Maternal Labor Decisions and the Effects on Adolescent Risky Behavior

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Abstract

This paper examines the effects of maternal employment on the decisions of adolescents to engage in risky behavior. I attempt to control for possible endogeneity of maternal employment by implementing instrumental variables. Ultimately, except for low SES families, maternal labor is found to have no statistically significant effects on adolescent risky behavior. Though low SES adolescents are found to benefit from a working mother, this may be a result of endogeneity; possible endogeneity controls through instrumental variables are ineffective, opening the door to future research with better endogeneity controls.

I. Introduction

Between the years 1975 and 2001, the percentage of mothers with infants who have entered the work force has increased from 31.0% to 55.2% (Ruhm, 2004a). Due to this dramatic increase, the influence that a mother has on her children has been heavily examined in the past few decades in order to determine whether or not this trend is harmful for the children.[1] Most of these studies were done to examine cognitive and behavioral effects of young children whose mothers entered the work force. Nevertheless, the increased number of working mothers has not solely been confined to those with young children. Within the same time frame, the percentage of mothers with school-age children who have entered the work force has increased from 47.4% to 73.1% (Ruhm, 2004a). Is it commonly accepted that mothers' labor choices may only deleteriously affect *young* children? No, recent research has been conducted on the effects on adolescents and how this age group is coping with parental labor decisions (e.g. Lopoo, 2004; Hillman and Sawilowsky, 1991).

Many may believe that, as a child grows, less supervision is necessary. When the teenage years are reached, autonomy can be given to the children without any problems. Though on the surface this may seem intuitive, there is evidence that points otherwise. Adolescence is an important turning point in the lives of children. Though they are children, they have the desires to participate in adult activities (Hillman and Sawilowsky, 1991). Passive parental households where teenagers have more autonomy witness more deviant activities (Dornbusch et al., 1985). Less parental supervision may also result in increased drug abuse: "eighth-grade students, who took care of themselves for 11 or more hours a week, were at twice the risk of substance use as those who did not take care of themselves at

[1] See Haveman & Wolfe (1995) for a review of methods and findings over the past few decades.

all" (Richardson et al., 1989, p. 556). Thus, for these reasons and more, it is very important to understand the effects that working mothers have on their teenage children.

There exists a very large amount of literature pertaining to cognitive and behavioral effects on children due to parental labor choices. As was previously mentioned, many researchers have chosen to focus on the cognitive effects of working mothers on children before entering grade school. There is still no consensus in the findings: Blau and Grossberg (1992) find that there are no net cognitive effects, while Ruhm (2004b) finds deleterious effects.[2] Researchers have also examined the effects on the *behavior* of young children once their mothers decide to work (e.g. Harvey, 1999; Han, Waldfogel, and Brooks-Gunn, 2001) with either no effects or slightly negative effects that persist through a child's development. Other researchers have decided to examine the effects of working mothers on adolescents (e.g. Hillman and Sawilowsky, 1991; Dornbusch et al., 1985; Richardson et al., 1989). An adolescent is in a very sensitive period in life when parental influence is important (as previous examples indicate). Thus, many researchers have pondered the effects of a mother's employment on this age group.

Ruhm (2004a) studied both academic and behavioral effects on children aged 10-11. He has found a general deleterious effect on academic abilities due to maternal employment, but a slight improvement in behavior (contrary to most other studies cited in the paper). He also examined these effects between different socioeconomic groups. Though his research using the Behavioral Problems Index (BPI) begins to touch on important issues, it would be important to examine more specific behavioral effects on adolescents that a general index such as the BPI cannot give. Ruhm concentrates on this index alone and this is where

[2] Both studies examine the effects on children during their first four years of life.

additional research can be done to examine behavioral effects beyond the BPI. Though this test has a good general estimate of behavioral problems, it lacks the nuance necessary for an in-depth analysis. The BPI considers factors such as depression, headstrongness, and hyperactivity, but doesn't measure other factors well, such as delinquency, drug use, or psychological problems. Ruhm spends much time on many different analyses (cognitive effects, SES effects, and behavioral effects), therefore not allowing for much depth into the specific behavioral effects on teenagers.

Although there is a plethora of research regarding cognitive outcomes of adolescents with mothers who work (e.g. Haveman and Wolfe, 1995; Heyns and Catsambis, 1986; Muller, 1995), there has yet to be the same large amount of investigation into the more social effects on these adolescents. As Ruhm (2004a) himself claims, many of his findings in low delinquency problems may have resulted from the fact that he analyzed data on 10-11 year-olds. Thus, I propose conducting similar research as Ruhm, but extending this to the 14-17 year-old range. Children in this age range have greater access to drugs and alcohol and are generally more capable of deviant behavior than 10-11 year-olds. This paper will examine the effects on the behavior of adolescents (ages 14-17 [high school]) due to a mother choosing to work during this time in their lives. The measures of behavioral problems will be termed "risky behavior:" engaging in sex, drinking alcohol, hurting another person enough to require bandages or a doctor's attention, stealing something from a store without paying for it, or damaging school property. Rather than focusing solely on the BPI, I will examine these specific risky activities in which adolescents may be involved.

Much past research has focused on only a few social problems such as substance abuse patterns (e.g. Hillman and Sawilowsky, 1991), teen pregnancies (e.g. Lopoo, 2004),

and deviance (e.g. Dornbusch et al., 1985). It will be important in this paper to examine teenage problems on a larger scale, including those risky behaviors previously listed. Aughinbaugh and Gittleman (2004) examine many of the same risky behaviors that I will examine; they find that there is no strong evidence to support the hypothesis that maternal labor choices affect adolescent risky behavior. They examine a broader age group than this paper will examine (14-22 year-olds); perhaps cutting out the 18-22 year-old range will obtain different results since "children" in this older age range are probably not affected as much by their mother's labor decisions than teenagers.

This paper will also divide the data groups into different subsections in order to find any important patterns within these different groups. For example, one division will examine the maternal labor effects within married families versus labor effects within other families.[3] The second division will separate the families into different socioeconomic groups: those families with a "high," "middle," and "low" socioeconomic status (SES). The amount of literature examining these various subgroups is also lacking; Ruhm (2004a) makes this point himself and claims that there has been only "peripheral attention" to the SES subject in papers such as Brooks-Gunn et al. (2002) and Lopoo (2004) (p. 18). The effects of maternal employment on the behavior of these different subgroups will be important to examine since some have been found to differ in the past (Ruhm, 2004a).

This paper finds that, whether examining all of the families in one group or dividing them into different subgroups, there is no statistically significant effect on adolescent risky behavior due to a mother's labor decisions. The only exception occurs within the low socioeconomic group. Here, a mother's choice to work is found to decrease the probability

[3] Here, "other families" is defined to be those mothers who have never been married or have been divorced, separated, or widowed.

that her adolescent will engage in risky behavior; nevertheless, possible data problems[4] leave this conclusion questionable.

I will begin with a review of the large amount of relevant literature in Section II. In Section III, the economic theoretical framework of the paper will be formed. In Section IV, the data on the families will be presented. I will then discuss the empirical specification in Section V, explaining the regressions of the paper. Section VI will have some concluding remarks, as well as a discussion for avenues for future research.

II. Literature Review

Much of the literature on this topic comes from subject areas outside of economics (e.g. psychology, sociology, childhood development). The available economic literature in the past has concentrated on modeling the attainments of children based on theories of family behavior. Input and output models of time and wealth have attempted to describe the cognitive and behavioral outcomes of children. The allocation of scarce resources such as time and money have been used to determine the effects on variables such as math scores or the number of times drugs have been used within particular years. Though much of the past research investigated young children, recent years have seen more focus on the adolescent age group.

Research on the topic of maternal labor effects on children has branched into two categories: (1) an examination of academic and cognitive effects on children due to maternal employment and (2) an examination of behavioral and socio-emotional effects on children

[4] Possible endogeneity problems with the independent variables will be addressed in Section V.

due to maternal employment. Where academic and cognitive effects garner the majority of the research (e.g. Hickman, 2006; Ruhm, 2004a; Altonji and Dunn, 2000), there is still a large amount of studies on behavioral and socio-emotional effects (e.g. Lopoo, 2004; Ruhm, 2004a; Dornbush et al., 1985; Hillman and Sawilowsky, 1991). This review will focus solely on the latter. In these behavioral studies, both young children and adolescents are observed to find effects in their lives due to maternal labor choices. For this paper, studies on adolescents will be most relevant.

Literature Outside Economics

Outside the economic literature, the research of Hillman and Sawilowsky (1991) addresses helpful substance abuse issues, but lacks some important qualities in the sampling techniques. In this work, 51 ninth-grade students were given a survey in a Midwestern suburban high school. The paper found that the employment status of mothers does not seem to affect substance use patterns of early adolescents. There are a few problems with this work that will be addressed. First, this sample was obtained from a Midwestern suburban high school. For the uses of comparing different subgroups (e.g. SES), it will be important to obtain sampling data from students in suburbs, cities, and everything between. Second, the availability of drugs and the opportunities of delinquency may be limited in a suburban town. It will be important to include cities that have public transportation and a larger number of people, including more possibilities of delinquent behavior. Third, a sample size larger than 51 students will be helpful in examining more problems over a larger sample. Fourth, including more teenagers (rather than only those in the ninth-grade) will create a more comprehensive study of that particular age group.

Other research outside economics is similar to the previous one in that some focus on only particular aspects of social behavior (e.g. Richardson et al., 1989), use a small sample size for data analysis (e.g. Hillman and Sawilowsky, 1991), or don't examine differences in socioeconomic classes (e.g. Patterson and Stouthamer-Loeber, 1984). Though each piece of research tackles specific problems in different ways, it will be helpful to examine all of these problems in a comprehensive review, splitting the results into different subgroups.

Literature Within Economics

The relatively few economic articles pertaining to this topic specifically is an indication of the need to continue to research this field using more economic methods. Recently, Aizer (2004) continued with the model that Becker and Tomes (1976) created to analyze parental supervision and its effects on a child's behavior. Aizer used the National Longitudinal Survey of Youth (NLSY) to research 10-14 year-old children. She found that children with adult supervision are less likely to skip school, use alcohol or marijuana, steal something, or hurt someone. The implementation of family fixed effect variables allowed Aizer to control for unobserved characteristics that might have influenced the effects on the child.

Another economic approach by Lopoo (2000) examines social effects on children due to maternal labor choices and differences between different socioeconomic classes. In this work, it is found that teenagers with working mothers in more wealthy schools are 77% more likely to have a birth compared to their counterparts in similar schools with non-working mothers. However, teenagers with working mothers in poor areas are 18% *less* likely to have a birth compared to their counterparts in similar schools with non-working mothers. Thus,

this piece introduces the differences between different subgroups (socioeconomic classes in this example) that may be important from an analytic and policy standpoint. The examination of teenage pregnancies is also useful in determining economic outcomes for these children. In addition to effects on teenage pregnancies, it will be important to examine other effects such as those risky behaviors previously described in Section I. The size of the sample in Lopoo's piece (1,000 schools) buttresses the findings, so this paper will be sure to use a large sample size.

Aughinbaugh and Gittleman (2004) create a third economic piece on the topic. After using the NLSY79 and its young adult supplement to examine risky behavior (e.g. alcohol use, sexual promiscuity, drug use) in adolescents between the ages of 14 and 22, they conclude that there is not strong evidence that a mother's employment affects the likelihood of participation in risky behavior. They are quick to note, however, that insufficient statistical precision may have played a role in creating less than optimal results. The conclusion of this piece differs from the two previous ones, suggesting that there is not a strong consensus on the issue within the economic community. The next article by Ruhm (2004a) also doesn't find a large significant effect on adolescent behavior.

Ruhm creates a two-part framework this paper will use to further examine the behavioral effects on children due to maternal employment. First, he examines the socio-emotional effects on 10-11 year-old children using the BPI. This index mixes an array of socio-emotional problems in order to obtain a cleaner number that can be used in research. His data concludes that there is a positive effect on the behavior of children whose mother's are employed, though this effect is slight and not statistically significant. His second part of the framework examines the differences in child outcomes in "high" versus "low"

socioeconomic classes. His data show that there is no statistically significant difference in the two classes and their scores on the BPI. Both groups of youths with working mothers seem to have fewer behavioral problems with a small amount of statistical significance; this conclusion is contrary to other works that have already been cited, buttressing the need for more analysis. His socioeconomic split also shows that more subgroups should be examined for patterns not found when all families are grouped together.

Ruhm's piece has two key shortcomings that this paper will address. First, in terms of the socio-emotional measurements, it is important to research children between the ages of 14 and 17. These children will be in high school, with a higher likelihood of engaging in behavior that is measurable if problematic. Though a 10-year-old may not be able to be as delinquent in his / her behavior due to age constraints, it may be easier to view a 15-year-old's actions and measure the behavioral problems. Behavioral problems may be more pronounced in children who have reached their teenage years. Second, the BPI aggregate may be unable to fully appreciate all of the nuances that different types of behavioral problems provide. It will be important to examine risky behaviors directly in a manner similar to Aughinbaugh and Gittleman (2004).

After resolving these two shortcomings, it will be helpful to mimic Ruhm's SES split, but extend it to a marriage split as well. Different family necessities and reasons for maternal employment in different subgroups may play an important role in the behavior of their teenagers.

III. Theoretical Framework

This theoretical discussion is split into two sections. The first section will intuitively discuss different outcomes due to maternal labor decisions. The second section will discuss an economic model of child outcomes and a family's utility function.

Intuitive Discussion

A mother's labor decisions may have important positive and negative potential effects on her teenage children. The following discussion will demonstrate why an empirical analysis is necessary since a theoretical discussion is incapable of resolving the issue by itself.

First, it is important to focus on the possible effects of a mother's choice to spend more time at home. In a positive sense, more time spent at home implies more supervision over the child's activities. This increased amount of supervision may lead to a decreased amount of risk-taking activities, delinquent activities, or poor decisions made and executed (Dwyer et al., 1990). A decreased amount of time in the labor force may also increase the amount of parental involvement in school programs or parent-teacher associations. This increased time at home can be used to prepare the household to be a proper environment for studying or living once the child returns home from school. Also, the mother may be able to initiate more necessary conversations with the children that otherwise would not have taken place. The cares and anxieties of the job market would not be present, decreasing the stress level of the home environment.

Nevertheless, there are some possible negative effects of a mother's choice to spend more of her time at home. The decreased amount of income may lead to deleterious effects

on the children. A decreased income level may be associated with fewer opportunities for children or fewer resources for learning. Perhaps the child would have to be sent to public school rather than private school due to cost considerations, possibly placing the child in a more risky social environment. A decrease in family income may also make nicer homes out of reach, placing children in a less optimal environment for social activities. It may be difficult for a family to afford vacations or "away time," thus increasing the stress level of the home. With less disposable income, children may not be able to be involved in structured after-school activities such as sports and theatre; this decreased amount of structured activities increases the amount of time available for delinquent activities.

In switching the framework and focusing on the effects of a mother's choice to spend less time at home and more time on the job site, one can simply take the opposite implications of those already described. For example, in a positive sense, perhaps more income will move the family into a better neighborhood, decreasing the chances of negative influences around teenage children. In a negative sense, spending more time away from the home may decrease child supervision, allowing the child to engage in more deviant activities. In studying all of the families together, the theory does not lend itself to a simple conclusion: an empirical analysis will be necessary.

Since this paper will examine all of the families together and then divide them into different subgroups, a discussion of the subgroups is important. The first divisions will be made to examine families in different marital settings. If a mother is married, her increased labor activity may not be as deleterious toward the children since there is more stability in the home. With this increased stability, the father may be able to assist in child-caring responsibilities. In other marital circumstances (e.g. divorce, separation), the theory is much

more ambiguous. The presence of the mother within the home may be more important for the child's development, or the example of the mother working may be more helpful for the development of the children. Again, since the theory is ambiguous, no hypothesis can be given without empirical research.

The next subgroups will be divided by SES. The SES of a family also affects the previously discussed positive and negative possible effects of maternal labor decisions. In a family with a high SES, the effects of more income may be minimal since there is a decreasing marginal return to this income and its positive effects on the child. One can only buy so many study tools before they cease to have a high benefit. A family with a high SES may also have children who have more time and resources to engage in delinquent activities. On the other hand, perhaps the benefits of more income in a family with a lower SES far outweigh the negative effects of time not spent at home. This is why it is important to split the effects into different socioeconomic classes: the positive and negative effects may have different weights on them due to the differing needs of families.

It is unclear based upon this theoretical framework what the results of maternal labor choices on adolescent behavior should be. The positive and negative effects due to labor hours and the subgroup splits will be measured empirically. In order to do this, it is important to create an economic framework using a production function and a utility function that can model the possible outcomes that will be measured.

Economic Model

The framework of this piece will follow similar frameworks used in other economic literature. A regression with child outcomes (behavioral effects in this case) as the dependent

variable and inputs such as time spent at home as the independent variables is a common method used in past literature (e.g. Aizer, 2004). The many different independent variables and coefficients will be used to isolate the key variables under consideration. A utility function of the family can be created using various inputs that will be described later in this section.

Beginning with the production function where child outcomes are measured based on various inputs, if C represents a child's behavioral outcomes,

$$C = C(\mathbf{T}, \mathbf{B_M}, \mathbf{B_C}, \mathbf{S}). \quad (1)$$

Each vector within the function stands for regressors that may affect the child's outcomes. **T** stands for the ways in which the parents spend time. Nonmarket time (i.e. time spent in leisure or taking care of the child) can directly affect the behavioral outcomes of a child. $\mathbf{B_M}$ represents a vector that encompasses many background characteristics of the mother. Some examples are the number of siblings the mother has, the age of the mother, and her marital status. $\mathbf{B_C}$ represents a vector that encompasses many background characteristics of the child. Some examples are the birth order of the child, sex of the child, and the child's age. Finally, **S** denotes the SES of the family. This can be measured using variables such as the income of the family, the educational attainment of the mother, and the education of the father.

A simplified utility function of the family can be modeled using the following function:

$$U = U(\mathbf{C}, \mathbf{G}, \mathbf{N}, \mathbf{J}). \quad (2)$$

The vector **C** contains many child outcome characteristics, such as behavior and educational attainment. **G** represents the material goods of the family, increasing pleasure through the

use of these particular goods that are purchased. **N** represents family characteristics such as the location of the home and family and the number of children in the family. Finally, **J** represents the intangible joy that is obtained through the attitudes shared in the family, the relationships made, and time spent in leisure activities.

The third piece of framework necessary is the full-income budget constraint of the family. Members of the family choose different ways to spend their time. Income that is obtained from the mother and father enters the family's budget and can be utilized for obtaining goods. The following function is a model of the family's budget constraint as it relates to time and income, adapted from a work with a similar framework by Hagy (1998):

$$G + W_m t_m + W_f t_f = W_m T + W_f T + V . \quad (3)$$

On the left side of the equation, G represents goods that the family purchases, W_m represents the wage rate of the mother, t_m represents the amount of time the mother spends not working, W_f represents the wage rate of the father, and t_f represents the amount of time the father spends not working. Thus, $W_m t_m$, for example, represents the opportunity cost of the mother not working. On the right side of the equation, total household wealth is given as the sum of the amount of income obtained from working for all of the time available, T, and wealth obtained outside of labor, V (i.e. inherited wealth).

Relating equation (3) back to the production function for child outcomes, the household will choose G, t_m, and t_f. $\mathbf{B_M}$, $\mathbf{B_C}$, and **S** are exogenous vectors that will be given. Using the variables from equations (1) and (3) to solve for the demand functions of G, t_m, and t_f yields

$$\begin{pmatrix} G \\ t_m \\ t_f \end{pmatrix} = f\left(W_m, W_f, V; \mathbf{B_M}, \mathbf{B_C}, \mathbf{S}\right). \quad (4)$$

Each of the three functions need not be the same.

The next section will explain the data collected to measure the behavioral characteristics of adolescents, accounting for variables from all of the vectors in equation (1).

IV. Data

The National Longitudinal Study of Youth in 1979 (NLSY79) and the National Longitudinal Study of Youth in 1979 Child and Young Adult Supplement (NLSY79-YA) are the two data sets that will be used in this investigation. In 1979, 12,686 men and women between the ages of 14 and 22 were interviewed. They were asked hundreds of questions ranging from academic history, employment history, and school attitudes; to height, weight, and gender. The interviews were continued biennially up to and including the year 2006. Beginning in the year 1986, a new cohort was followed and questioned: the children of those in the original interviews of 1979. In the year 2002, of the 3,955 women remaining from the first interviews conducted in 1979, 3,315 of them had given birth to 8,100 children. By the year 2002, the number of children birthed from the original NLSY79 women was expected to be over 90% of the mothers' childbearing capacity. The children in the NLSY79-YA have been asked the same questions their parents were asked in the original NLSY79. Their interviews have also been conducted biennially. Combining these two data sets creates many opportunities for researchers in varying disciplines to examine particular families through decades of changes.

The methods of obtaining the information from the families have remained largely the same throughout the years. Though recent technology changes have made some data gathering easier, the parents and children have always been personally interviewed for most of the questions. For the questions that are more sensitive in nature, the respondents have the ability to fill out a self-assessment questionnaire. The stability of questions and modes of inquiry throughout the years allow for intelligible comparisons between data gathering periods. All of the public information (no non-public information is necessary for this investigation) is placed online and can be freely downloaded through the U.S. Department of Labor at www.bls.gov.

Since this paper will examine effects of maternal employment on adolescent risky behavior with a focus on different subgroups, most of the variables in the data that will be viewed will be similar to past works where authors used the same dataset (e.g. Aughinbaugh & Gittleman, 2004; Ruhm, 2004a).

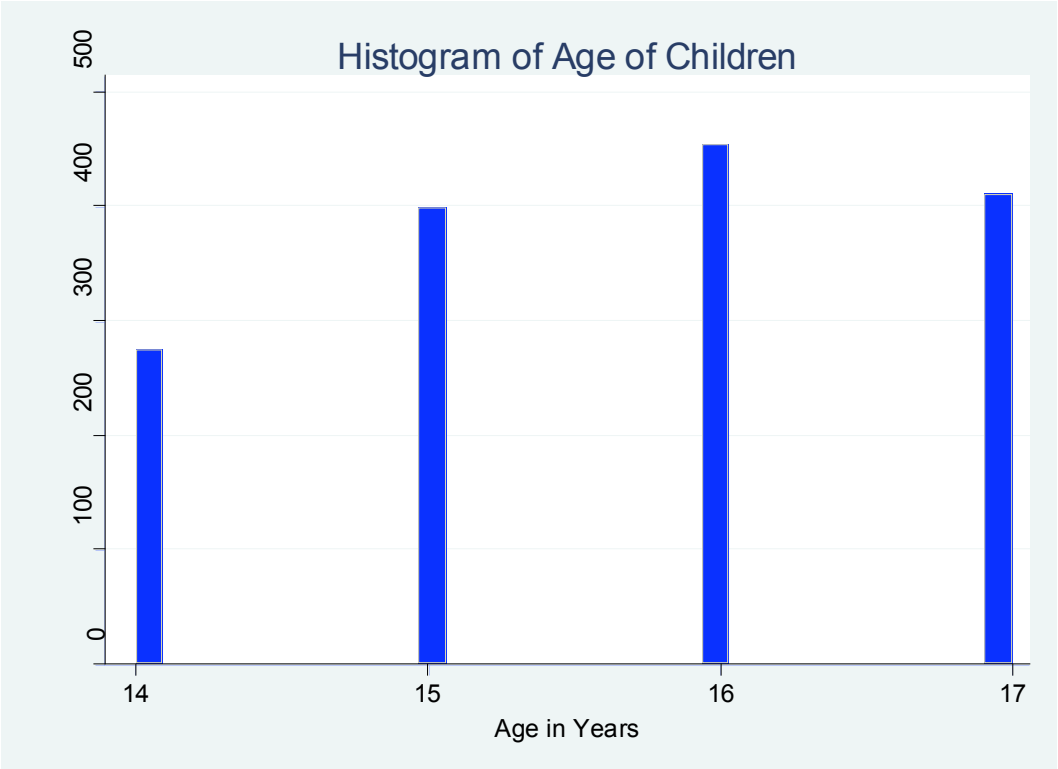
The NLSY is very useful for this paper since it has been used many times in similar research on adolescent behavior (e.g. Ruhm, 2004a; Aizer, 2004; Aughinbaugh & Gittleman, 2004). It is a well-respected, reputable source with a very large number of respondents and a very large number of questions. The large number of questions allows for a rich set of explanatory variables in different research fields. The large number of variables also allows for flexibility in the research if changes become necessary. The different counties throughout the country that were sampled provide for a balanced set of respondents in many different locations and family arrangements.

The data set does have a few weaknesses. The sample is limited since those interviewed in the NLSY79 (i.e. the parents of the children in the NSLY79-YA) were all

born between the years 1957 and 1964. Using information from these individuals and attempting to generalize may lead to some problems since children born in other time periods experience many different events. A second shortcoming deals with the sensitive information that is necessary for this investigation. It may be difficult for children to discuss their delinquent activities, even with the most anonymous methods of reporting information. The self-administered methods of investigation are helpful, but not perfect. Having different interview periods creates a third possible shortcoming. During the years of change, the students who did not proceed to subsequent rounds of interviews may have had common problems that would be helpful to know. For example, if the most delinquent individuals were most likely to drop out of the study, this would lead to incorrect conclusions in the data since those that remained were less prone to delinquent behavior. Nevertheless, given these weaknesses, the data set is still the best available for this investigation.

Child Behavioral Data

From the 8,100 children born in this cohort, the number of children between the ages of 14 and 17 is 1,540. The data in the following tables and graphs were obtained from the interviews in 2002. This recent year has a variety of ages of children and they were not born to only young mothers – a problem with some data analysis taken from this study in earlier years. In fact, Graph 1 displays a histogram with the particular ages on the x-axis and the amount of children that fall under these age ranges on the y-axis. Notice that there is a fairly good representation of each age group, with the most amount of children being age 16. After viewing this graph, it is apparent that there are enough children in each age range to constitute a fair representation of these four years of adolescent life.



Graph 1. A histogram of child ages with the number of adolescents of each age on the y-axis

The following table lists and describes the risky behaviors observed in the children of the NLSY79-YA in 2002.

Table 1. Examples of risky behaviors in which youths participated

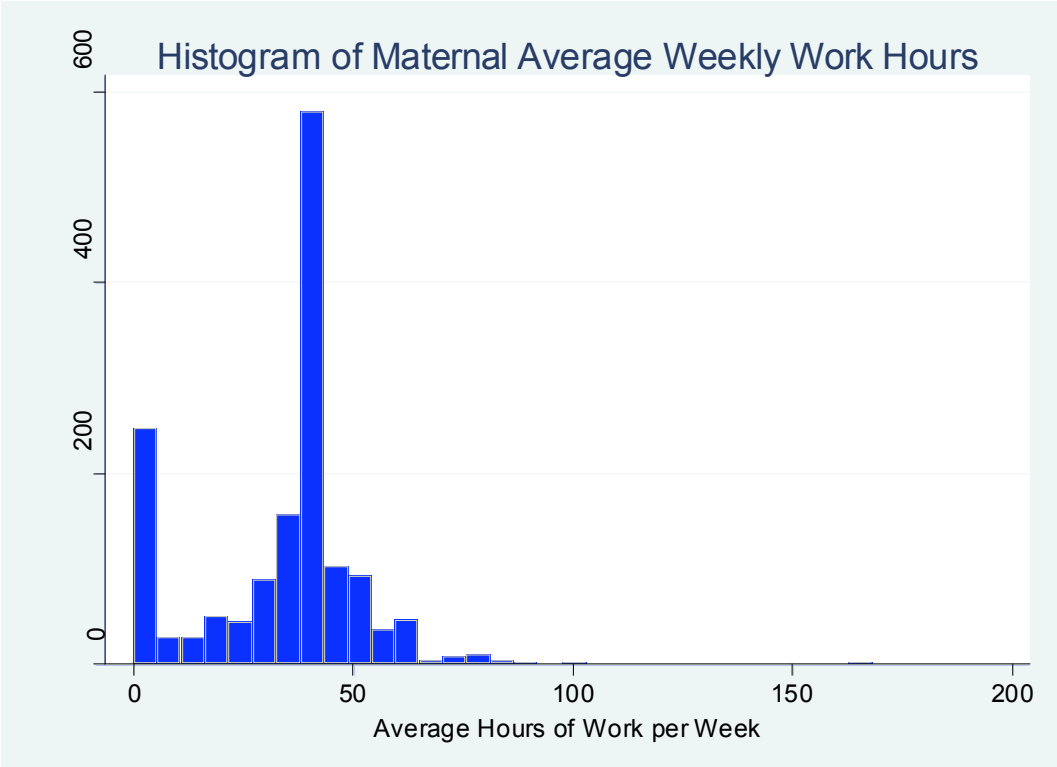
Risky Behavior	Number of Respondents	Percentage
Within the past year, did you:		
Damage school property	79	5.1
Hurt someone physically	206	13.4
Shoplift	157	10.2
Drink Alcohol	582	37.8
Have sex	448	29.1

Table 1 lists risky behaviors on the left-hand column such as drinking alcohol. The middle column gives the number of child respondents who engaged in these particular

behaviors. For example, within a one-year time period prior to the interview, 582 respondents drank alcohol. Since the total number of child respondents between the ages of 14 and 17 is 1,540, the right column lists the percentage of children who responded who engaged in these particular behaviors. Notice that damaging school property does not seem to be a large issue with the cohort, but over one-third have drunk alcohol within the past year.

Maternal Labor Data

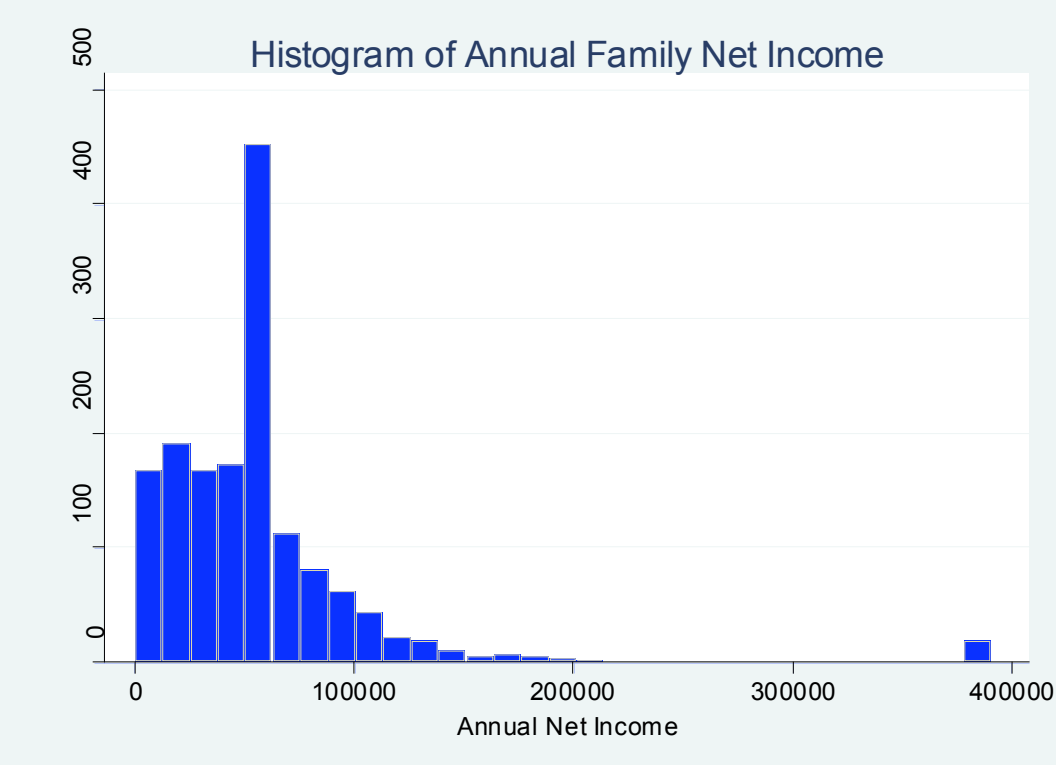
The next important aspect of the data to understand is the maternal labor decisions. Graph 2 is a histogram depicting the average amount of hours the mothers worked per week for one year prior to the year 2002. The hours are on the x-axis and the number of mothers working for that amount of time is on the y-axis. Notice that the data would most likely be a good representation of the normal distribution except for the large amount of mothers not working during the year 2002. This is very helpful for this paper for two reasons: (1) a normal distribution can be observed when neglecting the bar furthest to the left, and (2) there are obviously a good number of mothers who did not work during this year, creating the possibility of comparing the effects of these mothers' labor decisions with the labor decisions of the other mothers. The most frequent average weekly hours worked is approximately 43, which would seem intuitive. With the normal distribution, the values of hours represent what may be expected in the large population of the U.S.



Graph 2. A histogram of maternal average weekly labor hours

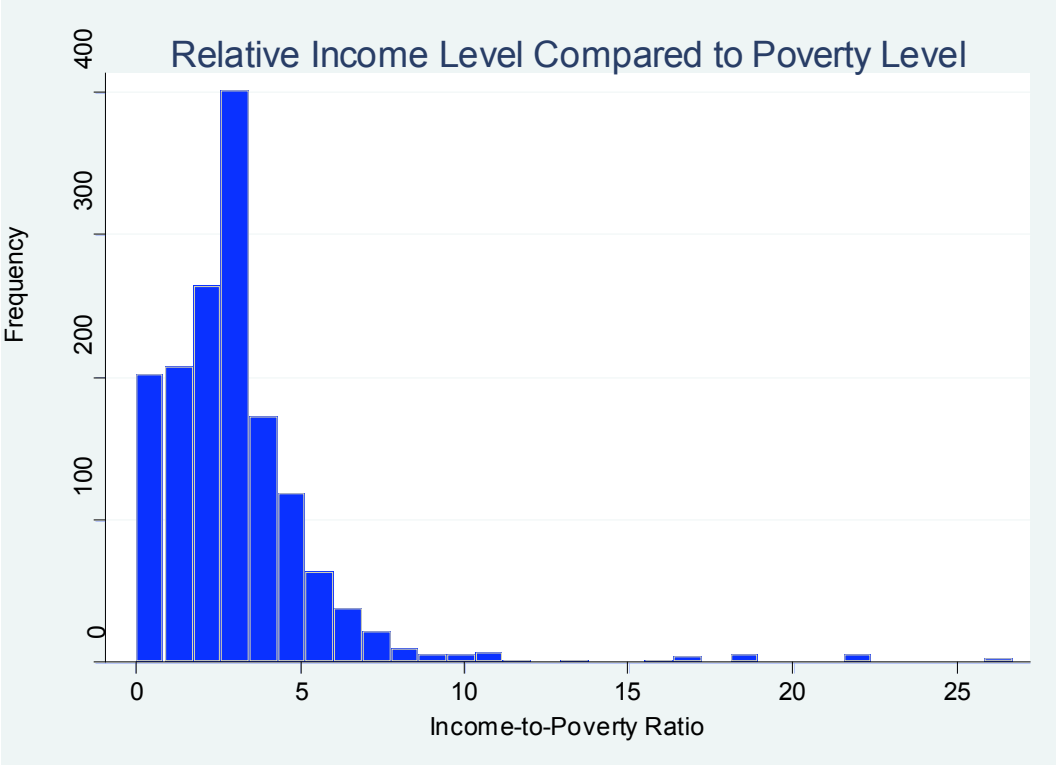
SES Data

Since the data will be split and examined in terms of marital status and SES, it is important to obtain a general intuition as to what type of SES is represented in this dataset. One possible method of examining the SES would be to measure the family's net income during the year 2002. Graph 3 displays a histogram with the particular net income on the x-axis and the frequency of each income on the y-axis. Notice that the values taper off as the income increases. This is helpful since there appear to be enough low-income families and average income families to perform comparisons. Each bar has a width of $20,000.



Graph 3. Total net income of families in the study during the year 2002

Each family has also been assigned a poverty level. This value indicates the maximum amount of income the family may obtain and still maintain its poverty status. The NLSY obtains this value from the U.S. Department of Health and Human Services. Dividing net income by the poverty level creates a ratio. If this ratio is less than or equal to one, the family's net income is less than their poverty level; thus, they are impoverished. If the ratio is greater than one, they are not impoverished. Graph 4, below, is a histogram of these ratios. In Section V the families will be split into different socioeconomic groups. Ratio divisions were chosen in order to create comparable sample sizes: these values are 2.2 and 3.2. Notice in Graph 4 that these values occur at points with approximately 500 families in each subgroup.



Graph 4. Ratios created by dividing annual net family income by poverty level

Race may also be a particular factor that can affect one's SES indirectly. Table 2 lists the racial / ethnic origins with which the mothers (and children) identify.

Table 2. Race / Ethnic Origin of mothers

Race / Ethnic Origin	Number of Respondents	Percentage
Neither Hispanic nor Black	726	47.1
Hispanic, Latino, or Spanish	355	23.1
Black or African American	459	29.8

This table follows a similar format as Table 1 with the race / ethnicity on the left column, the number of respondents who responded to these particular races / ethnicities in the middle, and what percentage of total mothers this creates on the right. The variety of races and ethnicities is helpful in mimicking the national averages. However, the minority

percentages are larger than the national averages. According to the U.S. Census for the year 2000, approximately 12% of the U.S. population is Black or African American; 13% is Hispanic, Latino, or Spanish; and 75% constitutes the other races / ethnicities. Thus, when viewing the findings in Section V, it will be important to keep in mind the overrepresentation of minorities in the data set.

Control Variables

In addition to all of the variables already discussed, it will be important to control for many other aspects of an adolescent and mother that may also affect behavior. Background information of both the child and mother will be important. All variables used in the next section are listed below in Table 3.

Table 3. All variables used in paper's analysis	
Dependent Variables	
Child Outcomes	
Risky Year	Binary variable = 1 if any of the below risky activities took place
Drank	Drank alcohol within the past year
Sex	Had sex within the past year
Hurt	Hurt someone badly enough to need bandages within the past year
Shoplifted	Stole something without paying for it within the past year
Damaged	Damaged school property on purpose within the past year
Independent Variables	
Parental Time (T)	
Mom Works	Does the mother work more than 0 hours per week?
Weekly Hours	Average number of hours mother worked per week in 2002
Weekly Hours Squared	(Weekly Hours) * (Weekly Hours)
House Husband	Does the spouse make less income than the mother?

Table 3. Continued

Mom Time	Maternal time spent with child from child's point of view
Not Enough	Not enough time
Enough	Enough time
Too Much	Too much time
Dad Time	Paternal time spent with child from child's point of view
Not Enough	Not enough time
Enough	Enough time
Too Much	Too much time
Background Characteristics of Mother (B_M)	
Foreign Language*	Foreign language spoken at home during the mother's childhood
Urban Residence*	Was the residence of the mother at age 14 urban or rural?
Siblings*	Number of siblings the mother has
Smoke (M)*	Does the mother currently smoke daily or occasionally?
Lifetime Drugs*	Number of times mother used marijuana, cocaine, or crack cocaine in lifetime: from 0 (Never) to 6 (100 or more times)
Religious Affiliation*	The religious affiliation of the mother
Christian	The mother belongs to a Christian denomination
Non-Christian	The mother is non-Christian (i.e. Jewish, Other)
Marital Status	Marital status of the mother
Married	Is married
Never Married	Has never been married
Other	Other marital status (i.e. divorced, separated, widowed)
Children	Total number of biological children the mother has
Age (M)	Age of the mother at the time of interview
Learning Resources*	At age 14 of the mother, did any household member receive newspapers / magazines regularly or have a library card
Experience	Age (M) - Mother Education - 6
Background Characteristics of Child (B_C)	
Female*	Is the child female or male (1 or 0)?
Birth Order*	Birth order of child
Age (C)	Age of child at child assessment date
Child Residence	Usual residence of child
Mother's Household	In household of mother
Other Household	In other household without mother or only part time with mother
Father in Household	Does the father of child live in the same household as child?
Religion	How important religion is to child: From 1 (Very) to 4 (Not at all)
School	Is the child currently attending or enrolled in school?
Dropped Out	Has the child ever dropped out of school and returned?
Homework	Amount of time spent on homework each week (hours)

Table 3. Continued

Check Homework	How often parents check whether child has done homework: From 0 (Never) to 3 (Often)
Chores	How often parents require child to do chores: From 0 (Never) to 3 (Often)
TV	How often parents restrict TV / Videogame time: From 0 (Never) to 3 (Often)
Discuss	How often child discusses courses / programs, grades / report card, or troubling things with parents: From 0 (Never on all) to 9 (Often on all)
Attend	How often parents attend a school event of the child's: From 0 (Never) to 3 (More than once per month)
Club	Does child belong to club or group in school or outside of school?
Highest Grade	Highest grade the child thinks he / she will complete
Mom Know	How often does mom know who the child is with outside home: From 1 (Child sets all rules) to 3 (Parents set some, child sets some)
Risky Pressure	Does the child feel pressured from friends to try cigarettes, try drugs, drink alcohol, skip school, or be violent?
School Pressure	Does the child feel pressured from friends to work hard in school?
Neighborhood Crime	Is crime a problem in the child's neighborhood: From 1 (Big problem) to 3 (No problem)
Medicine	Regularly takes medicine to control behavior
SES Characteristics (S)	
Grandmother Education*	Highest grade completed by maternal grandmother
Grandfather Education*	Highest grade completed by maternal grandfather
Race (C)	Race / Ethnic origin of the child (same as mother)
Non-black, Non-Hispanic	The child is neither black nor Hispanic (i.e. White, Asian)
Hispanic	The child is Hispanic
Black	The child is black
Race (F)	Race / Ethnic origin of the father
Non-black, Non-Hispanic	The father is neither black nor Hispanic (i.e. White, Asian)
Hispanic	The father is Hispanic
Black	The father is black
Income (M)	Income from wages and salary in past calendar year (mother)
Income (S)	Income from wages and salary in past calendar year (spouse)
Family Income†	Total net family income in past calendar year
Poverty Status	Family poverty status in 1999
Poverty Level	Maximum family net income for poverty status to be assigned to family

Table 3. Continued	
Mother Education	Highest grade completed by mother at time of interview
Father Education	Highest grade completed by father: From 1 (No high school graduation) to 7 (Ph.D. / J.D.)
Bill Difficulty	Difficulty child's household has paying bills: From 1 (No difficulty) to 5 (great difficulty)
* Observed in years other than 2002	
† Observed in 2003	

V. Empirical Specification

The first subsection will give a general description of the equation that will be used in the statistical analysis of this paper. The second subsection will analyze all of the families together. The third subsection will break the families into marital groups. The fourth subsection will focus on the socioeconomic distinctions within the data and how these affect the results. The final subsection will serve as a summary discussion of the findings.

Econometric Equation

Recall equation (1) from Section III. The four different vector characteristics on the right-hand side determine a child's behavioral outcomes. The NLSY data sets discussed in section IV allow for the following equation to be estimated using statistical software:

$$Y = \beta_0 + \beta_1 Time + \beta_2 Background_{Mom} + \beta_3 Background_{Child} + \beta_4 SES + \varepsilon \quad (5)$$

The binary dependent variable Y equals 1 if the child has engaged in a risky activity within the past year and 0 if not. A risky activity is defined to be having sex, drinking alcohol, hurting another person enough to require bandages or a doctor's attention, stealing something from a store without paying for it, or damaging school property. Since the average working

hours of the mother will be measured from the past year's data, the risky behavior of the adolescent has been observed over the same period.

For each of the regressions, the independent variables are shown in equation (5). $Time$ represents the manner in which the parents spend their time. One of the variables in this vector is the average weekly work hours of the mother. In addition, there are variables that relate to how much time the child feels that the mother and father spend with him / her. The coefficient in front of maternal labor time will be important for this investigation. As was described in Section III, the theoretical models do not presuppose a positive or a negative sign. If it turns out to be positive, this implies that an increase in maternal labor activity increases the probability that a child will engage in a risky activity. If the coefficient is negative, the opposite is implied. $Background_{Mom}$ represents the background characteristics of the mother. Some examples from the data are the number of siblings the mother has, the age of the mother, and her marital status. $Background_{Child}$ represents the background characteristics of the child. Some examples from the data are the birth order of the child, the sex of the child, and the age of the child. Though some of these variables may not have strong predictive abilities, they are all important in isolating the effects of maternal employment. Some of the variables are expected to be significant; for example, a negative coefficient might be expected in front of a dummy variable for female, implying that being female decreases the likelihood of engaging in risky activities. SES represents all of the possible variables that can be used to examine the SES of the family. Family income, race, and education are just a few examples of these variables.

All of the regression analysis made use of instrumental variables. Possible endogeneity can be expected between some of the $Time$ variables and the dependent

variable. For example, though the choice of a mother to work may affect the adolescent's probability in engaging in risky behavior, the child's decision to engage in risky behavior may also affect the mother's labor choices. This two-way causality creates problems with a simple probit regression. To attempt to correct for this, instrumental variables have been employed. These are variables that affect the independent variables (i.e. *Time* variables) but don't affect the dependent variable (except through the independent variables). In the regressions below, each data set was run once without the instrumental variables and once with them. The instrumental variables are *Income (S)*, *Children*, *Experience*, *Father Education*, and *Learning Resources*. These were specifically chosen since they may affect the mother's labor decisions but may not affect the adolescent's risky behavior directly. Tests to analyze how effective these instruments are appear in the next subsections.[5]

Entire Dataset

Before discussing any of the regressions below, it is important to note that there were missing values in some of the observations. Rather than throwing out the observations that had some missing values, the missing variable values were replaced with the mean of that variable. This may have affected the results, but hopefully not so much so that they are irrelevant. A table in Appendix A lists the number of missing values for each variable.

Since the dependent variable is binary, the first regression run was a probit regression. All of the variables have been included in the regression and the results appear below on the left side of Table 5. Anticipating possible endogeneity problems between adolescent risky behavior and some of the independent variables, a second regression was

[5] Other independent variables might have been endogenous as well. Attempting to control for their endogeneity did not affect the results of the regressions.

run with instrumental variables. This regression appears to the right of the probit regression in Table 5 below. Due to the extreme difficulty of using instrumental variables to run a probit model, the second regression below is a linear probability model.[6]

Both regressions had 1,540 observations. The missing coefficients in the linear probability model are the instruments that were used to control for endogeneity. Endogeneity was suspected and instrumented for in the following variables: *Mom Works, Weekly Hours, Weekly Hours Squared,* and *House Husband*. The R-Squared is not reported in the second regression since the ivreg2 command in Stata does not lend itself well to this information.

Table 5. Results of regressions with 1-year risky behaviors as dependent variable

	(Probit)		(LPM)	
Number of Observations	1,540		Number of Observations	1,540
Pseudo R-Squared	0.1561			
Probability > χ^2	0		Probability > F	0
Independent Variable	Coefficient (Standard Error)	z	Coefficient (Standard Error)	z
Constant	-4.5416***	-4.54	-1.0586	-1.1
	(1.0013)		(0.9581)	
Time				
Mom Works	0.0224	0.12	-0.8729	-0.35
	(0.1886)		(2.5035)	
Weekly Hours	-0.0034	-0.56	0.0601	0.77
	(0.0061)		(0.0777)	
Weekly Hours Squared	0	0.48	-0.0006	-0.68
	(0.0001)		(0.0009)	
House Husband	-0.0833	-0.67	-0.1357	-0.54
	(0.1251)		(0.2514)	

[6] Instrumental variables are commonly used in econometrics to control for possible endogeneity problems. The object is to isolate the part of the independent variable that is not caused by the dependent variable. The best instruments are those that can explain the independent variable being instrumented *and* the best instruments should not directly explain the dependent variable except through the independent variable being instrumented.

Table 5. Continued

Mom Time				
Not Enough	0.1157	1.14	0.0129	0.24
	(0.1012)		(0.0533)	
Too Much	-0.1592	-1.07	-0.051	-0.64
	(0.1494)		(0.0801)	
Dad Time				
Not Enough	0.1078	1.25	0.0196	0.5
	(0.0861)		(0.0395)	
Too Much	0.2478	1.37	0.0603	0.68
	(0.1808)		(0.0884)	
Background (M)				
Foreign Language	0.1475	1.01	0.0916	1.35
	(0.1468)		(0.0676)	
Urban Residence	-0.0407	-0.46	0.0302	0.52
	(0.0893)		(0.0579)	
Siblings	0.0176	1.28	0.0072	1
	(0.0137)		(0.0073)	
Smoke (M)	-0.2770**	-2.35	-0.0892*	-1.91
	(0.1178)		(0.0466)	
Lifetime Drugs	0.0348***	2.92	0.0109*	1.91
	(0.0119)		(0.0057)	
Religious Affiliation				
Christian	0.0809	0.87	0.0307	0.62
	(0.0927)		(0.0494)	
Marital Status				
Married	-0.1228	-0.78	-0.0002	0
	(0.1571)		(0.1369)	
Other	-0.1272	-0.89	-0.0579	-0.82
	(0.1428)		(0.0705)	
Children	-0.0660*	-1.78		
	(0.0371)			
Age (M)	-0.0033	-0.19	-0.0021	-0.14
	(0.0174)		(0.0149)	
Background (C)				
Female	-0.2234***	-3.09	-0.1147**	-20.5
	(0.0723)		(0.0459)	
Birth Order	0.1209**	2.57	0.0036	0.18
	(0.0471)		(0.0204)	
Age (C)	0.2603***	7.27	0.0814***	2.65
	(0.0358)		(0.0307)	
Child Residence				
Other	0.0313	0.21	0.0128	0.18
	(0.1515)		(0.0733)	
Father in Household	-0.2397**	-2.29	-0.0375	-0.55
	(0.1047)		(0.068)	
Religion	0.0705	1.5	0.0126	0.57
	(0.0471)		(0.0218)	

Table 5. Continued

School	-0.1088	-0.63	-0.0735	-0.94
	(0.1722)		(0.0781)	
Dropped Out	0.6650**	2.57	0.1333	1.41
	(0.2589)		(0.0944)	
Homework	0.002	0.27	0.0011	0.32
	(0.0075)		(0.0033)	
Check Homework	-0.0537	-1.54	-0.0333	-1.19
	(0.0349)		(0.028)	
Chores	0.019	0.36	0.0082	0.19
	(0.0521)		(0.0438)	
TV	-0.1188***	-3.42	-0.0305	-1.14
	(0.0348)		(0.0267)	
Discuss	0.0236	1.15	0.0119	0.98
	(0.0206)		(0.0122)	
Attend	0.0316	0.74	0.0093	0.29
	(0.0428)		(0.0321)	
Club	-0.0702	-0.61	-0.0606	-0.54
	(0.1146)		(0.1117)	
Highest Grade	0.0095	0.43	-0.0093	-0.45
	(0.0222)		(0.0205)	
Mom Know	0.2210***	3.19	0.0719	1.51
	(0.0693)		(0.0475)	
Risky Pressure	0.7384***	7.95	0.2089***	4.1
	(0.0929)		(0.0509)	
School Pressure	-0.0549	-0.75	-0.0075	-0.17
	(0.0735)		(0.0448)	
Neighborhood Crime	-0.0475	-0.75	-0.0277	-0.65
	(0.0636)		(0.0429)	
Medicine	0.0609	0.38	0.1629	0.69
	(0.1613)		(0.2353)	
SES				
Grandmother Education	0.008	0.53	0.0116	0.79
	(0.0152)		(0.0146)	
Grandfather Education	0.0054	0.43	0.0033	0.45
	(0.0124)		(0.0074)	
Race (C)				
Hispanic	-0.1993	-1.18	-0.1347	-1.53
	(0.1688)		(0.0879)	
Black	-0.1748	-1.4	-0.0888	-1.36
	(0.1251)		(0.0654)	
Race (F)				
Hispanic	0.1549	0.99	0.068	0.98
	(0.1561)		(0.0691)	
Black	0.0248	0.17	-0.0104	-0.13
	(0.1484)		(0.0776)	
Income (M)†	0	0.42	0	0.479
	(0)		(0)	

Table 5. Continued				
Income (S)	0	-1.59		
	(0)			
Family Income	0	1.28	0	0.83
	(0)		(0)	
Poverty Status	-0.0681	-0.54	0.1557	0.69
	(0.1262)		(0.2263)	
Mother Education	0.0295	1.49		
	(0.0199)			
Father Education	-0.0467	-0.92		
	(0.0509)			
Bill Difficulty	0.1021**	2.51	0.0265	1.15
	(0.0407)		(0.023)	

[*] Coefficient estimate is statistically significant at the 10% level.
[**] Coefficient estimate is statistically significant at the 5% level.
[***] Coefficient estimate is statistically significant at the 1% level.
[†] Regressions were run with and without this variable in case it affected the sign of any of the Time variables. It does not, so it is included here.

In the first regression, none of the maternal labor coefficients under the Time subsection are statistically significant. Since the null hypothesis is that an increase in maternal labor hours does not affect risky behavior, this null hypothesis cannot be rejected. One way to see how much confidence to put in this result is to look at other variables that may be intuitive and see what their coefficients are. *Lifetime Drugs*, *Birth Order*, *Age (C)*, *Dropped Out*, *Mom Know*, *Risky Pressure*, and *Bill Difficulty* are all positive and statistically significant. All of these variables seem to make sense except for *Mom Know*. A positive coefficient here implies that the stricter the parent is in making decisions in the household, the more likely the child is to engage in risky activities. A possible explanation to this could be that the strict household parameters are set because of the risky behavior of the child (i.e. reverse causation). *Smoke (M)*, *Children*, *Female*, *Father in Household*, and *TV* are all negative and statistically significant. All of these variables seem to make sense as well and cases can be made for each. Since most of the statistically significant variables seem logical in their sign, one can be more confident in the results of the regression.

Expecting possible endogeneity problems with the maternal labor decisions under the subsection Time, the linear probability model (LPM) on the right of Table 5 utilizes instrumental variables. *Mom Works, Weekly Hours, Weekly Hours Squared,* and *House Husband* were instrumented using *Income (S)*, *Children*, *Experience*, *Father Education*, and *Learning Resources*. These five instruments were used because they can be used to explain the labor decision variables while at the same time not affecting risky behavior (the dependent variable). Though the signs switch on the maternal labor coefficients, they are still not statistically significant. Many of the coefficients that were statistically significant in the probit regression are still significant (though less so) in the LPM regression, implying that the change from probit to LPM did not change the results enough to throw them out altogether.

When using instrumental variables, it is important to check for the instruments' relevance and exogeneity. For the relevance test, the instruments used in the above regression are unfortunately found to be weak. When conducting an F test on the instruments in the first stage regression, the F comes out to be 1.84, much lower than ten.[7] Fortunately, the Hansen J-statistic is 0.997 with a χ^2 of 0.3179, implying that the instruments are sufficiently exogenous (i.e. the instruments do not have high covariance with the error term). Thus, though the instruments are indeed exogenous, their weak impact on the coefficients might fail to completely solve the endogeneity problem.

Ultimately, after running both regressions in Table 5 and even after controlling for possible endogeneity (albeit with weak instruments), maternal labor decisions do not seem to affect adolescent risky behavior in any statistically significant manner.

[7] 10 is commonly used as an approximate bar when checking for instrumental relevance. An F score below 10 implies weak instruments.

Marital Subsection

A second set of regressions was run and the results are shown below in Table 6. Since a possible difference in labor decisions and adolescent behavior was expected within married families and non-married families, the regressions below were run. The data sets were split into married and non-married sections. The probit model on the left is for those parents who reported being married while the probit model on the right is for those parents who reported not being married. Since the data sections have been split, there are no values to report for the marriage coefficients.

Table 6. Results of marriage split regressions with 1-year risky behaviors as dependent variable

	Married (Probit)		Not Married (Probit)	
Number of Observations	971		Number of Observations	569
Pseudo R-Squared	0.189		Pseudo R-Squared	0.1487
Probability > χ^2	0		Probability > χ^2	0
Independent Variable	Coefficient (Standard Error)	z	Coefficient (Standard Error)	z
Constant	-6.6109***	-5.02	-1.7874	-1.1
	(1.3179)		(1.6238)	
Time				
Mom Works	-0.0249	-0.11	0.142	0.34
	(0.2225)		(0.4209)	
Weekly Hours	-0.0066	-0.96	-0.0004	-0.03
	(0.0069)		(0.0152)	
Weekly Hours Squared	0.0001	0.94	0	-0.05
	(0.0001)		(0.0001)	
House Husband	-0.1187	-0.81	0.0074	0.02
	(0.1473)		(0.2972)	
Mom Time				
Not Enough	0.2445*	1.74	0.0055	0.04
	(0.1403)		(0.1562)	
Too Much	-0.2298	-1.08	-0.1177	-0.53
	(0.2129)		(0.2213)	

Table 6. Continued

Dad Time				
Not Enough	0.1097	0.95	0.0811	0.58
	(0.115)		(0.1392)	
Too Much	0.3701	1.48	-0.0815	-0.29
	(0.2493)		(0.2855)	
Background (M)				
Foreign Language	0.1871	0.96	0.1161	0.51
	(0.1944)		(0.226)	
Urban Residence	0.0453	0.4	-0.3228**	-1.98
	(0.1121)		(0.1627)	
Siblings	0.0284	1.52	-0.0004	-0.02
	(0.0187)		(0.021)	
Smoke (M)	-0.2056	-1.37	-0.5430***	-2.63
	(0.1498)		(0.2068)	
Lifetime Drugs	0.0275	1.64	0.0439**	2.41
	(0.0168)		(0.0182)	
Religious Affiliation				
Christian	0.0381	0.31	0.1248	0.83
	(0.1235)		(0.1497)	
Marital Status				
Married				
Other				
Children	-0.1197**	-2.28	-0.0253	-0.45
	(0.0524)		(0.0563)	
Age (M)	0.0189	0.83	-0.0471*	-1.67
	(0.0227)		(0.0282)	
Background (C)				
Female	-0.2383**	-2.56	-0.1701	-1.37
	(0.0932)		(0.1245)	
Birth Order	0.0903	1.53	0.2012**	2.46
	(0.0591)		(0.0819)	
Age (C)	0.2881***	6.01	0.2351***	3.78
	(0.0479)		(0.0621)	
Child Residence				
Other	0.0485	0.18	0.1138	0.5
	(0.2696)		(0.2264)	
Father in Household	-0.2845**	-2.33	-0.2147	-0.74
	(0.122)		(0.2918)	
Religion	0.0822	1.34	0.0288	0.38
	(0.0612)		(0.0764)	
School	0.0841	0.35	-0.3026	-1.15
	(0.2393)		(0.2636)	
Dropped Out	1.3232***	2.78	0.218	0.68
	(0.4765)		(0.3202)	
Homework	0.003	0.3	-0.0045	-0.31
	(0.01)		(0.0145)	

Table 6. Continued				
Check Homework	-0.0726	-1.63	-0.0264	-0.43
	(0.0445)		(0.0607)	
Chores	-0.0038	-0.06	0.0777	0.83
	(0.0651)		(0.0931)	
TV	-0.1384***	-3.08	-0.0938	-1.56
	(0.0449)		(0.0602)	
Discuss	0.0195	0.72	0.0291	0.83
	(0.027)		(0.0353)	
Attend	0.0444	0.8	0.049	0.68
	(0.0555)		(0.0723)	
Club	-0.1127	-0.73	-0.0364	-0.2
	(0.1544)		(0.1849)	
Highest Grade	0.0376	1.27	-0.0309	-0.88
	(0.0297)		(0.0351)	
Mom Know	0.3399***	3.55	0.1212	1.13
	(0.0957)		(0.1069)	
Risky Pressure	0.7289***	6.3	0.8313***	5.15
	(0.1156)		(0.1613)	
School Pressure	-0.09	-0.95	0.015	0.12
	(0.0943)		(0.1262)	
Neighborhood Crime	-0.0794	-0.86	-0.0778	-0.84
	(0.0923)		(0.0932)	
Medicine	0.0399	0.18	0.1738	0.67
	(0.2192)		(0.2609)	
SES				
Grandmother Education	0.0196	0.95	-0.0104	-0.42
	(0.0206)		(0.0248)	
Grandfather Education	-0.0012	-0.07	0.02	0.98
	(0.0164)		(0.0205)	
Race (C)				
Hispanic	-0.2429	-1.11	-0.2272	-0.82
	(0.2187)		(0.2783)	
Black	-0.0956	-0.55	-0.3073	-1.55
	(0.1732)		(0.1985)	
Race (F)				
Hispanic	0.1437	0.72	0.0877	0.32
	(0.1983)		(0.2716)	
Black	-0.1181	-0.55	0.0501	0.22
	(0.2157)		(0.2256)	
Income (M)	0	-0.3	0	0.85
	(0)		(0)	
Income (S)	-0.0000*	-1.76	0	-0.28
	(0)		(0)	
Family Income	0	1.54	0	0.53
	(0)		(0)	
Poverty Status	0.2747	1.34	-0.0652	-0.34
	(0.2047)		(0.1894)	

Table 6. Continued				
Mother Education	0.0203	0.8	0.0487	1.45
	(0.0253)		(0.0335)	
Father Education	0.0994	1.18	-0.1366**	-2
	(0.084)		(0.0683)	
Bill Difficulty	0.1486***	2.58	0.0841	1.38
	(0.0576)		(0.0609)	
* Coefficient estimate is statistically significant at the 10% level.				
** Coefficient estimate is statistically significant at the 5% level.				
*** Coefficient estimate is statistically significant at the 1% level.				

Again, none of the maternal labor coefficients in either regression are statistically significant. Many of the other variables that were statistically significant in Table 5 are statistically significant in Table 6 with the same signs. It seems that splitting the data between marriage indicators does not affect the statistical insignificance of the maternal labor coefficients.

Linear models were also run on both subsets with the same instrumental variables as Table 5. Like the regressions run in Table 5, these linear models did not change the statistical insignificance of the maternal labor coefficients. The instruments were also found to be weak yet exogenous.

The null hypothesis that maternal labor choices do not affect adolescent behavior cannot be rejected with any statistical significance. Even after using instrumental variables (weak and exogenous) and splitting the data into marriage indicators, this remains the case.

The results of Tables 5 and 6 reinforce those of Aughinbaugh and Gittleman (2004). They, too, found that maternal employment does not seem to have an effect on adolescent risky behavior. They also note as a caveat that difficulties with the data make it difficult to have strong confidence in this result. The instrumental variable weakness is a testament to that difficulty in this paper as well.

SES Subsection

The SES of the families in the data was split into three sections: "high," "middle," and "low" socioeconomic classes. There is a variable in the data that gives the poverty level of each family. This is a measurement based on census data that calculates the maximum net income that the family may have in order to be considered impoverished. By dividing the family's net income by the poverty level of the family, a ratio is created. If the ratio is less than or equal to 1, that family is impoverished. If the ratio is greater than 1, the family's net income is higher than their official poverty level. In creating Table 7 below, I split the data into three sections based on this ratio. Those with ratios below 2.2 fall into the "Low SES" category. Those with ratios above 3.2 fall into the "High SES" category. Those with ratios between 2.2 and 3.2 fall into the "Middle SES" Category. These ratio values were chosen in order to split the data into three approximately equal groups. Probit models run on the three subsections appear below in Table 7.

Table 7. Results of SES regressions with 1-year risky behaviors as dependent variable

	Low SES (Probit)		Middle SES (Probit)		High SES (Probit)	
Number of Observations	543		Number of Observations	482	Number of Observations	515
Pseudo R-Squared	0.1623		Pseudo R-Squared	0.2204	Pseudo R-Squared	0.2425
Probability > χ^2	0		Probability > χ^2	0	Probability > χ^2	0
Independent Variable	Coefficient (Standard Error)	z	Coefficient (Standard Error)	z	Coefficient (Standard Error)	z
Constant	-4.1223** (1.7292)	-2.38	-3.3192 (2.1677)	-1.53	-5.3990*** (1.8306)	-2.95
Time						
Mom Works	-0.6641* (0.3695)	-1.8	0.1202 (0.3469)	0.35	0.1131 (0.4378)	0.26
Weekly Hours	0.0161 (0.014)	1.15	-0.0087 (0.0106)	-0.82	-0.0096 (0.0167)	-0.57

Table 7. Continued

Weekly Hours Squared	-0.0001	-0.96	0	0.66	0.0001	0.53
	(0.0001)		(0.0001)		(0.0002)	
House Husband	-0.5129*	-1.67	-0.0414	-0.19	0.0775	0.4
	(0.3068)		(0.2209)		(0.194)	
Mom Time						
Not Enough	0.1993	1.19	-0.073	-0.38	0.2346	1.25
	(0.1681)		(0.1907)		(0.1872)	
Too Much	-0.0741	-0.29	-0.3622	-1.25	-0.2219	-0.8
	(0.2512)		(0.2897)		(0.2782)	
Dad Time						
Not Enough	0.0037	0.03	0.1612	0.95	0.2604	1.63
	(0.1471)		(0.1702)		(0.1595)	
Too Much	0.3724	1.24	0.03	0.09	0.3625	0.96
	(0.3008)		(0.3505)		(0.3775)	
Background (M)						
Foreign Language	0.1914	0.57	0.2744	1	0.148	0.67
	(0.3349)		(0.2745)		(0.221)	
Urban Residence	-0.2929*	-1.88	0.0256	0.14	0.1628	1
	(0.1561)		(0.1821)		(0.1632)	
Siblings	0.0393*	1.77	0.0261	1.02	0.0048	0.16
	(0.0223)		(0.0257)		(0.0305)	
Smoke (M)	-0.2409	-1.11	-0.5646**	-2.44	-0.1683	-0.83
	(0.2178)		(0.2315)		(0.2028)	
Lifetime Drugs	0.0383*	1.83	0.0419*	1.68	0.0358*	1.67
	(0.0209)		(0.0249)		(0.0215)	
Religious Affiliation						
Christian	0.2959*	1.88	-0.2502	-1.41	0.234	1.32
	(0.1575)		(0.177)		(0.1773)	
Marital Status						
Married	0.0943	0.38	-0.1618	-0.48	-0.9838**	-2.34
	(0.2457)		(0.3366)		(0.4199)	
Other	-0.11	-0.61	0.1136	0.34	-1.0112**	-2.45
	(0.1815)		(0.3301)		(0.4132)	
Children	-0.0579	-1.04	-0.0977	-1.1	-0.2073**	-2.08
	(0.0556)		(0.089)		(0.0996)	
Age (M)	-0.0084	-0.28	0.0011	0.03	0.0183	0.55
	(0.0299)		(0.0346)		(0.0333)	
Background (C)						
Female	-0.3335***	-2.63	-0.2706*	-1.94	-0.1334	-0.97
	(0.127)		(0.1391)		(0.1378)	
Birth Order	0.1149*	1.66	0.0614	0.63	0.1962*	1.84
	(0.0693)		(0.0978)		(0.1069)	
Age (C)	0.2033***	3.26	0.2449***	3.59	0.3047***	4.39
	(0.0624)		(0.0682)		(0.0694)	

Table 7. Continued

Child Residence Other	0.2072	0.92	0.1527	0.42	-0.171	-0.65
	(0.224)		(0.3647)		(0.265)	
Father in Household	-0.3645**	-1.98	-0.4095**	-2.04	-0.1723	-0.88
	(0.1845)		(0.201)		(0.1969)	
Religion	0.1312	1.58	0.0098	0.11	0.0669	0.78
	(0.0829)		(0.0886)		(0.0859)	
School	0.0883	0.37	-0.6900*	-1.87	-0.2031	-0.58
	(0.2415)		(0.3689)		(0.353)	
Dropped Out	0.5834	1.41	0.9631**	2.2	0.7397	1.63
	(0.4124)		(0.438)		(0.4526)	
Homework	-0.0058	-0.56	0.0212	1.21	0.006	0.39
	(0.0105)		(0.0176)		(0.0156)	
Check Homework	-0.1141*	-1.76	-0.0872	-1.35	0.0332	0.52
	(0.065)		(0.0644)		(0.0632)	
Chores	0.0436	0.43	0.0427	0.42	0.0016	0.02
	(0.1017)		(0.1026)		(0.0891)	
TV	-0.0666	-1.1	-0.0771	-1.17	-0.1914***	-2.93
	(0.0607)		(0.0659)		(0.0653)	
Discuss	0.0679*	1.88	0.006	0.16	-0.0103	-0.26
	(0.0362)		(0.0367)		(0.0397)	
Attend	-0.0031	-0.04	0.1127	1.35	0.0452	0.57
	(0.0752)		(0.0833)		(0.0791)	
Club	0.0663	0.37	-0.0553	-0.24	-0.3472	-1.52
	(0.1808)		(0.2307)		(0.2281)	
Highest Grade	0.0448	1.27	-0.0167	-0.38	-0.0007	-0.02
	(0.0353)		(0.0443)		(0.0411)	
Mom Know	0.0416	0.36	0.4792***	3.79	0.3109**	2.25
	(0.116)		(0.1263)		(0.1382)	
Risky Pressure	0.5991***	3.96	0.6580***	3.36	1.0423***	6.16
	(0.1514)		(0.1959)		(0.1692)	
School Pressure	0.0862	0.7	-0.1348	-0.98	-0.1802	-1.28
	(0.1237)		(0.1372)		(0.1403)	
Neighborhood Crime	-0.0921	-0.95	0.0739	0.59	-0.0683	-0.49
	(0.097)		(0.1261)		(0.1391)	
Medicine	-0.1175	-0.35	-0.0465	-0.14	0.402	1.61
	(0.3327)		(0.3224)		(0.2499)	
SES						
Grandmother Education	0.0069	0.28	0.0316	1.07	0.0061	0.18
	(0.0247)		(0.0295)		(0.034)	
Grandfather Education	0.0105	0.49	0.0047	0.2	-0.0123	-0.47
	(0.0213)		(0.0236)		(0.0259)	

Table 7. Continued

Race (C)						
Hispanic	-0.0427	-0.11	-0.5046	-1.55	-0.2678	-0.99
	(0.3777)		(0.3258)		(0.2695)	
Black	-0.0045	-0.02	-0.3065	-1.31	-0.4192	-1.59
	(0.2036)		(0.2344)		(0.2632)	
Race (F)						
Hispanic	-0.1716	-0.64	0.4243	1.38	0.0761	0.26
	(0.2675)		(0.307)		(0.2906)	
Black	-0.4149*	-1.74	0.028	0.1	0.4673	1.47
	(0.2386)		(0.2772)		(0.3185)	
Income (M)	0.0000***	2.94	0	-0.15	0	-1.09
	(0)		(0)		(0)	
Income (S)	-0.0000*	-1.85	0	0.01	-0.0000**	-1.99
	(0)		(0)		(0)	
Family Income	0	-1.08	0	1.4	0.0000*	1.95
	(0)		(0)		(0)	
Poverty Status	0.0123	0.06				
	(0.2105)					
Mother Education	0.0253	0.75	-0.037	-0.95	0.0709*	1.82
	(0.0339)		(0.0388)		(0.039)	
Father Education	0.0457	0.48	-0.1817**	-2.12	0.0149	0.14
	(0.0952)		(0.0855)		(0.1084)	
Bill Difficulty	0.1255*	1.94	0.1400*	1.79	0.1184	1.31
	(0.0646)		(0.0783)		(0.0907)	

* Coefficient estimate is statistically significant at the 10% level.
** Coefficient estimate is statistically significant at the 5% level.
*** Coefficient estimate is statistically significant at the 1% level.

In the first regression, *Mom Works* is negative and statistically significant at the 10% level. This implies that, given all of the other variables being held constant, if a mother works at least 1 hour per week (as opposed to not working at all), the probability that her adolescent will engage in risky behavior decreases. No other maternal labor coefficients are statistically significant, including those in the other two regressions. A second interesting statistically significant coefficient under the Time subsection is *House Husband*. This is a created variable (explained in Table 4) that measures whether or not the spouse earns less income than the mother. This variable is created in an attempt to find which households have

the spouses spending the most amount of time away from the job in order to care for the children at home. In the instance of having a low SES, being a "house husband" decreases the probability that the adolescent will engage in risky behavior with a 10% statistical significance level.

Other similarities and differences among the socioeconomic classes can be found in Table 7. For example, notice that *Age (C)* is positive and statistically significant with each probit model. In addition, the size of the coefficient increases moving from a low SES to a high SES. This implies that the higher a family's SES, the more that age affects the likelihood of engaging in risky behaviors (with a positive coefficient). *Risky Pressure* also has the same pattern, increasing in effectiveness as the family moves from a low to a high SES.

In an attempt to control for possible endogeneity in each of these three regressions, instrumental variables were again utilized as before. This is extremely important for the first regression since the hypothesized endogeneity effect could be taking place: notice that the regression shows that if a mother remains at home, the child is more likely to engage in risky activities. However, causality may run in both directions since the mother could have decided to stay at home as a result of the risky behavior that the teenager exhibited. For these regressions, the same instruments were used on the same independent variables with similar results as previous regressions: none of the maternal labor coefficients became statistically significant when using instrumental variables. When the instrumental variables were used to test the robustness of the first probit model on low SES, the coefficient on *Mom Works* went from statistically significant to statistically insignificant, perhaps decreasing the

confidence one may have had in that coefficient. Like the regressions in the past subsection, the instruments were found to be exogenous, but weak nonetheless.

Ultimately, after splitting the data into three different socioeconomic classes and running independent regressions on each, maternal labor decisions may have a positive effect in a low socioeconomic family, but the possibility of endogeneity still remains since the instrumental variables are weak. Maternal labor decisions in the other two socioeconomic groups do not seem to affect the adolescent's likelihood of engaging in risky behavior, though the same caveat must be stated since endogeneity was not completely controlled for.

Recall that Ruhm (2004a) examined the effects of maternal employment on different socioeconomic classes. In terms of cognitive test scores of the adolescents, the effects of maternal labor were either positive or negative, depending upon the SES of the family. The regressions in Table 7 do not carry this same pattern into the risky behaviors of the adolescents. Though there is the possibility that maternal employment decreases the likelihood of risky activities in a low SES family, the possibility of endogeneity still lingers.

Lopoo (2004) used data from the National Education Longitudinal Study in 1988 to examine teenage childbearing rates of eighth-grade students. He found that the SES of the child mattered when examining the effects of maternal employment. To see if my data set and regressions agreed with Lopoo's findings, the dependent variable was changed from including all risky behaviors to just including a binary variable equal to 1 if the adolescent engaged in sex within the past year. The regression did not show that maternal labor had any effect on whether or not the adolescent engaged in sexual activities within the past year, regardless of SES. One possible explanation of this is the difference in the data sets and

years of information. Also, Lopoo examined the childbearing rates of the teenagers, while this paper only had information on sexual activities of the child.

Concluding Discussion

Except for low SES families, maternal labor decisions do not appear to affect the likelihood of an adolescent engaging in risky behavior. After analyzing all of the data together, splitting the data into marriage subsections, and splitting the data into different socioeconomic classes, this pattern persists. In an attempt to control for the possibility of endogeneity, instrumental variables were utilized on the maternal labor coefficients. The resulting linear probability models did not show any statistical significance on the coefficients for maternal labor. In addition, the instruments were found to be weak in every case, though exogenous.

A possible explanation for these findings may reside in the large amount of control variables used. Maternal employment may indirectly affect an adolescent's life through other variables such as time spent with the child, time spent checking on homework, or the availability of the parent to take the child to different activities. Since these variables were being held constant while maternal employment changed, the labor aspect by itself may have had no effect. Thus, if many of the effects that maternal labor has on the household are controlled for through other variables, the fact that a mother chooses to work may not by itself affect adolescent behavior.

For low SES families, the results obtained could be a result of endogeneity. Since this was unable to be sufficiently controlled for, high confidence cannot be placed in the outcome obtained for low SES families. One hypothesis as to why a low socioeconomic

adolescent may benefit from maternal labor would be the increase in income. However, since income was controlled for, this may not be the case. Perhaps the role model of the parent working assists in creating healthy attitudes within the adolescent that decreases risky behavior.

These results for the most part agree with past literature (e.g. Aughinbaugh & Gittleman (2004)), though relevant discrepancies sometimes appear (e.g. Lopoo (2004)). These discrepancies have possible explanations stemming from different age groups observed, different data sets used, and different econometric techniques utilized.

VI. Conclusion

This study analyzed the effects of maternal labor on the behavior of adolescents. It has been found that, when examining all of the families together or when splitting them into different subgroups, maternal labor choices do not have a statistically significant effect on the probability that an adolescent will engage in risky activities. The only exception was found in low SES families, where a mother entering the work force decreased the probability of the adolescent engaging in risky behavior with a 10% statistical significance level. In an attempt to control for hypothesized endogeneity, instrumental variables were implemented. These instruments were found to be weak yet exogenous in every regression, implying that the possible endogeneity effects were not completely controlled for.

There are a number of limitations in this paper that may have affected the findings. First, the missing data that was replaced by the means of the variables may have created larger problems than is realized. Perhaps using other data sets without missing pieces of information would be useful in future research. Second, the effects of endogeneity were not

successfully controlled for since the instruments used were weak. Better instruments would be helpful in controlling for the hypothesized endogeneity of the regressors. Finally, the time frame of the maternal employment hours was during the same year as the adolescent risky behavior. This may be a problem if there is a lag between the maternal employment decisions and the effects on the adolescents. Thus, examining the employment history during the same time as the risky behaviors would not demonstrate a causal relationship.

There are a number of areas for future research. Since endogeneity was not completely controlled for, other methods may be implemented to successfully control for this problem. Ruhm (2004a) examined the maternal labor patterns before the adolescent was born in an attempt to control for this possible problem. There may be other methods that would be useful since there is the possibility that this endogeneity harmed the findings of this paper. Since there are so many variables to consider and data challenges, a second possible research frontier could focus on better regression analyses. For much of the research already done on the topic, the style of regression analysis the authors use tends to create different results. Thus, it would be helpful to have a study reconciling the different regression techniques and the different results they create.

Further research topics also lie in the realm of policy applications. How do these behavioral effects change if extended family members spend most of the time caring for children? Are there different parenting abilities or is there different parenting knowledge typically associated with different socioeconomic classes? What are the effects of school programs that try to give children activities in which to be involved after school and do these effects offset problems created from absent homes? Understanding some of the basic effects

on teenagers due to maternal labor decisions is a foundation off of which more research can be done to rectify any problems found.

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Appendix A

Table A.1 below lists all of the variables used in this paper and the number of missing observations present in each variable. Missing values were replaced with the means of the variable; the means were found using the observations that were present.

Table A.1. Number of missing values replaced in each variable

Variable	Number of Observations Missing
Time	
Mom Works	68
Weekly Hours	68
Weekly Hours Squared	
House Husband	
Mom Time	
Not Enough	30
Too Much	30
Dad Time	
Not Enough	190
Too Much	190
Background (M)	
Foreign Language	1
Urban Residence	5
Siblings	2
Smoke (M)	925
Lifetime Drugs	72
Religious Affiliation	
Christian	72
Marital Status	
Married	61
Other	61
Children	61
Age (M)	61
Background (C)	
Female	0
Birth Order	0
Age (C)	0

Table A.1. Continued	
Child Residence	
Other	61
Father in Household	186
Religion	7
School	0
Dropped Out	21
Homework	114
Check Homework	100
Chores	99
TV	99
Discuss	103
Attend	648
Club	644
Highest Grade	624
Mom Know	84
Risky Pressure	115
School Pressure	113
Neighborhood Crime	4
Medicine	2
SES	
Grandmother Education	86
Grandfather Education	226
Race (C)	
Hispanic	0
Black	0
Race (F)	
Hispanic	658
Black	655
Income (M)	160
Income (S)	686
Family Income	310
Poverty Status	310
Mother Education	61
Father Education	1099
Bill Difficulty	45