Does Marriage Strengthen Family Ties?

The Analysis of the Effect of Parental Marriage on Out-Of-Wedlock Children's Home Environment and Academic Success

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Abstract

In the last 50 years, the unwed birthrate escalated drastically from an almost negligible rate to more than one third of all births. In this study, I examine whether a marriage improves the home environment quality and academic performance of out-of-wedlock children. Whereas a divorce worsens children's academic and social outcomes, little is known whether a legal marriage instead of cohabitation tightens family relationships and benefits children's academic and behavioral outcomes.

In order to understand the roles of parental marriage and cohabitation for out-of-wedlock children, I sample out-of-wedlock children in the National Longitudinal Survey for Children and Young Adult 1979 (NLSY79) and analyze the effects of their mothers' marital status changes on their academic performance and home environment quality.

The comparison between child outcomes of those whose parents eventually married and those whose parents just cohabitate suggests that those whose parents married have better academic outcomes and home environment quality. However, I find that this advantage cannot be attributed to the parents' marital statuses. Moreover, I find that a marriage of previously cohabitating biological parents actually has a negative effect on the child's reading comprehension score. Contrarily, the advantage of children whose parents cohabitate compared to those who do not live with their biological fathers can be largely attributed to the cohabitation and involvement of the biological fathers in raising their children.

1. Introduction

The last century has witnessed a drastic decline in first marriage rates and a surge in unwed childbearing. The unwed birthrate increased drastically from 8 percent in 1965 to 35 percent in 2006 (Figure 1). The social pressure for single mothers to marry has faded as more single women started to have children, and "shotgun marriages" became less common as a result (Stevenson and Wolfer (2007)). At the same time, the political climate towards marriage has fluctuated immensely in the last three decades. Many states implemented unilateral and no-fault divorce laws in the 1970s. However, since early 1996, at least eight states have started to consider rolling back unilateral and no-fault divorce in order to reverse the liberalizing trend in divorce laws.[1] The advocates of pro-marriage policies often argue that encouraging marriages and making divorce more difficult will help maintain traditional two-parent families and improve child outcomes. For example, in 1996 Congress decreed, "Marriage is the foundation of a successful society" and "marriage is an essential institution of a successful society which promotes the interests of children." Given the common assumption that children in single parent households are less successful than the comparable children in intact families, why do so many mothers never get married? Is there any advantage in cohabitation with the child's father over a legal marriage, or vise-versa?

In this study, I examine whether a marriage improves the home environment quality and academic performance of out-of-wedlock children. While the impact of parental divorce on child outcomes has been studied extensively, the effect of cohabitation, marriage, and divorce of mothers who had out-of-wedlock births has received little attention. A large volume of studies have shown that being raised by a single parent causes poor academic performance and behavioral issues even after controlling for the self selection effect where the poor performance of

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[1] Arkansas, Louisiana and Arizona have passed "covenant marriage" laws, under which the couple receives premarital counseling and signs a covenant that makes divorce more costly via separation periods with intensive counseling.

children of divorcees can be caused by their parents' frightful marriage instead of their divorce (Picketty (2003), McLanahan and Sandefur (1994), Ermisch and Francesconi (2001)). [2] Consequently, these findings have motivated policy makers to apply substantial political pressure to promote marriage and reduce out-of-wedlock births under the assumption that out-of-wedlock children will be better off when their parents are married. Yet, little is known beyond the effect of being raised in a non-intact family instead of an intact family.

Several recent studies have utilized family structures other than just intact or non-intact families in order to find the effect of family structure on children's academic and behavioral outcomes. For example, Hill et al. (2001) compare intact families with families with only a mother, a mother with grandparents, a mother plus a stepfather, and other non-intact families. Similarly, the new studies by Gennetian (2005) and Ginther and Pollak (forthcoming) divide family structure into intact, divorced, step, and blended families using marital changes and sibling structure changes. Whereas they find a significant negative effect of being raised in a divorced family, the effects of being raised in other types of family on child outcomes are insignificant.

The effects of family structures on the well-being of out-of-wedlock children had not been addressed until Liu and Heiland (2006) investigated the effect of involvement of fathers in raising children as reflected by the health level of young out-of-wedlock children. Interestingly, they find some evidence that children born into families of cohabiting biological parents realize better outcomes, on average, than those born to mothers who are less involved with the child's father. However, there is no evidence that children born to cohabiting biological parents benefit from a subsequent marriage. Whereas Liu and Heiland (2006) focus on the health status of young children under age three as reported by their mothers, my study further investigates whether a mother's marital status affects her child's home environment quality (for children of all ages) and academic performance (for children over 5 years old) using observations of out-of-wedlock

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[2] These studies find that single parenthood negatively affects children's futures by lowering their educational attainment and is correlated with inactivity, early childbearing, distress, and smoking.

children in the National Longitudinal Survey for Youth 1979 (NLSY79). In order to control for the potential endogeneity of marital status choices, I employ generalized fixed effects models.

There are many important policy implications from understanding the effect of marital status changes of mothers with out-of-wedlock children. For example, qualification rules for welfare programs such as Temporary Assistance for Needy Families (TANF, formally known as Aid to Families with Dependent Children (AFDC)) can affect single mothers' incentive to legally get married. 1996 welfare reform imposed a lifetime limit of five years for the recipients of TANF benefits, and the rate of increase in out-of-wedlock birth slowed down substantially (Figure 1). If the growth of the out-of-wedlock birth rate decreased due to the lowered incentive to stay single as the consequent of the reform, it is crucial to understand whether marriage of parents will really improve the well-being of out-of-wedlock children.

The analysis in this paper makes several contributions to the literature. First, existing studies that find the effects of family structures on children's well-being did not distinguish these effects between out-of-wedlock children and others. In reality, the mothers of out-of-wedlock children may face different benefits, costs, and obstacles in their marriage than other mothers. In addition, previous studies often did not distinguish marriages between biological parents from other types of marriages. NLSY79 allows me to identify whether the mother's husband was a biological father of her children or not and whether the children lived with their biological fathers.

My analysis finds that living with a biological father improves the out-of-wedlock child's home environment and academic performance. On the other hand, I do not find any evidence that a legal marriage of a mother who already lives with her children's father improves the children's home environment quality. Moreover, the mother's marriage is predicted to lower her children's reading comprehension scores regardless of whether the husband is the biological father of the children or not. Contrarily, out-of-wedlock children whose parents eventually marry tend to have better home environment and school performance than those whose parents just cohabitate.

Therefore, the findings in my analysis confirm that the better well-being of out-of-wedlock children in intact families is not due to the legal marital status of parents.

2.   Hypothesis

The key hypothesis that this paper intends to test is whether there are benefits to marriage for out-of-wedlock children compared to simple cohabitation between biological parents. The household economics theory explains the formation of a family by the advantage associated with a marriage such as specialization in household production, joint accumulation of wealth, and joint ownership of properties (Becker (1981)). A marriage allows a man and a woman to raise children together and invest in them as public goods efficiently. It also expands the budget constraint for the family. If men were not able to join raising children without a marriage, then a single mother's children become her own private good, and the child care quality provided by a single mother is likely to be more limited than that of married couple. On the other hand, married couples should always provide better child care compared to single mothers.

In reality, the number of couples who cohabitate without marriage and raise their children together like traditional intact couples has consistently increased in the last century. These out-of-wedlock children whose parents cohabitate are likely to receive more care and investment from both of their parents compared to children raised by only one parent. However, can these cohabitating families provide as good home environment for their children as families that are tied by legal marriage contracts? The major difference between legal marriage and cohabitation outside of marriage is that there is a higher fixed cost for initiating and terminating a marriage compared to cohabitation. For example, the cost of wedding is not trivial for many couples who are just starting to raise their children. In addition, marriage may raise the tax the couple pays in total or lower the welfare benefit the couple could have received if they remained unmarried. On the other hand, a legal marriage imposes a greater cost of breakup, which may strengthen the couple's trust between each other and possibly increase the father's investment in his children.

Previous studies have found that being in an intact family gives children a great advantage in gaining social and academic success compared to being raised by a mother who has never been married (Guidubaldi, 1984, Krein and Beller, 1988). These findings serve as one of the grounds used by the advocates of pro-marriage policies. However, it still is unclear whether those who are most pressured to get married by these policies, cohabiting parents of out-of-wedlock children, will provide better child care if they legally marry. It is possible that parents of out-of-wedlock children may choose not to marry even after their pregnancy as they expect that the cost of marriage is higher than its benefit. Therefore, this study carefully tests whether a legal marriage will benefit the well-being of out-of-wedlock children whose parents already live together. A policy that promotes marriage is likely to be successful if my results predict that children whose parents just cohabitate would have demonstrated significantly better outcomes if their parents were legally married.

3. Data and Methodology

3.1 Overview

I use the 1979 National Longitudinal Survey of Youth (NLSY79). The NLSY79 is a panel study of approximately 12,000 males and females who were interviewed first in 1979. The data include detailed information about the marital status, socio-economic characteristics, and labor market behavior of each respondent and his or her family. In addition, information about the biological children of female respondents represented in the NLSY79 has been reported since 1986. I match the information about mothers and children in the NLSY79 in order to construct a panel dataset containing each child's demographic and family characteristics. NSLY79 reports whether each child lives with his or her biological father at each data point. However, it provides limited information about fathers of the children, and many variables describing the fathers' characteristics are missing.

I use two types of dependent variables in the model; children's home environment quality and achievement test scores. The children's home environment quality is measured by the Home Observation for Measurement of the Environment (HOME) Inventory. The HOME Inventory is designed to measure the quality and quantity of stimulation and support available to a child in the home environment. This measure has become one of the most widely used measurement scales for assessing children's home environments.[3] The HOME Inventory was administered in four versions for children of all ages (Infant/Toddler HOME, Early Childhood HOME, Middle Childhood HOME, and Early Adolescent HOME).[4] These data, collected from both reports by mothers as well as interviewer observations during the biennial assessment interviews, provide information on the overall quality of the home environment, the emotional and verbal responsiveness of the mother, the maternal acceptance of and involvement with the child, the organization of the environment, presence of materials for learning, and the variety of stimulation. For the older age groups, the HOME Inventory also includes a measure of parental maturity. A binary-choice (yes/no) format is used in scoring items for the HOME.[5] I use the percentile score of each child's assessment as the HOME Inventory score each year.

The second dependent variable, children's academic performance, is measured by percentile scores on the Peabody Individual Achievement Test (PIAT) in reading comprehension and mathematics. PIAT is an individually administered biennial achievement test for children ages 5 to 18 years and is designed to assess student achievement in educational settings.

3.2 Family Classifications

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[3] The measure has been used throughout North and South America (including the Carribean), in several European and Asian countries, in Australia, and in at least two African nations. It has been used in a wide variety of clinical and research settings and to evaluate the impact of intervention programs. Reviews of research on HOME can be found in Elardo and Bradley (1981), Bradley (1982), Gottfried (1984), Bradley and Caldwell (1988), Bradley (1994), and Bradley, Corwyn, and Whiteside-Mansell (1996).

[4] NSLY79 records HOME scores of children between 0 to 14 years old.

[5] Psychometric information about the Inventories is found in the Administration Manual (Caldwell and Bradley, 1984).

In NLSY79, changes in the mothers' marital status are observed every year. I first classify out-of-wedlock children's family structures into three types; "never married", "married", and "divorced". If a mother is coded as "never married" from the last survey year (or the child's birth year if the child is born after the last survey) to each panel year, I classify the mother as "never married". If the mother has been coded as "divorced" during the panel year, I classify the mother as "divorced". Then, "never married" and "married" mothers are categorized into two types depending on whether the mother cohabitates with the biological father of her child. If a mother is "never married" and her child is coded as "living with a biological father", then I classify the family as "unmarried cohabitation". Otherwise, the family is classified as "single: no cohabitation". Similarly, if the mother is "married" and her child is coded as "living with a biological father", the family is coded as "intact". Otherwise, "married" mothers are classified to be in "step" families.

Figure 2 and 3 depict the composition of family structures among all of the mothers in NLSY79 and the mothers who experienced unwed births, respectively. Figure 2 shows that over 50% of observations of mothers in NLSY79 are of mothers who are married to the biological fathers of their children. The proportion of single (never married, divorced, or widowed) mother observations is only 29%. On the other hand, in figure 3, nearly 70% of observations of mothers who have had children out-of-wedlock are single. Out of the single mother observations, only 6% of observations of the out-of-wedlock children cohabitate with fathers. Contrarily, 36% of observations are of mothers who are married; 64% of them are of those who end up marrying their children's biological fathers, and 36% of them are of mothers who marry a partner who is not a biological father of their children. Finally, 6% of these observations belong to mothers who are divorced.

Figure 3 further describes the change in the proportion of married and cohabitating parents of out-of-wedlock children in the panel data over years (from 1986 to 2004). Initially, only 0.6% of out-of-wedlock children's parents are married in 1986, and around 10% of out-of-

wedlock children's parents cohabitate without marriage. The proportion of parents cohabitating without marriage has consistently decreased over the years, from 10% in 1986 to 3% in 2004. At the same time, the proportion of intact families has increased drastically from 0.6% in 1986 to 11% in 1988, perhaps due to couples who married because of the pregnancy, and kept rising to 36% in 1998. This indicates that majority of cohabitating parents eventually marry each other.

3.3 Summary of Dependent Variables

Table 1 and Table 2 summarize the mean HOME scores and PIAT scores in NLSY79 from 1986 to 2004 by family structure type of all observations and only out-of-wedlock observations respectively. Comparison between tables 1 and 2 allows one to evaluate the difference in child outcomes in various family structures between out-of-wedlock children and all others. Surprisingly, for all dependent variables, the average scores are higher for out-of-wedlock children in intact families than for all children in intact families. It seems to imply that parents who cohabitate before marriage tend to provide better home environments for their children and their children tend to have higher academic achievement. This could be due to the screening process that cohabitation provides, which may only select parents who fit for a stable relationship and thus marriage. On the other hand, married parents who argue often may not easily get divorced, which may negatively affect the average quality of marriage among intact families. The average test scores of out-of-wedlock children and other children in divorced families are comparable. Contrarily, out-of-wedlock children with step parents tend to have worse home environment and academic scores than other children in step families.

Reviewing the simple descriptive statistics for out-of-wedlock children in table 2 may provide some grounds for belief of this paper's hypothesis: encouraging single mothers to marry benefits out-of-wedlock children's well-being. First, among children who live with their biological parents in table 2 ('intact' and 'single cohabitation'), all of the average test scores are notably higher for children whose parents are married. This gap raises a question of whether a marriage of biological parents improves their children's well-being or parents who have better

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parenting skills and resources are more likely to marry eventually. In addition, among children

who do not live with their biological fathers, those whose mothers have *never* been married tend

to have appreciably lower scores than those whose mothers have been married (either divorced or

remarried). However, it is still not clear whether a marriage itself improves the child's well-being

or perhaps mothers with better parenting skills tend to marry.

3.4 Independent Variables

Independent variables used in this analysis are: the family structure of the child's family,

the mother's wage rate, her working hours and labor force participation, and net family income.

For children whose mothers are married to their partners, the ratio of wage rates between the

mother and her husband may provide information about the bargaining power between the

partners. However, the majority of the observations (82%) are missing the wage rates and

working hours of spouses.[6] Moreover, since these spouse variables are not reported in

"cohabitation" families, the relative bargaining power between couples who cohabitate would be

biased using the ratio of wage rates from only married couples. Therefore, I do not include the

variables involving the mother's partner. Instead, I use the net family income in order to capture

the amount of income each male partner earns. In addition, including the net family income as

well as the information about the earnings of each mother such as the mother's wage rate and

working hours allows me to take into account the effects of non-labor income such as welfare

benefits for low-income mothers and child support from the biological father of the child.

There are many time invariant variables that are likely to affect child outcomes such as

mothers' years of education, Armed Force Qualification Test (AFQT) scores that measure

mothers' basic abilities, as well as children's sex and race. However, since the identification of

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[6] NLSY79 reports each respondent's wage rate but does not report his or her spouse's. Instead, it lists the weekly earnings and number of hours worked by each respondent's spouse. Husbands' wage rates can be calculated based on the information on earnings and hours of work.

my model relies on the change in explanatory variables over time, it is impossible to identify the effects of these variables on the dependent variables.

Tables 3 and 4 contrast the family characteristics of all child observations and those of out-of-wedlock children. Among child observations coming from intact families, the average values of net family income, mother's age at first birth, hourly wage, and educational attainment are all higher for out-of-wedlock children than for children born to married couples. This comparison may explain the higher home environment quality and test scores of out-of-wedlock children than others among intact families. However, the average AFQT score of mothers with out-of-wedlock children in each of the family structure categories is substantially lower than that of mothers who were married when their children were born.

In Table 4, it is important to note that there is a large difference in the family characteristics of out-of-wedlock children whose biological parents are just cohabiting (column 2) and those whose parents are married (column 1). Mothers who are married to their children's biological fathers tend to have a large economic advantage over cohabiting mothers; sizably higher family income, educational achievement, wage rates, and AFQT scores. On the other hand, out-of-wedlock children whose biological parents cohabitate do not seem to have more advantageous family backgrounds than those whose mothers do not cohabitate with their children's fathers.

3.5 Empirical Specifications

I estimate basic regression equations in order to isolate the effects of the family structure choices of mothers on the home environment quality and academic achievement of out-of-wedlock children. In order to control for the endogeneity of family structure choices, I use the generalized fixed effects model by treating, as a time invariant fixed effect, the unobserved child specific factor that could affect the child's home environment and achievement test scores.

The identification of a fixed effects model relies on changes in explanatory variables over panels. Therefore, this specification does not allow one to estimate the effects of the factors that

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do not change over time. Whereas using the random effects specification instead allows one to identify the effects of time invariant variables on the dependent variables, this specification may cause the estimated parameters to be biased because of the endogeneity of marital status choice. I implemented a Hausman test to assess the appropriateness of the random effects model and reject this specification at the1% significance level. To take into account the possibility that the model fits the data differently for children of different sex or race, I also run separate regressions for male and female children, and white and non-white children.

4. Results

Table 5 summarizes the marginal effects of family structures and characteristics of out-of-wedlock children on their HOME Inventory percentile scores and PIAT test percentile scores. The default family category is intact. There are significantly more child observations with HOME Inventory scores available than child observations with PIAT scores because HOME test scores are obtained from children of all ages, while only children over 5 years old take PIAT tests.

Whereas I use both HOME and PIAT scores as measures of children's well-being, these scores capture slightly different sides of children's welfare. Home Inventory scores measure the amount of quality time between children and their parents, parental skills, and the availability of educational materials and aids at home. One can view this home environment measure as the input for production of child development, while PIAT scores measure the quality of child output. HOME scores may better capture the direct short run effect of a family structure change on the child's well-being than PIAT scores because a family structure change may affect the child's academic scores with a significant time lag. On the other hand, PIAT scores may capture the unobserved quality of child care that helps the child to be more competent, which cannot be measured in the objective measure of home environment.

The key questions that this analysis answers are: 1) Are out-of-wedlock children whose biological parents first live together better off when the parents later marry? 2) Does cohabitation

between biological parents improve an out-of-wedlock child's well-being? 3) What are the effects of the mother's marriage to some one other than the biological father of her child?

4.1   Determinants of Home Environment

The first column of Table 5 presents the determinants of out-of-wedlock children's home environment quality. To answer the first key question, one can show that a legal marriage between biological parents improves their children's home environment if the estimated coefficient on "biological cohabitation" is negative relative to the default category, "intact". In fact, the marginal effect of cohabitation between biological parents compared to intact marriage is statistically not different from zero at the 10% significance level. Therefore, the hypothesis that a legal marriage improves the home environment of an out-of-wedlock child is rejected.

Second, there is a large negative marginal effect of having a single mother who does not cohabitate with the child's father compared to living with both biological parents. This result suggests that the father's involvement in child-care is one of the important keys for the better home environment quality for out-of-wedlock children. To address the third key question, I find no evidence that an intact family gives a better environment to an out-of-wedlock child than a step family does. However, the estimated model still indicates that going from a single mother family without the child's biological father to a step family actually improves the child's home environment quality.

Finally, the estimated negative effect of divorce on the home environment of out-of-wedlock children is substantial. This detrimental effect is larger than that of being raised by a mother who does not cohabitate with the child's biological father. This finding emphasizes the importance of single mothers' careful marriage decisions.

Among the family characteristics included as explanatory variables, only net family income was found to have a significant effect on the child's home environment. Surprisingly, the mother's working hours, which should reflect the time the mother can spend with her children, have no significant effect on the home environment quality percentile scores. This may be due to

the limitation of the HOME Inventory percentile scores as the measure of home environment quality; the HOME scores were calculated by some objective questions that may not entirely capture the true quality of child care in each family.

4.2 Determinants of Academic Achievement

In order to better understand the effect of family structures for out-of-wedlock children on their well-being, I not only use the measure of child care quality at home but also the child outcomes measured by achievement test scores as dependent variables. The second and third columns of table 5 report the estimated determinants of PIAT math scores and reading comprehension scores respectively.

First, it is noteworthy to compare the significance of the estimated parameters in the second and the third columns. Whereas the mother's longer hours of work have a negative effect both on her child's math and reading comprehension scores, none of the other explanatory variables explain the math score. On the other hand, the reading comprehension scores are significantly affected also by the family structure of the child's household.

Interestingly, a legal marriage between previously cohabitating biological parents of the child is predicted to deteriorate his reading comprehension scores by over 12 percentage points. Similarly, a single mother's marriage to the child's non-biological father also is predicted to worsen the child's reading comprehension score by about 14 percentage points. Whereas marriage of the mother is always predicted to worsen the out-of wedlock child's reading comprehension score, the negative effect of marriage is significantly greater if the mother marries a man who is not the biological father of her child. In previous studies, little evidence has been found that distinguishes the effect of having both biological parents and being in a step family (Akashi (2007)). However, this finding clearly shows that intact families may provide a better environment than step families can for out-of-wedlock children, at least from an academic stand point.

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There are several possible reasons why a marriage could worsen a child's academic achievement. First, a marriage often increases a mother's net family income, which may disqualify her from welfare benefits she could have received otherwise. Many studies have shown that there is a large incentive for low-income mothers to remain unmarried (Alm et. al. (1999)). In addition, single mothers may lose a part of her support structure and non-pecuniary aids such as free child care from her family, friends, and community members when they get married. Moreover, marriage itself may add extra burdens and stress to some couples who would have had good relationships otherwise such as the sharing financial accounts and closer interaction with each other's family members.

In order to understand the effects of cohabitation of biological parents on the child outcomes, I compare the coefficients that explain the effect of being raised by a single mother who cohabitates with her child's father ('Single, Biological Cohabitation') and the effect of having a single mother who does not live with her child's father ('Single, No Biological Cohabitation'). I still find that there is a significant positive effect of living with both biological parents than having no biological father in the household. Living with both biological parents improves the child's reading score by over 5% compared to having no biological father at home. This result is consistent with the findings in Liu and Heiland's (2006) study on the effects of parental cohabitation on out-of-wedlock infants' health and confirms that the presence of a biological father in an out-of-wedlock child's life helps the child improve his or her academic ability. Finally, divorce is predicted to have a large negative effect, the reduction of 12 percentage points, on average, in the child's reading percentile score for those who go from an intact to a divorced family.[7]

4.3   The Family Structure Effects on White and Non-White Children, Male and Female Children

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[7] Most (96%) of divorced mothers of out-of-wedlock children were previously married to their children's biological fathers. In other words, only 4% of divorced mothers go from 'step' to 'divorced' families.

A large volume of literature explores the causes of achievement gaps between males and females as well as blacks and whites. In order to allow for the possibility that children of different genders or races develop their academic skills differently, and that the quality of the home environment is determined differently among these children, I estimate separate regressions for whites and non-whites (Table 6) as well as for males and females (Table 7).

From the parameters reported in Table 6, it is clear that the home environment quality is determined differently for white and non-white families. The explanatory variables in the model can better explain white children's home environment quality than non-white children's. For example, I find there is a significant negative effect on a white child's home environment quality when the child's biological parents' marital status changes from "unwed cohabitation" to "legal marriage". On the other hand, the effect of the same change is insignificant for non-white children. Similarly, whereas net family income is predicted to largely improve white children's home environment, there is no significant relationship between non-white children's home environment and their family's income.

Comparing the determinants of PIAT reading comprehension scores of white children and others, all of the estimated parameters that are statistically significant have the same signs. However, the estimated impact of family structure changes on non-white children's reading comprehension scores is significantly stronger than that on white children's. Especially, the benefit of the mother's unmarried status is overwhelmingly large for non-white children. A non-white child of unwed parents that cohabitate is predicted to receive a score that is more than 13 percentage points higher than the case where his or her parents are legally married. Whereas cohabitation of parents is found to be important for child development, the negative effect of legal marriage exceeds the benefit of cohabitation when comparing the case where an out-of-wedlock child is raised by a mother who does not cohabitate with his or her biological father and by married biological parents. A non-white child is predicted to score more than 5 percentage points higher when the mother does not cohabitate with the father compared to the case where the

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biological parents are married. The effect of the mother's marriage to a non-biological father is also significantly detrimental for the child. In column 6 of Table 6, a non-white child of a single mother who does not cohabitate with a biological father, is predicted to earn a 5.87 percentage higher reading score relative to the case where he is in an intact family. If the child's mother now marries a man who is not the biological father of her child, then his reading score is predicted to be 9.9 percentage points lower than the case when he is in an intact family. Therefore, the total negative effect of the mother's marriage to a step father on the child's reading score can be calculated as 5.87 +9.9=15.77 percentage points. Finally, non-white children are also more vulnerable to their parents' divorce, which is predicted to decrease their score by nearly 20 percentage points.

Table 7 compares the determinants of out-of-wedlock children's home environment and academic achievement for male and female children. Again, male and female children are affected by their parents' marital and cohabitation status differently. Comparing the first and the second column, I do not find any evidence for any effect from family structure changes for male children except for the effect of parental divorce. However, for female children, having a biological father at home significantly improves their home environment quality. For example, a female child who does not live with both of her biological parents is predicted to earn 5 percentage points less than she would if her parents were cohabitating or married.

I also find that female children receive more benefit from their mothers' single marital status than male children in obtaining better reading comprehension test scores. For example, comparing column 5 and 6 of Table 7, a female child is predicted to earn a reading comprehension score that is nearly 18 percentage points higher when she lives with both of her biological parents who are unmarried than in the case where her parents are legally married. Similarly, if a female child's mother who was previously single marries a man who is not the biological father of her daughter, then my analysis predicts that the child's reading score declines

by approximately 16 percentage points (10.204+5.997). For male children, reading scores appear to be insensitive to the same scenario.

Overall, the comparisons between white and non white children and male and female children draws a more clear conclusion that explains the effects of family structure changes on out-of-wedlock children; The reading ability of female and non-white out-of-wedlock children tends to receive a large advantageous effect from their mothers single marital status regardless of whether they live with their biological father or not. In addition, these children are also more vulnerable to the possible negative effect of being in a step family when their mothers marry non-biological fathers. Regardless of the sex and race of children, a divorce always drastically deteriorates out-of-wedlock children's outcomes.

5.   Conclusions

Although the effects of divorce and remarriage on children's well-being have been studied extensively, little attention has been paid in the literature to the effects of mothers' marital and cohabitation choices on the welfare of children born out of wedlock. Since tremendously many mothers who give unwed births stay single for a substantial amount of time despite the extraordinary financial and social difficulties they face, it is important to understand the true effects of their marital and cohabitation status choices on their children. With the panel dataset from NLSY79 that contains the marital histories of mothers, this paper provides new evidence on the fundamental effects of cohabitation and marriage of biological and non-biological parents on the home environment quality and academic achievements of children born out of wedlock.

Using the results of the estimated model, this paper answers three key questions; (1) Does a parental marriage improve the home environment and academic achievement of out-of-wedlock children? (2)Does cohabitation between biological parents of out-of-wedlock children improve their home environment and academic achievement? (3) Do out-of-wedlock children gain a better home environment and/or higher academic success when their mothers marry males who are not

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the biological father? To answer these questions, I estimate a model that explains the determinants of children's home environment quality and PIAT math and reading comprehension scores. In order to control for a potential endogeneity bias from omitting the unobserved family/child characteristics that are correlated with family structure choices, I employ the generalized fixed effects specification as the estimation method. Among the three dependent variables used, I find that PIAT math scores of children born out of wedlock are not significantly affected by family structure. Considering the fact that children's math skills can be a powerful prediction of their future earning ability (Rose and Betts (2001)), this finding; children's math achievement cannot be explained by their family structure, should be further investigated in the future.

Using the home environment quality as the measure of children's welfare, I do not find any evidence that a legal marriage of biological parents who already cohabitate improves their children's home environment quality. Surprisingly, I even find that a legal marriage of an out-of-wedlock birth mother tends to deteriorate the reading comprehension scores of her children regardless of whether the mother already cohabitates with her children's biological father or not. This effect is much stronger for non-white or female children than for white or male children. This is a striking finding as it is against the controversial policy that promotes marriage for unmarried mothers in order to improve their lifestyle. There are many possible reasons why a mother's marriage may deteriorate an out-of-wedlock child's home environment and reading scores such as the mother's loss of welfare and social support as a result of her marriage. However, it is still not clear what exactly is causing the negative association between the out-of-wedlock child's HOME and PIAT reading scores and his or her mother's marriage. Whereas it is extremely important to identify these factors, the quest for such factors is left for future research.

To answer question (2), I find that out-of-wedlock children, especially female children, whose mothers are single are predicted to have better home environment and reading

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comprehension scores when they cohabitate with their biological parents compared to living with their mothers only. This result is supported by another previous study by Liu and Heiland (2006).

Finally, whereas a mother's marriage to a man other than her child's biological father is predicted to improve the child's home environment quality, it actually has a strong negative effect on the child's reading comprehension scores especially for female and non-white children. Again, the reason why having a step father has a large negative effect on out-of-wedlock children's reading scores while it improves their home environment scores is unclear. One possibility is that a mother's remarriage causes psychological stress to her child, and this stress may worsen the reading score of the child. Alternatively, there may be an unobservable decline in home environment quality associated with step families that cannot be captured by HOME Inventory tests. Whereas little evidence of the effect of remarriage has been shown in previous studies, this study identifies a negative effect of remarriage for out-of-wedlock children. This again is additional evidence that the well-being of children born out of wedlock is determined differently than that of children born into wedlock.

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Figure 1 The Percent of Unmarried Births to All Births from 1940 to 2000 (Source: National Vital Statistics Reports, Vol. 48, No. 16, October 18, 2000)
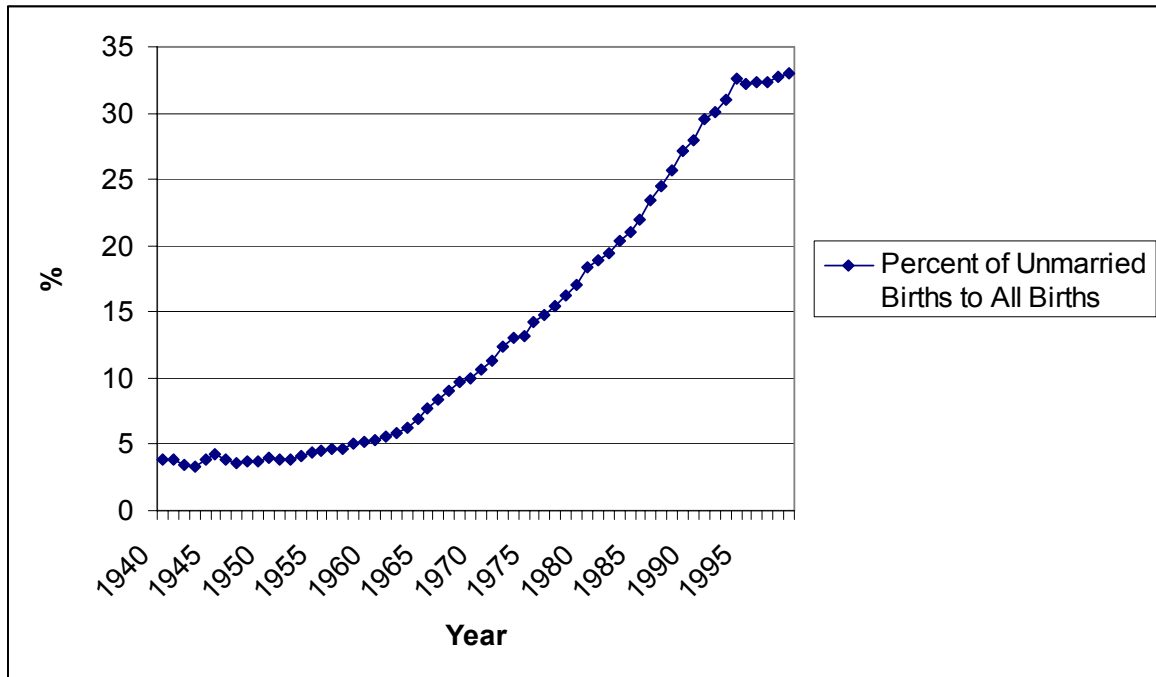
Figure 2: Composition of Family Structures among the Mothers in NLSY79 (1986-2004, N= 92,335)

Never Married to Married
12%

Widow
1%

Never Married
16%

Intact (Never Single Mother)
51%

Step
8%

Divorce
12%
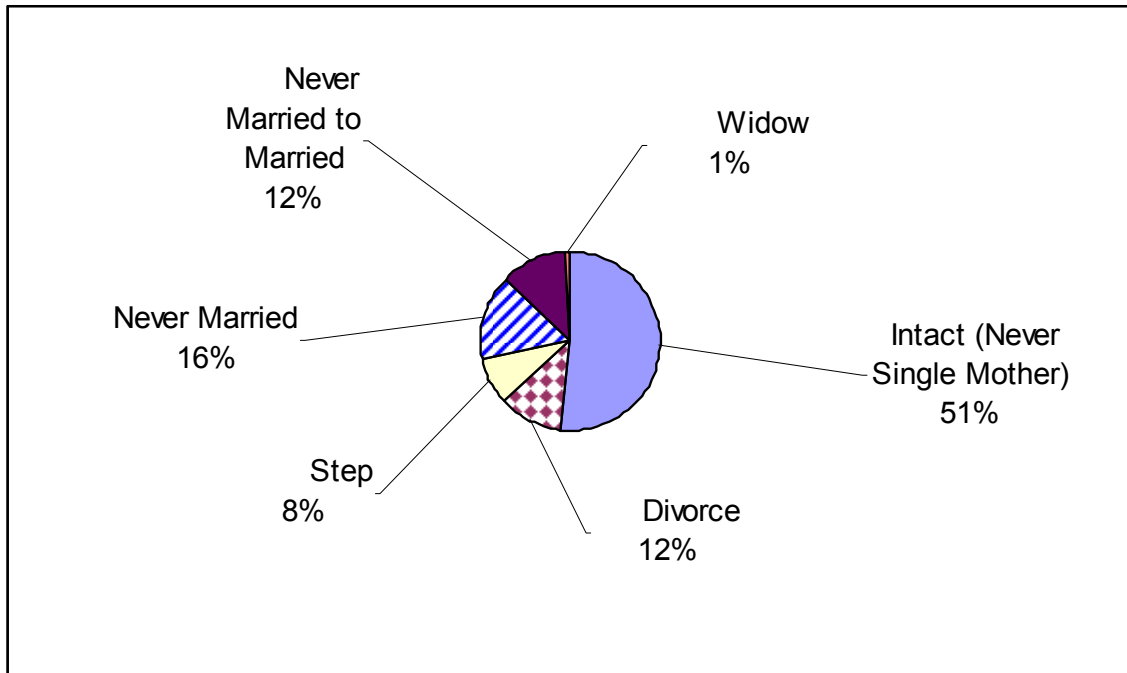
Figure 3: Composition of Families among the Mothers of Out-Of-Wedlock Children in NLSY79 (N=32,309)

Never Married (No Info about Cohabitation)
24%

Never Married (Biological Cohabitation)
6%

Widow
1%

Never Married (No Cohabitation)
32%

Divorce
6%

Intact
23%

Step
8%

Figure 4: The Change in the Proportion of Family Structures among the Out-Of-Wedlock Children Families in NLSY79 from 1986 to 2004

Table 1 – Descriptive statistics of children's HOME percentile scores and PIAT percentile scores (N=46,239)

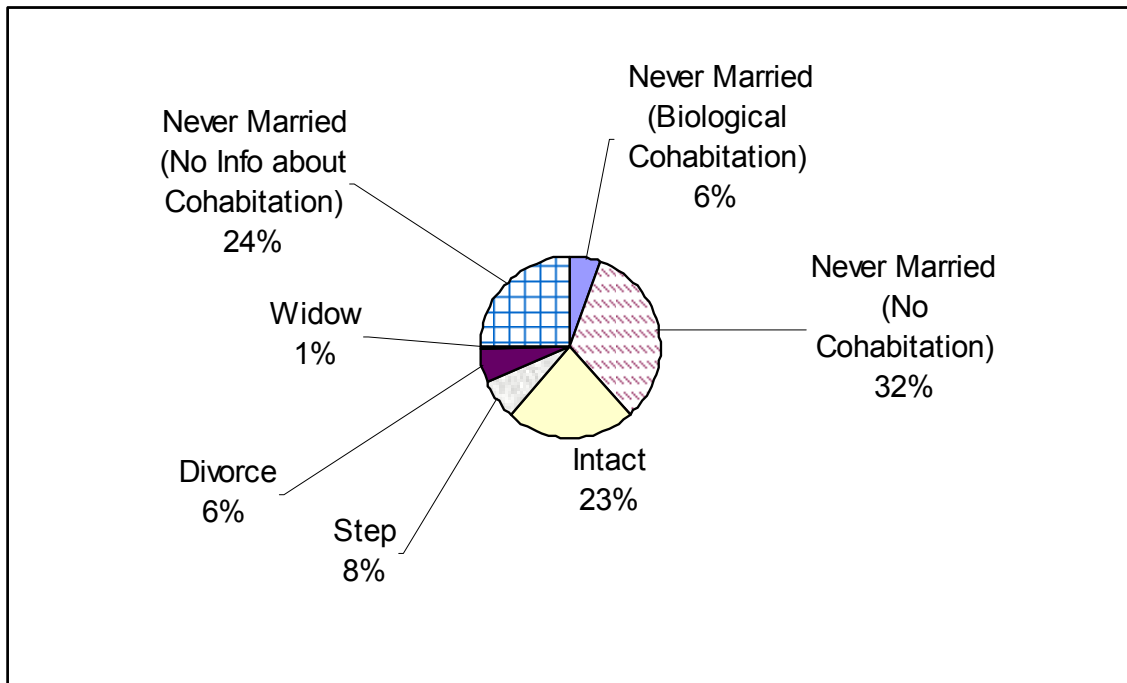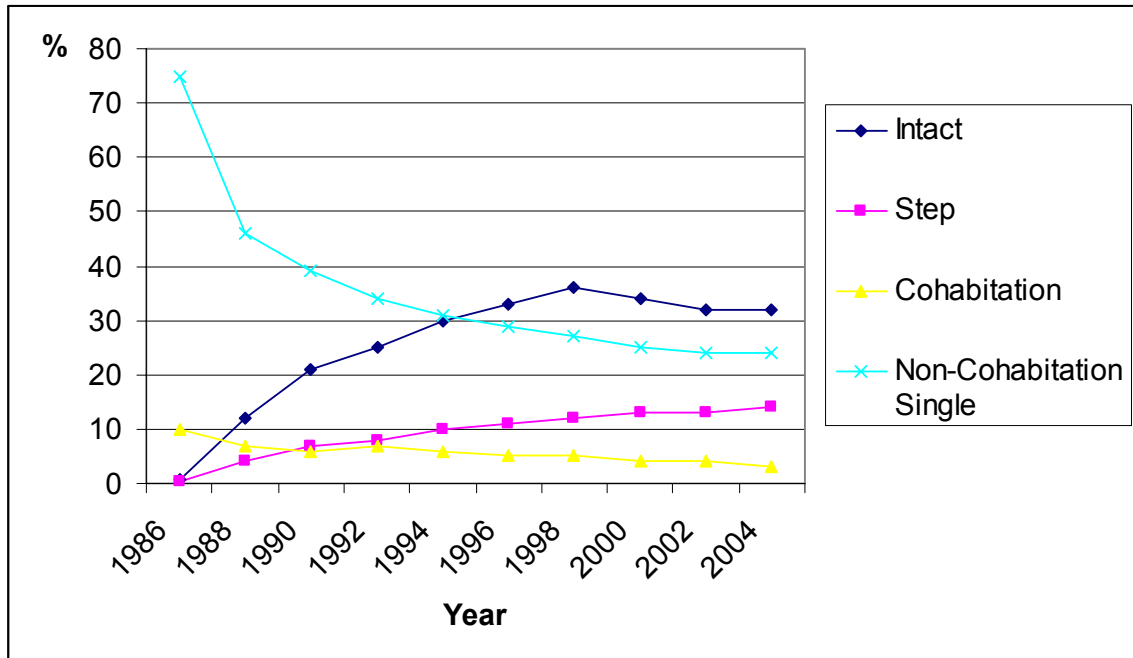| Children's Environment and Performance Mean and Standard Error						
	Overall Mean	Intact Mean	Divorce Mean	Step Mean	Never Married	Widow Mean
HOME Inventory Percentile Score	46.25 (29.36)	52.08 (28.50)	34.58 (26.41)	47.13 (28.122)	28.64 (26.06)	32.49 (27.32)
PIAT Reading Comprehension Percentile Score	52.13 (27.80)	55.29 (27.66)	49.38 (26.97)	54.29 (26.17)	41.28 (27.05)	38.52 (26.27)
PIAT Math Percentile Score	49.81 (27.56)	52.51 (27.78)	48.48 (26.52)	53.91 (26.14)	38.16 (25.10)	38.48 (26.44)

Table 2 – Descriptive statistics of Children's HOME percentile scores and PIAT percentile scores among out-of-wedlock children (N=16,138)

Children's Environment and Performance Mean and Standard Error		Cohabitation		No Cohabitation with Biological Father		
	Overall Mean	Intact Mean	Never Married	Step	Divorce	Never Married
HOME Inventory Percentile Score	40.32 (29.29)	54.41 (27.52)	36.00 (28.02)	36.62 (27.32)	34.69 (25.85)	26.78 (25.20)
PIAT Reading Comprehension Percentile Score	48.47 (28.49)	61.91 (27.08)	43.99 (27.43)	42.73 (27.17)	47.01 (26.46)	41.00 (27.00)
PIAT Math Percentile Score	46.60 (28.05)	59.86 (28.30)	41.54 (26.87)	42.12 (25.85)	48.44 (25.99)	37.79 (24.84)

Table 3– Descriptive Statistics of Family Characteristics of All Mothers in the Sample

	Overall Mean	Intact	Divorce	Step	Never Married	Widow
Mother's Education	13.59	13.91	12.90	13.79	12.43	13.54
Mother's First Birth Age	24.36	25.27	22.37	22.78	22.35	22.76
AFQT Test (Mother)	42.86	49.45	34.61	42.63	19.27	29.8
Hour Wage	10.05	11.11	7.95	8.77	7.20	8.00
Net Family Income	61,242	76,108	26,902	65,784	17,997	26,742
Hour Work	1,319	1,277	1,540	1,543	1,202	1,146
Black	24%	15%	32%	13%	72%	42%
Single Birth	18%	7%	8%	5%	100%	34%

Table 4 – Descriptive Statistics of Family Characteristics of Out-of-wedlock Children (Means and Standard Errors)

	Overall	Cohabitation		No Cohabitation with Biological Father		
		Intact	Never Married	Step	Divorce	Never Married
Mother's Education	12.96 (3.67)	14.33 (3.06)	11.98 (2.66)	12.34 (2.21)	12.89 (4.52)	11.88 (3.55)
Mother's First Birth Age	23.52 (6.33)	27.10 (5.16)	21.65 (5.22)	19.71 (4.00)	22.49 (5.55)	19.45 (4.18)
AFQT Test (Mother)	31.05 (26.92)	47.02 (28.47)	22.61 (20.99)	21.21 (18.74)	27.12 (21.55)	16.25 (15.95)
Hour Wage	9.57 (41.02)	11.95 (21.26)	7.36 (16.81)	11.06 (42.36)	8.79 (6.05)	7.16 (52.19)
Net Family Income	38,902 (79,929)	80,780 (122,169)	13,917 (15,441)	31,426 (41,434)	27,219 (33,563)	14,832 (18,331)
Hour Work	1,208 (1,023)	1,323 (978)	969 (990)	1,354 (1,041)	1,588 (1,066)	940 (1,012)
Mother Age	32.86 (6.12)	34.80 (4.99)	30.92 (5.94)	35.27 (5.15)	36.16 (4.69)	32.37 (6.09)
Black	0.46 (0.50)	0.23 (0.42)	0.40 (0.49)	0.60 (0.48)	0.49 (0.50)	0.76 (0.42)

Table 5: Marginal Effects of Key Independent Variables on Children's Home Environment and PIAT Reading Comprehension and Math Scores for All Samples

			HOME Inventory Percentile Score	PIAT Math Percentile Score	PIAT Reading Comprehension Percentile Score
			N= 13,759 Number of Groups=2870	N= 8256 Number of Groups=2498	N= 6834 Number of Groups= 2363
Family Structure (Reference Category: Intact)					
Biological Parents Cohabitation	Never Married	Single, Biological Cohabitation	1.39 1.07	1.33 1.93	12.77** 2.44
No Cohabitation between Biological Parents		Single, No Biological Cohabitation	-3.79** 1.09	0.33 1.64	7.16** 2.05
	Married	Step	-1.58 1.05	0.32 1.45	-6.71* * 1.81
		Divorced	-5.69** 1.22	2.59 1.76	-12.15** 2.24
Family Characteristics					
Net Family Income			7.32e-06** 3.50e-06	9.40e-06 6.62e-06	-0.00001 8.15e-06
Mother's Labor Force Participation			-0.79 0.71	0.72 0.86	0.46 1.06
Mother's Hours of Work per Year			-0.0004 0.0003	-0.0009** 0.0004	-0.002** 0.0005
Mother's Hourly Wage			.009 .013	0.017 0.02	-0.017 0.03

Table 6: Comparison Marginal Effects of Family Structures between White and Non-White Children

Family Structure			HOME Inventory Percentile Score		PIAT Math Percentile Score		PIAT Reading Comprehension Percentile Score	
			N= 7386 Number of Groups= 1535	N= 6373 Number of Groups= 1335	N= 3882 Number of Groups= 1252	N= 4374 Number of Groups= 1246	N= 3106 Number of Groups= 1159	N= 3728 Number of Groups= 1204
			Whites	Non-Whites	Whites	Non-Whites	Whites	Non-Whites
Biological Parents Cohabitation	Single	No Marriage, Cohabitation	4.024** (1.49)	-1.97 (1.57)	1.89 (2.92)	0.74 (2.59)	9.29** (3.63)	13.54** (3.31)
No Cohabitation between Biological Parents		No Biological Cohabitation	-3.63** (1.77)	-4.91** (1.46)	-0.47 (2.63)	0.59 (2.17)	5.41 (3.27)	5.87** (2.73)
	Married	Step	-2.29 (1.46)	-1.46 (1.54)	-0.39 (2.07)	0.72 (2.06)	-4.56 (2.57)	-9.90** (2.57)
		Divorced	-5.10** (1.57)	-7.05** (1.94)	1.94 (2.32)	3.14 (2.68)	-5.91** (2.93)	-19.25** (3.36)
Family Characteristics								
Net Family Income			1.20e-06** (3.99e-06)	-8.30e-06 (7.36e-06)	1.12e-05 (7.76e-06)	4.58e-06 (1.25e-05)	-5.45e-06 (9.49e-06)	-2.93e-05** (1.45e-05)
Mother's Labor Force Participation			-1.16 (1.00)	-0.41 (0.99)	0.96 (1.32)	0.49 (1.14)	1.34 (1.66)	-0.18 (1.39)
Mother's Hours of Work per Year			0.00008 (0.0005)	-0.0008 (0.00046)	1.29e-004 (6.20e-04)	-1.68e-03 (5.42e-04)	-1.71e-03** (7.75e-04)	-.003** (0.0007)
Mother's Hourly Wage			0.017 (0.018)	-0.0001 (0.023)	9.49e-04 (0.027)	0.038 (0.031)	3.54e-03 (0.044)	-0.031 (0.041)
Intercept			51.88** (0.90)	36.40** (1.33)	56.00** (1.44)	41.06** (1.91)	59.89** (1.82)	46.51** (2.41)

Table 7: Comparison Marginal Effects of Family Structures between Male and Female Children

Family Structure			HOME Inventory Percentile Score		PIAT Math Percentile Score		PIAT Reading Comprehension Percentile Score	
			N= 6748 Number of Groups= 1438	N= 7011 Number of Groups= 1432	N= 4038 Number of Groups= 1238	N= 4218 Number of Groups= 1260	N= 3303 Number of Groups= 1156	N=3531 Number of Groups= 1207
			Male	Female	Male	Female	Male	Female
Biological Parents Cohabitation	Single	Single, Cohabitation	1.708 (1.541)	1.158 (1.500)	0.435 (2.884)	2.100 (2.590)	6.647 (3.517)	17.719 ** (3.384)
No Cohabitation between Biological Parents		Single, No Biological Cohabitation	-2.456 (1.617)	-5.021 ** (1.487)	0.636 (2.475)	0.092 (2.181)	3.282 (2.951)	10.204** (2.846)
	Married	Step	-0.672 (1.598)	-2.347 (1.404)	2.142 (2.239)	-0.930 (1.903)	-7.176** (2.647)	-5.997** (2.497)
		Divorced	-6.290 ** (1.858)	-5.251 ** (1.612)	4.691 (2.717)	1.113 (2.292)	- 11.914** (3.262)	- 12.197** (3.077)
Family Characteristics								
Net Family Income			-2.09e-07 (4.81e-06)	1.61e-05** (5.09e-06)	2.02e-06 (9.15e-06)	1.81e-05** (9.66e-06)	-4.70e-06 (1.12e-05)	-2.26e-05** (1.18e-05)
Mother's Labor Force Participation			-2.512** (1.016)	0.807 (0.984)	0.644 (1.268)	0.779 (1.173)	3.709 (1.502)	-2.481 (1.499)
Mother's Hours of Work per Year			4.849e-04 (4.80e-04)	-0.001** (0.0005)	-6.043e-04 (5.927e-04)	-1.232e-03** (5.60e-04)	-2.956e-03 ** (7.054e-04)	-1.713e-03** (7.167e-04)
Mother's Hourly Wage			0.021 (0.018)	-.009 (.022)	0.024 (0.028)	.00876 (0.030)	1.593e-03 (0.044)	-0.039 (0. 041)
Intercept			42.669 ** 1.123)	45.934 ** (1.031)	47.206 ** (1.796)	48.896** (1.562)	49.588 ** (2.189)	54.879 ** (2.055)