more likely to become pregnant unintentionally.

This elucidates why exposure to sexual education might affect rates of unintended pregnancy, and through it, work behavior. Of women between the ages of 15 and 19 in 1986, 68 percent had had sexual education including information on pregnancy and contraception. 16 percent had education on pregnancy only, and another 16 percent received no sexual education at all.[9] According to Dawson, having sexual education doesn't seem to influence age of first intercourse but does affect knowledge and use of contraception. Kirby found differently, concluding that certain types of courses have had significant effects on sexual behavior. Some programs delayed first intercourse, increased contraceptive use, and/or lowered pregnancy rates in the short term.[10] But it is not clear if these courses have significant long-term effects or if they affect behavior only when they are immediate. However, neither of these studies attempted to control for family or regional fixed effects that might influence both the availability of sexual education and the probability that a teenager would have sex.

[9] Dawson, 1986.
[10] Kirby, 1994.

In contrast to Dawson and Kirby, Oettinger did control for these family and regional effects and found that participation in a sexual education course actually lowered the age of first intercourse for girls though not for boys. His explanation for this phenomenon was that sexual education was a significant factor in shaping girls' perceived and real risks of pregnancy. In other words, perhaps having knowledge about contraception made sex seem less of a risk to girls who might have abstained without this assurance. Oettinger also found less consistently that taking a sex ed course increased the probability of pregnancy. He concluded that sexual education must have some bearing on girls' knowledge of contraception because although they tended to engage in sexual activity at an earlier age, this change was not accompanied by a commensurate increase in pregnancy rates. Oettinger noted that his study was limited in that it only looked at age of first intercourse and not at other patterns of sexual behavior, so it is still unclear how sex ed might influence teenagers beyond that initial encounter.

Oettinger's study is particularly relevant for the current one because of its data and methodology. It used the National Longitudinal Survey of Youth (NLSY) dataset and exploited the presence of siblings in the data to control for community and family characteristics in its study of sexual education and sexual behavior. The current study attempts to investigate labor force participation, a variable that does not concern Oettinger, through a similar method and also using the NLSY data. While past studies of the effects of contraception and abortion on women's labor force participation have used natural experiments, this one uses contrasts between sisters and between brothers as a sort of natural comparison. Studies based on natural experiments rely on the assumption that the explanatory change is independent from other factors that might influence the

outcome. So Bailey's analysis of the effect of the pill on women's labor force participation is valid only insofar as the age of adulthood in a state is truly uncorrelated with the attitudes toward women working and women's ability to work in that state. This assumption seems fairly plausible.

More suspect is the assumption that Kalist makes in his analysis of the effect of abortion on women's work behavior. For his natural experiment he assumes that certain states had similar enough social climates to compare women's labor force participation in those that had legal abortion already versus in those that didn't before *Roe v. Wade* was handed down. For this analysis to be valid there must not be a reason that particular states had earlier legal abortion that would be correlated with the likelihood that women work. It seems likely that those states with more progressive ideas of gender roles would be more likely to support both legal abortion and women in the workplace. If this is the case, then Kalist's assumption does not hold and his results are voided. Thus, a natural experiment analysis is subject to pitfalls because of the difficulty of finding a spontaneous change that is truly uncorrelated with other factors that might influence labor force participation.

By employing a fixed effects estimate as Oettinger does, this study avoids having to make this type of tenuous assumption. Household fixed effects by sex control for many variations in background, region, upbringing, and political and social climate that would influence both sexual education and women's work behavior. This type of estimation has its own set of challenges, however, which I will address later in the empirical section. The next section explains the theoretical mechanism for a connection between sexual

education and women's labor force participation. This is followed by an explanation of the empirical model and data, after which I present my results.

Theoretical Background

David Kalist found that women who do not participate in the labor force tend to be younger, have more children, less education, and live in higher income households than those who work outside the home. Of these factors, the availability of sexual education should most directly affect the number of children women have, especially at younger ages. It may not affect the total children a woman bears, but rather the timing of these children, as Martha Bailey found no statistically significant effect of chemical birth control on total completed fertility. But, she did find significant differences in the labor force participation patterns of women with and without early legal access to the pill.

The mechanism behind such a phenomenon is most likely that by allowing women to plan pregnancy to when it is most convenient for their careers, birth control reduces interruptions to or withdrawals from labor force participation or investments in training or education. It also reduces the uncertainty women may have about the possible payoff to investments in human capital, since it allows them more control over the time they will have to reap its benefits. Sexual education might act similarly to increase the expected rate of return for human capital investments. In this way, it seems plausible that access to and knowledge about reproductive options would make women more willing to make human capital investments and to enter the labor force.

But abortion, chemical birth control, and sexual education all act in different ways to accomplish this end. The availability of abortion should lead to less uncertainty about future time in the labor force because it acts as a sort of insurance policy, just in case a

woman who is not planning to become pregnant does so. And as with other types of insurance, there may be a bit of a moral hazard effect in this case; because women know abortion is an option, they may be less vigilant in using birth control. But the final effect of this availability theoretically, should be fewer unexpected shocks to labor force participation as women avoid full-term pregnancies and therefore avoid long absences from work associated with pregnancy and birth. Its availability may also increase overall labor force participation due to the certainty it provides that a woman will not have to interrupt her work. Chemical birth control reduces the number of unplanned pregnancies by preventing conception, which should also lead to fewer unexpected lapses in labor force participation. Since use of this medication leads to more certainty for women planning their life-cycle labor force supply, birth control may influence career choices and could also increase human capital investments and career-building.

Sexual education may influence work behavior by enhancing access to or knowledge of these other methods; theoretically, it may reduce the chance of pregnancy by informing women of their reproductive options. The mechanism I propose for this effect is that sexual education can alter women's fertility timing by providing knowledge of the reproductive system and of contraceptive methods and abortion which give women more control in pregnancy decisions. By informing women of the risks of sex and of ways to mediate those risks, sexual education could change women's fertility patterns and could thereby alter women's life-cycle work behavior.

Sexual education may also provide more certainty about future labor force participation. In this way, it could influence the work behavior even of women who have not become pregnant. Imagine two young women who are identical except that one has

taken a sex ed course while the other has not. Neither plan to have children in the next few years. If sexual education provides a woman concrete knowledge about her reproductive options, then she will be more certain than her un-sexually educated peer that she can avoid pregnancy if she so chooses. Thus her expected fertility for the years to come will be reduced as compared to her peer. On average, then, this would give her more confidence in building a career and entering the labor force than a woman in her same position who had not received sex ed.

If this theoretical model holds, I would expect women's labor force trends to diverge according to sexual education status while men's should not, since most men do not exit the labor force for decent chunks of time when they have a child. Most men do not plan their careers taking into account the possibility that they will need to take a few months or years off work to care for a baby. Women tend to be cognizant of the chance of becoming pregnant when planning their work behavior; thus there is the possibility for sexual education to influence either the real or perceived chance of pregnancy and through it future labor force participation. Of course, there is a strong potential for unobserved heterogeneity related to regional differences, family differences, and social beliefs and norms which might influence both the availability of sexual education and the likelihood that women work. Empirically, it is critical to take these factors into account.

Empirical Methods and Data

This study will be the first to my knowledge examining the correlation between sexual education and women's life-cycle work behavior. Though the aim is primarily to understand women's outcomes, men are also included in the study. Since changes in

fertility and fertility expectations likely affect men's work behavior differently than women's, data on men are useful to understand if sexual education actually affects fertility behavior or if unobserved factors only make it appear as though it does. This analysis uses men as a comparison group for women in studying this phenomenon.

The main empirical challenge in this analysis is controlling for the unobserved heterogeneity between sexual education and labor force status. This study attempts to take into account the aforementioned unobserved family and regional effects using sibling groups available in the National Longitudinal Survey of Youth to create a fixed effects panel data estimate. Using fixed effects eliminates the assumptions necessary for a natural experiment or policy analysis, but it entails challenges of its own.

There are several restrictions on the sample imposed in this study. Since I hope to see the effects of these variables through their effects on fertility, I restrict the observations to people between the ages of 14 and 40. This is consistent with sample restrictions in the studies on reproductive options and labor force participation discussed above. It is particularly convenient with the dataset used in this analysis because not everyone in the sample has reached age 40 by the last year observed, so observations for ages beyond it would begin to dwindle. The sample will also be restricted to people who have siblings within the NLSY dataset since effects will only be identified off of differences within a household. Additionally, for the initial fixed effects estimate the sample is limited to those people with values for labor force participation, sexual education status and several other individual explanatory variables. There may be a selection effect based upon those who are willing to answer questions about sex ed for

which it is necessary to take into account those people who do not have values for these questions, and I will address this momentarily.

In the fixed effects model, the outcome is the discrete variable of whether or not a person works during each week of the year. The explanatory variable of interest in this equation is sexual education. Beyond the fixed effects, the model will include other factors that are commonly thought to affect labor force participation and that may differ between siblings. These controls include number of children, race, education and the unemployment rate of the area. It also seems likely that the type of area in which a woman lives affects her labor force participation. One unobservable that will play into this model is how conservative or progressive an area is in terms of gender roles. This analysis uses the urban-ness of an area and a question about support for traditional gender roles to take this into account.

The equation for this model is as follows:

$$LaborForceStatus._{f_1} - LaborForceStatus._{f_2} = \beta_0 + \beta_1(SexEdR_1 - SexEdR_2) + \beta_2(XR_1 - XR_2)$$

where X represents a set of characteristics generally thought to affect work behavior, SexEd represents a person's sex ed status, and labor force participation represents whether a person was working during each period. The difference between the labor force status for f1 and f2, two siblings, is proposed to be a function of the difference between their sexual education statuses and the difference between the other factors that influence work behavior.

Since respondents may not be completely open in their responses to questions about sexual education, a selection model is incorporated into this study. Using respondents' religious affiliation as a proxy for willingness to answer this question, a

Heckman selection model is created. This is based upon the premise that people who are less religious may also be more open in talking about sexual education with an interviewer. Using these variables to create a selection model within the fixed effects regression will decrease the efficiency of the regression but will correct for response bias if it exists.

The ideal data for this study include panel data on work behavior, information about sexual education courses, and other data relevant to labor force participation. The dataset needs to track the same individuals over a number of years for the analysis to identify life-cycle patterns in work behavior. Ideally, there would be no attrition from the study, so that all people who were observed in the first year would also be observed in later years. In addition, the data need to include some way to control for unobserved heterogeneity, whether this is through a natural experiment or a variable from which one can identify a fixed effect.

The actual data for this come from the National Longitudinal Survey of Youth which has followed the same respondents from 1979 to today. There is a decently large attrition rate, however, so of the original 12,686 respondents, about 5,000 were not interviewed in 2002. The NLSY includes data on weekly labor force participation, sexual education, and other factors that are commonly thought to be associated with work behavior. These include age, race, gender, number of children, and educational levels. The scope of this data is wide. The NLSY asks a variety of questions and follows to the present day a cohort of thousands of Americans who were between the ages of 14 and 22 in 1979. It also presents an opportunity to control for regional and family effects because all the eligible residents of a particular household were included in the study. Thus, a

fixed effects estimation can eliminate a wide variety of unobservables by comparing respondents with their siblings who were also interviewed in the survey.

Results

The main sample in this analysis is restricted to people who answered questions about labor force participation and sexual education history. The National Longitudinal Survey of Youth collected data on all eligible members of a family and has tracked those individuals since the late 1970s. As such, there are several thousand siblings in the dataset. This analysis exploits this feature to control for family and community effects by household and by sex. It controls for differences between families by comparing respondents against their siblings of the same sex, and thus also controls for community, regional, and social factors that might cause individuals' sexual education and labor force statuses to differ.

Since a fixed effect estimate will only identify effects based off of differences within a household, the sample is also restricted to people with siblings in the dataset. To test my hypothesis that sexual education would have different effects for men and women, I further restricted the sample to multiple siblings of the same sex. Women will be compared against their sisters and men will be compared against their brothers. In other words, a woman with a sister in the dataset would be included in this regression, while a woman with a brother would not be.

These sample restrictions could be problematic if one believes that people without siblings in the NLSY, who would not be included in the sample, would have significantly different sexual education or work behavior from people with siblings. But there seems to

be no evidence that only children would have different labor force participation than people from larger families, though there is a documented correlation between increasing family size and decreasing education levels.[11] So, if a correlation does exist between the number of siblings and work behavior, including education level as an explanatory variable should help to control for this.

The sample is also limited to the years between 1979 and 2003. This is to limit the effects of respondent attrition on the analysis, since in later years when fewer people are surveyed, the results are more vulnerable to the behavior of a few individuals. It seems that this attrition does indeed have some effect on the data because in 2004 and 2005, the data that exists shows a jump in labor force participation rates from previous values in the low 80 percents to values in the 90 percent range. For similar reasons, I restrict this analysis to people aged 14 to 40. With an older cutoff age, few people would have reached it by 2003, thus making the analysis less robust. This range of ages is particularly useful, however, because it spans women's main childbearing years.

Now I turn to the preliminary results of this analysis. Those which correspond with graph of women's labor force participation by sexual education presented at the beginning of this paper, plus the statistics for males, appear below. This simple regression was performed to get a sense of the correlation between sexual education and labor force status without controls. It included only the variables listed below.

[11] Hanushek, 84.

Table 1. **Coefficients for Sexual Education and Age as Explanatory Variables for Labor Force Status**
N = 3,551,065

Variable	**Female**	**Male**
Sex Ed	0.057 (0.0007)**	0.035 (0.0006)**
Age	0.039 (0.004)**	-0.016 (0.003)**
Age^2	0.006 (0.0007)**	0.018 (0.001)**
Age^3	-0.001 (0.00006)**	-0.002 (0.00005)**
Age^4	$0.00004\ (2.51^{-06})$**	$0.0001\ (2.06^{-06})$**
Age^5	$-6.13^{-07}\ (3.69^{-08})$**	$-1.07^{-06}\ (3.02^{-08})$**

Note: For all tables included in this paper, coefficients are followed by standard errors in parentheses. Coefficients significant at the 95% confidence level are indicated by an asterisk while those significant at the 99% confidence level are indicated by two such symbols.

In this table, the coefficient for sex ed can be interpreted as the average difference at age 14 between people who have taken a sex ed course and those who have not. The age variables attempt to model the age trend in labor force participation using 14 as the base age. In this basic analysis the coefficients for sex ed for both sexes are highly significant. Also, the coefficients for women and men who have had sex ed are different, and indeed a formal test rejects that sexual education has the same association with men's labor force participation as it does with women's. This suggests that, at the very least, taking sexual education is correlated with factors that differentiate women's labor force trends from men, such as fertility. This preliminary regression leads us to wonder whether the correlation between sex ed and labor force participation can be explained by other factors not included in this model, or whether an actual relationship exists between these two variables.

The more complete analysis relies on household fixed effects to control for many factors normally associated with differences in labor force participation and in sexual education. To check that this type of estimator was in fact necessary, I compared the fixed effects regression against the more efficient random effects estimation of the same variables with a Hausman test. With a chi-square value of 0.000, I reject the hypothesis that the results of the two estimators are essentially the same. So, fixed family and regional attributes do matter for the results of this regression. These may include regional and social characteristics such as growing up in the South or the North, living in a rural or urban area, and the quality of schools in the area. The fixed effects estimator also controls for differences between regions that might influence whether or not schools offer sexual education. Finally, it controls for respondents' disparate family environments including religious affiliation, political leanings, and ideas about gender roles.

But there are obviously still differences within families, between sisters and between brothers, that must be taken into account in a complete estimation. So, this analysis also includes variables to control for characteristics that might differ between siblings. Such variables include race, year of birth, the type of area in which they were living at age 14 (city, country, or farm), the unemployment rate of the area in which they live each year, the urban-ness of that area, the number of children they have, how many children they expect to have, and if the person who influenced them most would disapprove of their begetting no children. Additionally, it includes data on respondents' religious affiliation, education, and whether they believe traditional husband-wife roles are best.

Variable interactions were created with gender for most of these factors to allow the model to show their effects separately for women and for men. For example, the dummy variables for sex are interacted with that for having children, considering that the birth of a child might have different or even opposite effects on work behavior for a woman and a man. Similarly, the variable for belief in traditional husband-wife roles is interacted with sex due to the prediction that such a belief would have opposite labor force consequences for men and women.

The model also includes interaction variables between sexual education status and age, considering that any effects that sex education might have may change over time. If expected or actual pregnancy is indeed the mechanism through which sexual education works, and fertility changes over a person's lifespan, then it seems plausible that the correlation between sexual education and labor force participation might fluctuate according to childbearing patterns. These interaction variables give flexibility to the model and allow it to take into account more accurately the shifts that occur over time and the differences in behavior between women and men.

The fixed effect estimate appears in Table 2, and a graph of the life-cycle labor force trends for respondents separated by sex and sexual education status appears in Graph 2 below.

Graph 2. **Labor Force Participation Trends by Sex and Sexual Education Status**

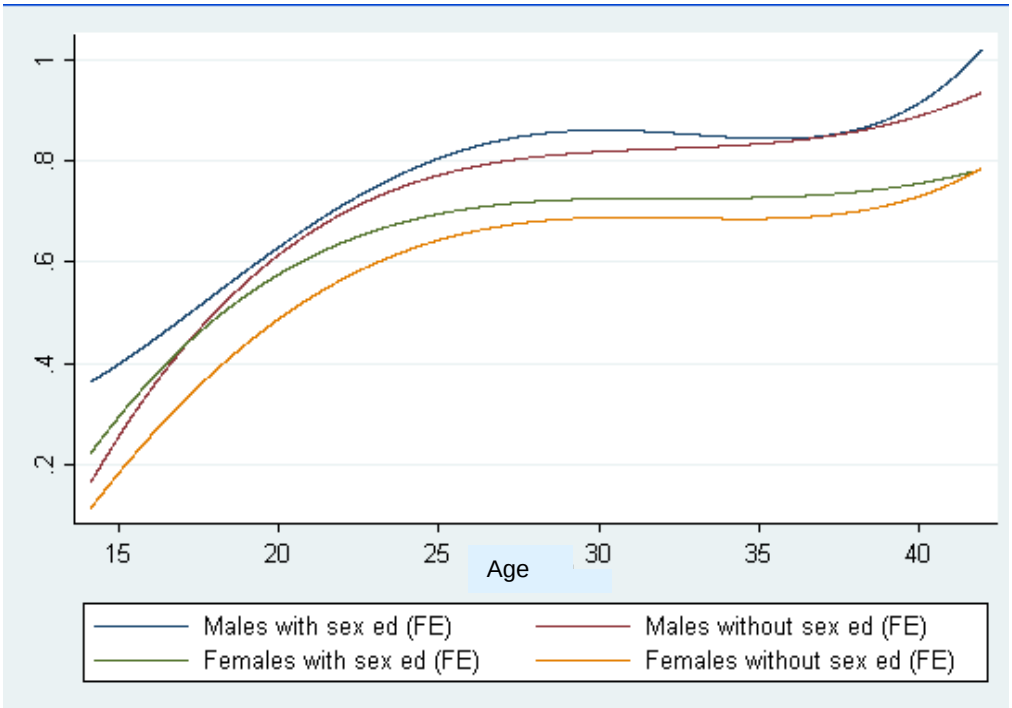


Table 2. **Coefficients for a Fixed Effects Regression of Weekly Labor Force Status**
N = 1432254, Total Sister/Brother Groups = 1305

Variable	**Female**	**Male**
Sex Ed	0.100 (0.023)**	0.005 (0.022)
Age	0.154 (0.011)**	0.091 (0.011)**
Age^2	-0.013 (0.001)**	-0.004 (0.002)
Age^3	0.001 (0.000)**	-0.0002 (0.0002)
Age^4	-0.00002 (9.51^{-06})*	.00001 (9.10^{-06})
Age^5	2.99^{-07} (1.52^{-07})*	-2.80^{-07} (1.46^{-07})
SexEd*Age	-0.004 (0.013)	-0.043 (0.013)**
SexEd*Age^2	-0.003 (0.013)	-0.012 (0.003)**
SexEd*Age^3	0.0002 (0.0002)	0.001 (0.000)**
SexEd*Age^4	-8.55^{-06} (0.00001)	-0.00006 (0.00001)**
SexEd*Age^5	9.22^{-08} (1.78^{-07})	1.06^{-06} (1.72^{-07})**
Time	-0.065 (0.004)**	
Time^2	0.018 (0.001)**	
Time^3	-0.002 (0.000)**	
Time^4	0.0001 (7.99^{-06})**	
Time^5	-2.09^{-06} (-1.64^{-07})**	
Post-1993	0.003 (0.002)	
Year of Birth	0.019 (0.001)**	0.017 (0.001)**
School in the Past Year	-0.075 (0.004)**	-0.145 (0.004)**
Years of Education < 9	-0.027 (0.004)**	
8 < Years of Education < 12	-0.004 (0.002)	
Years of Education = 12	0.043 (0.001)**	
Black	0.583 (0.022)**	-0.101 (0.014)**
Other race	-0.050 (0.008)**	-0.078 (0.008)**
AFQT score[12]	0.003 (0.000)**	0.002 (0.000)**
Any Children	-0.153 (0.001)**	0.049 (0.002)**
Number of Children	-0.031 (0.001)**	-0.011 (0.001)**
Children Expected	-0.0003 (0.001)	-0.019 (0.001)**
Influence on No Children	-0.016 (0.002)**	0.0025 (0.002)
Urban Area	0.035 (0.002)**	0.031 (0.002)**
Unemployment Rate	-0.004 (0.0002)**	-0.007 (0.0002)**
Lived in Country at Age 14	-0.04 (0.003)**	
Lived on Farm at Age 14	-0.112 (0.006)**	
Catholic	-0.09 (0.005)**	-0.09 (0.004)**
No Religious Affiliation	-0.006 (0.004)	-0.043 (0.003)**
Traditional	0.024 (0.002)**	0.007 (0.002)**

[12] This refers to the Armed Forces Qualifying Test, the most widely taken intelligence and ability measure available in the National Longitudinal Survey of Youth.

As would be expected, a higher unemployment rate is associated with a decrease in working among both men and women, while living in an urban area is correlated with an increase. Compared to living in a city at age 14, living in the country or on a farm also decreases labor force participation by several percentage points. A higher Armed Forces Qualifying Test (AFQT) score, which I use as a proxy for ability, is associated with an increase in labor force participation at a rate of three percentage points for a ten point increase in women and about two percentage points for a similar increase for men.

Children are associated with significant differences in labor force participation in this analysis, especially for women. The variables accounting for this include a dummy variable for having any children and a discrete variable for the total number of children a person has. Adding together the coefficients for “Any Children” and “Number of Children” gives the true coefficient for the change in labor force participation associated with having a first child. For women, this first birth is associated with an 18 percentage point decrease in labor force participation, while for men the little tyke is linked to about a 4 percentage point increase in labor force participation. After a few children, it seems that their positive effect on men’s work behavior disappears, while for women more and more children are associated with a continually decreasing likelihood of working. These results are consistent with common conceptions of the labor force consequences for women and men having children.

Turning to racial or ethnic differences, with white folks as a reference group, being black is associated with an increase in working for women and a decrease for men. This is consistent with other research on labor force participation in the African-American population. Being of an “other” race is associated with negative changes in

labor force participation for both sexes compared to whites. Since this estimation uses fixed effects by household, racial coefficients are only identified off of siblings whose race was coded differently. This is likely a small percentage of the sample. Additionally, given the possible heterogeneity of the "other" ethnicity group as well as the fact that it made up only a small portion of this sample, the results associated with race should be interpreted cautiously despite their being statistically significant.

Variables for age and year of birth are associated with positive changes in labor force participation. Individuals born in later years are more likely to work, no matter their sex. The percentage of people working also increases with age, up to a point. To allow for more easily interpretable estimates, age is coded as a person's age in years minus 14, the age at which the youngest respondents in the study began. This allows us to use fourteen years as the base age for the coefficient estimates, and to determine how correlations change over time after this starting point.

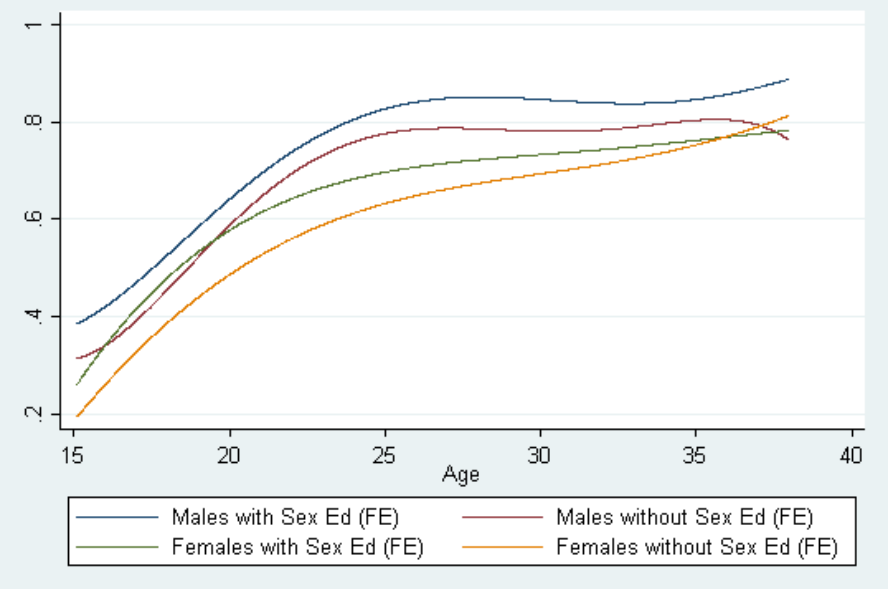
Finally the results of interest for this study, the associations of sexual education status and work behavior, are statistically significant. The data show that, at age fourteen, girls who have had a sexual education class are about ten percent more likely to work than those who have not. Boys at this age do not show a statistically significant difference based on sex ed status. The graph above illustrates the interactions of sexual education status and age, showing the trend that, over time, the association between sex ed and labor force participation decreases for women. What is especially important to note about Graph 2 is that the shape of the trends for the two groups of men are substantially similar over the middle years, while the trends for women differ greatly over the early years but then converge towards the end. This suggests, as the preliminary graph did, that having

sexual education in grade school is correlated with later fertility timing and through this, may affect life-cycle work behavior.

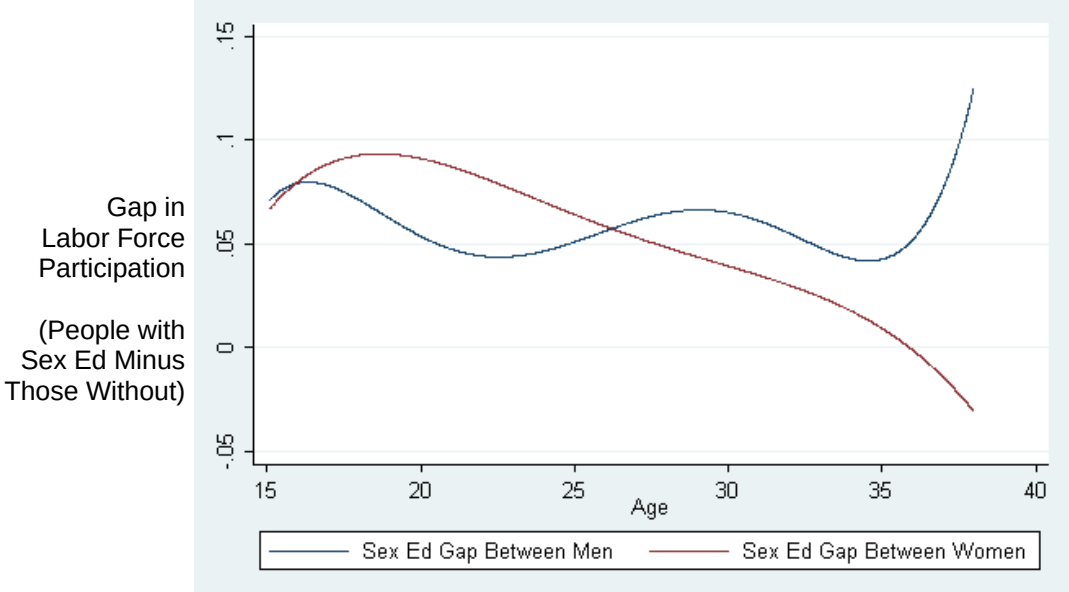
Model with Selection

Because certain types of people might be more likely to answer questions about sexual education than others, and because unobserved characteristics leading to this modesty might also be correlated with labor force participation, I created a selection model for this regression. In a regression of a variable indicating that people had answered the sex ed question on the explanatory variables for the fixed effects model, several variables were statistically significant at the 99% confidence level, indicating that selection was non-random. Since this non-random selection might influence the results of the estimation, I attempt to control for the selection using religious preference, a variable that might predict willingness to answer questions about sex ed. All explanatory variables besides sex ed were regressed on a variable for whether the person answered the question about sexual education history. An Inverse Mills Ratio was generated as the normal distribution density function over the normal distribution probability function of the resulting predicted value that this question would be answered. The IMR was then incorporated into the fixed effects regression to control for selection, from which the predicting variables, Catholic and Non-Religious, were dropped. The graph and table of the estimation results including this IMR appear below.

Graph 3. Fixed Effects Regression Including an IMR for Answering the Sex Ed Question



Graph 4. Difference between Labor Force Participation Within Gender of People with Sex Ed and Those Without



These graphs are somewhat misleading because the regression includes an age variable to each integer power up to five, and thus assumes a fifth-order functional form for age. Five age terms were as many as could be included given software memory limitations. Thus, the downturn for middle-aged men without sex ed (and thus the

upswing in the sex ed-labor force participation gap between men) probably does not actually exist in the data. The same caution must be applied to interpreting the graphs after age 35 or so for women. At the right edge of the regression, due to attrition in the study, the regression is working off of fewer individuals. It is thus more vulnerable to the possibly anomalous behavior of a few people. These graphs do show, however, that from age 15 to 35 the gap in women's labor force participation by sex ed is larger than men's and seems to decrease with age, while the gap for men remains relatively constant. Interestingly, the gap for women crosses under the gap for men at about age 26 or 27, and decreases to zero by age 35, at a time where most women are nearing the end of their childbearing. The somewhat constant gap for men suggests that it may represent some unobserved factors correlated with sex ed and work behavior, while the gap for women also may include an extra effect of sexual education on fertility. As women become less affected by planning for pregnancy, the difference between their labor force participation rates approaches and then crosses under men's.

Selected coefficients for this estimation are given below in Table 3.

Table 3. Selected Results of Fixed Effects Regression Controlling for Selection
N = 1384310, Total Sister/Brother Groups = 1268

Variable	**Female**	**Male**
Sex Ed	0.161 (0.024)**	-0.006 (0.022)
SexEd*Age	-0.024 (0.014)*	0.049 (0.013)**
SexEd*Age^2	-0.002 (0.003)	-0.013 (0.002)**
SexEd*Age^3	-0.0001 (0.0002)	0.001 (0.0002)**
SexEd*Age^4	3.44^{-06} (0.00001)	-0.00006 (0.00001)**
SexEd*Age^5	-5.49^{-08} (1.83^{-07})	1.10^{-06} (1.71^{-07})**

Similar to the fixed effect results, I find a correlation for women at age 14 between having sex ed and working. However in this regression, the coefficient for men's sex ed is not significant. Interestingly, only the coefficient of sex ed interacted with age

to the first power is somewhat significant for women in this regression, while all of those for men are. This is reflected in the fairly linear downward shift in the gap between the labor force participation of women who have taken a sex ed course and those who have not. There are also some fluctuations male sex ed gap trend, leading to a curve that looks fifth-order in nature. This probably accounts for all of the age variables being highly significant for men. Other results for this regression, shown in the appendix, reveal that the coefficients for the variables used in the earlier fixed effects regression were largely similar to the coefficients yielded by that regression.

Interpretation

These results do not necessarily show a causal relationship between sexual education and increased labor force participation for women. However, the both statistically and economically significant difference between the coefficients of sex ed for men and women suggest that something is, in fact, going on here. One possible explanation for this phenomenon is that there is something fundamentally different about the people who took sexual education courses from those who did not. In other words, that some other factor was correlated both with the individual decision to take a sex ed course and with later work behavior. However, Oettinger finds that, during the 1970s when the respondents for the NLSY would have taken sexual education, parents and children had little control over whether the child took sex ed. Even when parents had this control, they rarely made a decision about enrollment based upon an individual child's characteristics. Any variation between households or regions is controlled for by the fixed effects estimation, so I am only concerned about variation between siblings in a

choice to take sex ed. But if respondents and their parents had little control over enrollment in sexual education, then it seems unlikely that there would be something fundamentally different about the one sister who took a sex ed course as compared to her sister who did not.

Another possible explanation is the causal one, that by giving women greater knowledge about and therefore control over their fertility, sexual education increases labor force participation among younger women. This interpretation is supported by the diminishing difference between the groups of women near the end of average childbearing years, suggesting that those who received sexual education did not abstain altogether from childbearing but rather timed their fertility differently. It seems that women who had sexual education probably waited till later in life to have children, allowing for career building in earlier years. It also seems that women who did not have sexual education caught up in terms of labor force participation in these later years. This could be attributed to their gaining knowledge about preventing pregnancy through experience, thus leading to more certainty that they would be able prevent future births. It is also possible that this group tended to work more in later years after younger children grew up. The convergence of these two trends at ages at which women are less likely to have children seems to suggest that sexual education indeed has some sort of effect on expected or actual fertility which in turn alters work behavior. As the likelihood that women will have children decreases, the association between sexual education status and labor force participation also decreases.

Conclusions

Using a fixed effects method by same-sex sibling groups and additional individual explanatory variables, this study estimated the effects of taking a sexual education course on the life-cycle work behavior of women. This method allowed the analysis to control for differences between families as well as differences between siblings. The results of the estimate showed that sexual education is associated with differing labor force trends for women who have taken a sex ed course and those who have not. Women who have taken sex ed show greater labor force participation than those who have not in their teens, 20s and early 30s. But the work behavior of the two groups seems to converge in their late 30s. This convergence was compared to the life-cycle labor supply of men, who seem to show a fixed upward shift in work behavior for those with sexual education. Since the association between sexual education status and labor force participation decreased with age for women while it did not for men, the mechanism for the effect of sexual education on work behavior was interpreted to be an alteration of fertility patterns.

The converging work behavior of women near the end of average childbearing years is consistent with the hypothesis that through effects on perceived or real chance of pregnancy, sexual education influences women's labor force participation. Future studies might more deeply analyze this mechanism using data on contraceptive use, sexual behavior, and attitudes about the chance of pregnancy. Especially in the context of an increasing federal focus on abstinence-only education over the 1980s and today, it will be important to know what effects, if any, this might have in the long-term on women's work behavior. For now, I can at least say that exposure to some form of sexual education

seems to have an effect on either expected or actual fertility patterns, leading to greater employment for younger women but with a diminishing effect over time.

Appendix A: *Table of Full Fixed Effects Results Including Selection*

Variable	**Female**	**Male**
Sex Ed	0.161 (0.024)**	-0.006 (0.022)
Age	0.146 (0.012)**	0.121 (0.011)**
Age^2	-0.011 (0.002)**	-0.009 (0.002)*
Age^3	0.0004 (0.0002)*	-0.0003 (0.0002)
Age^4	-8.49^{-06} (9.51^{-06})	-4.08^{-06} (9.15^{-06})
Age^5	6.79^{-08} (1.58^{-07})	-7.52^{-09} (1.46^{-07})
SexEd*Age	-0.024 (0.014)*	0.049 (0.013)**
SexEd*Age^2	-0.002 (0.003)	-0.013 (0.002)**
SexEd*Age^3	-0.0001 (0.0002)	0.001 (0.0002)**
SexEd*Age^4	3.44^{-06} (0.00001)	-0.00006 (0.00001)**
SexEd*Age^5	-5.49^{-08} (1.83^{-07})	1.10^{-06} (1.71^{-07})**
Time	-0.059 (0.004)**	
Time^2	0.019 (0.001)**	
Time^3	-0.002 (0.0001)**	
Time^4	0.0001 (8.38^{-06})**	
Time^5	-2.69^{-06} (1.73^{-07})**	
After 1993	-0.002 (0.002)	
Year of Birth	0.021 (0.001)**	0.018 (0.001)**
School in the Past Year	-0.059 (0.004)**	-0.129 (0.005)**
Years of Education < 9	-0.053 (0.006)**	
8 < Years of Education < 12	-0.047 (0.002)**	
Years of Education = 12	-0.007 (0.002)**	
12 < Years of Education< 16	-0.065 (0.002)**	
Black	--	-0.103 (0.014)**
Other race	--	-0.092 (0.008)**
AFQT score	0.003 (0.0001)**	0.002 (0.0001)**
Any Children	-0.160 (0.002)**	0.044 (0.002)**
Number of Children	-0.029 (0.001)**	-0.005 (0.001)**
Children Expected	-0.005 (0.001)**	-0.017 (0.001)**
Influence on No Children	-0.033 (0.002)**	0.004 (0.001)**
Urban Area	0.035 (0.002)**	0.036 (0.002)**
Unemployment Rate	-0.004 (0.0002)**	-0.007 (0.0002)**
Lived in Country at Age 14	-0.045 (0.003)**	
Lived on Farm at Age 14	-0.082 (0.006)**	
Traditional	-0.006 (0.002)**	-0.010 (0.002)
Inverse Mills Ratio	0.499 (0.077)**	

Note: The variables Black*Female and Other*Female were dropped from this regression due to collinearity with the Inverse Mills Ratio. Neither varied for the variable that someone would answer or refuse to answer questions about sexual education.

Appendix B. *Descriptive Statistics*

These are presented in the form Female Data/Male Data in each category for comparison purposes. There were 697,359 total observations for females and 734,895 for males.

Variable	**Mean**	**Std. Dev.**	**Minimum**	**Maximum**
Labor Force Status	0.639 / 0.736	0.480 / 0.441	0	1
Sex Ed	0.636 / 0.600	0.481 / 0.49	0	1
Age	27.8 / 27.8	6.86 / 6.86	14.1 / 14.1	47.8 / 47.9
Year	87.8 / 87.8	5.14 / 5.16	80	98
After 1993	0.159 / 0.159	0.366 / 0.365	0	1
Year of Birth	62.4 / 62.5	1.04 / 1.06	61	64
School in the Past Year	0.307 / 0.291	0.462 / 0.454	0	1
Years of Education < 9	0.698 / 0.721	0.459 / 0.449	0	1
8<Years of Education<12	0.11 / 0.12	0.309 / 0.328	0	1
Years of Education = 12	0.072 / 0.059	0.258 / 0.234	0	1
12 < Years of Education< 16	0.088 / 0.067	0.283 / 0.251	0	1
Black	0.295 / 0.298	0.456 / 0.458	0	1
Other race	0.069 / 0.059	0.253 / 0.235	0	1
AFQT score	35.4 / 32.1	26.2 / 26.6	1	99
Any Children	0.476 / 0.239	0.499 / 0.426	0	1
Number of Children	0.87 / 0.43	1.09 / 0.878	0	7 / 6
Children Expected	2.46 / 2.82	1.39 / 1.50	0	9 / 12
Influence on No Children	0.376 / 0.326	0.485 / 0.469	0	1
Urban Area	0.80 / 0.79	0.400 / 0.404	0	1
Unemployment Rate	7.48 / 7.54	3.18 / 3.18	1.5	16
Lived in Country at Age 14	0.150 / 0.156	0.357 / 0.363	0	1
Lived on Farm at Age 14	0.041 / 0.062	0.199 / 0.242	0	1
Traditional	0.398 / 0.560	0.489 / 0.496	0	1
Catholic	0.346 / 0.336	0.475 / 0.472	0	1
Non-Religious	0.09 / 0.127	0.286 / 0.332	0	1

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