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## ABSTRACT

### **The Division of Labor by New Parents: Does Child Gender Matter?\***

This paper documents some distinct and surprising patterns of specialization among new parents in the NLSY79. Child gender has significant effects on the labor supply of both mothers and father, and these effects are opposite at the two ends of the education spectrum – boys reduce specialization among the college-educated and increase specialization among parents with less than a high school education. Estimates from the recent American Time Use Survey are generally consistent with the NLSY79 findings, and indicate that highly-educated parents devote more childcare time to young sons. The labor supply results are inconsistent with previous research that found boys substantially increase the work hours of their fathers relative to girls but have no effect on mother's work hours. Possible explanations for the heterogeneous responses to sons and daughters across education groups include a bias towards same-sex parental inputs as desired child quality increases and child gender effects on the relative bargaining power of the mother and father. No evidence of improved maternal bargaining power can be found in the leisure consumption of mothers of young sons in the ATUS, but patterns in parental childcare time suggest gender differences in child production functions.

JEL Classification: J22, J12, J13, J16

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## I. Introduction

Since the middle of the 20<sup>th</sup> century, there has been a marked decline in the degree to which married men and women in the United States and in other developed nations specialize in distinct economic activities. Decreasing specialization is reflected in converging rates of male and female labor force participation and in a much slower convergence of time spent by men and women in household activities, including childcare. The “causes” of decreased specialization are often said to be found in decreasing gender wage differentials, rising relative female education levels, decreasing fertility, or even increasing risk of divorce, but these changes in human capital investments and in family structure have evolved simultaneously with changing patterns of time use. Recently, economists have concentrated on examining the effects of presumably exogenous changes in technology as drivers of changes in family life and activities, including changes in market production technology (Goldin, 1990; Galor and Weil, 1996), changes in household production technology (Greenwood, Seshadri, and Yorukoglu, in press), and the development and availability of effective contraception (Goldin and Katz, 2002; Bailey, 2004).<sup>1</sup>

As the average work hours of men and women have converged, substantial heterogeneity has persisted in the degree of specialization across couples at a point in time. Individual and family characteristics such as education and the number and ages of children are strongly correlated with the gap between women’s and men’s hours, but truly exogenous sources of variation in incentives to specialize in the cross-section are difficult to find. Some researchers have used state differences in divorce and property laws or in marriage market conditions as exogenous determinants of married women’s labor supply (Gray, 1998; Chiappori et al., 2001); in this paper I use the sex of a woman’s first-born child as a source of random variation in the incentives facing new parents. Recent research has shown that the birth of a son increases the stability of the parent’s relationship, relative to the birth of a daughter (Lundberg and Rose, 2003; Dahl and Moretti, 2004) and this effect should unambiguously increase specialization. However,

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<sup>1</sup> The dynamics of the resulting changes, through the diffusion of new domestic appliances or the transmission of social norms (Fernandez, Fogli, and Olivetti, 2003) are of considerable interest.

fathers also spend more time with sons (Yeung et al., 2001): if this reflects a greater demand for paternal input in childrearing, the birth of a boy could reduce specialization. Finally, a male preference for sons could increase the relative bargaining power within marriage of mothers of boys, and therefore shift the household's time allocation to one that she prefers.

Diversity in the gender division of labor is particularly evident among couples with the highest average degree of specialization—parents of young children. In 2003, 46 percent of married mothers with children under age 3 in the United States were not employed, while 35 percent were employed full-time (U.S. Dept. of Labor, 2004). For married mothers with children under 1 year, the numbers are remarkably similar—50 percent were not employed, 32 percent worked full-time. As the employment rate of American mothers ended its long climb in the late 1990s and began to fall,<sup>2</sup> public attention has focused on the decisions of young parents regarding labor force attachment and childcare. Accounts in the popular press have emphasized the value of parental time with young children and features of the American labor market that impede work-family accommodation, such as the lack of parental leave and expectation of long work hours in professional jobs, as the sources of a modest retreat from market work among mothers.<sup>3</sup> However, the varying choices of young mothers (and their husbands/partners) are likely to depend not only on desired investments in children and job constraints, but also on a variety of other economic considerations—including the earnings opportunities of each parent, the expected duration of the marriage, and, in general, the expected implications of specialization for each partner's command of resources, in both the short- and long term.

In this paper, I examine the determinants of the work hours of married female respondents in the National Longitudinal Survey of Youth, 1979 (NLSY79) and their

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<sup>2</sup> The labor force participation rate of mothers with children under age 1 fell from 57.9 percent in 1998 to 53.7 percent in 2003.

<sup>3</sup> Recently, a New York Times Magazine article (October 26, 2003) profiled women with advanced degrees in law and business from prestigious universities who had decided to stay home with their young children, provoking a flood of responses from readers, and Time magazine ran a cover story titled "The Case for Staying Home" (March 22, 2004).

husbands during the 3 years following a first birth. Why do some couples adopt a traditional gender-specialized division of labor following childbirth, while others continue to both work fulltime and purchase childcare services? Little is known about the joint determination of work hours by new parents—Klerman and Leibowitz (1994, 1999) have documented the working patterns and job continuity of new mothers in the NLSY79, but I am not aware of any similar study that focuses on new fathers, or on the joint decisions of couples.<sup>4</sup> Specialization among new parents is strongly correlated with education, wage rates, and marital status, and with the mother's age at the birth, but these observable characteristics are likely to be correlated with unobservables in the labor supply equations. Since fertility and the timing of fertility will have been determined simultaneously with the parent's human capital investments, a causal interpretation of these effects is problematic. One observable variable that has been found to influence parental labor supply can reasonably be regarded as exogenous, however—the sex of the child at birth (Choi, Joesch, and Lundberg, 2005; Lundberg and Rose, 2002).

For the sample as a whole, I find that the birth of a boy significantly reduces the work hours of fathers in the three years following his birth, relative to the birth of a girl. When the child gender effect is allowed to vary by the mother's (or father's) education level, the negative effect of a boy on father's market hours, which ranges from 100 to over 300 hours per year, comes entirely from households in which the mother is at least a college graduate, and is accompanied by an offsetting relative increase in the work time of the mother. Less-educated mothers of boys, however, work significantly less than mothers of girls. The net effect of these changes in work hours is that the birth of a boy reduces specialization for more-educated couples relative to the birth of a girl, and increases the specialization of less-educated couples.

The specialization patterns of NLSY79 women and their partners are consistent both with a (rather surprising) substitution towards same-sex parent input as child investment increases with income, and with a non-unitary model in which the birth of a

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<sup>4</sup> Most studies find that children have a weak positive or no significant association with the work hours and earnings of fathers (eg. Pencavel, 1986; Blomquist and Hansson-Brusewitz, 1990; van Soest et al., 1990).

boy improves his mother's bargaining power. Results from the 2003 American Time Use Survey fail to support (though they do not contradict) a bargaining interpretation of the child gender effects on work hours, since mothers of young boys do not seem to consume more leisure than mothers of girls. The child investment explanation, however, is supported by the fact that more educated fathers both reduce their work hours when they have a son and increase their childcare time. In general, these results suggest that there is considerable heterogeneity across groups of parents (defined, in this case, by education) in the determinants of post-birth specialization and in responses to sons versus daughters.

## **II. Determinants of Specialization**

In Becker's original formulation of marriage as a productive enterprise (Becker 1973), the traditional gender division of labor is a principal source of marital surplus, or gains to marriage. Family utility is assumed to depend upon the consumption of "commodities" that are produced with inputs of purchased market goods and household time. If women have a comparative advantage in household production and childcare relative to market work, whether due to biological factors, early training, or market discrimination, then family output and wellbeing will be maximized when at least one spouse devotes all of his or her time to a single sector—home or market. This specialization is reinforced if sector-specific human capital is acquired "on the job," so that the relative market returns to men's and women's time diverges over time. As Becker (1985) notes, increasing returns to specialized human capital can provide incentives for division of labor even among identical individuals, and several recent studies have examined the sources of a gender-based division of labor per se. Hadfield (1999) and Engineer and Welling (1999) postulate a coordination role—if individuals must decide which skills to invest in before knowing the characteristics of a future mate, then a rigid gender-based task assignment will minimize the losses due to coordination failures. Baker and Jacobson (2003) show that a gender-specialized division of labor alleviates some strategic problems in skills investment, but has distributional consequences both inside and outside marriage.

If we focus on the labor supply of new parents, possible sources of a gendered she-stays-home, he-goes-to-work equilibrium are not hard to find. Childbirth itself, with possible physical disability before and after the birth, and the demands of breastfeeding tilt the relative returns to home and market time against maternal market work. However, the prevalence of fulltime work among mothers with young children suggest that, even here, biology is not destiny. In a purely static model of parental time allocation, variations in specialization should depend upon the market wages and home productivities of both parents, and on the price of market childcare services. Variations in preferences, particularly concerning the appropriateness of substituting purchased childcare for parental (particularly maternal) care, are also likely to be important.<sup>5</sup>

A dynamic model introduces a number of complications. As Lommerud (1989) has pointed out, the expectation of future divorce may alter time allocation within marriage. If time spent at home and in the market contributes to skills that are sector-specific and, to some extent, marriage specific then the expected return to these investments falls as the probability of divorce rises. If domestic skills are less valuable outside the marriage than market skills, as seems likely, then an increase in the risk of divorce will reduce the level of specialization within marriage. Stratton (2005) finds that cohabiting couples specialize less than married couples, and that this is principally due to the shorter duration of cohabiting relationships.

Departing from a unitary framework for marital labor supply decisions, it is possible that the work hours of new parents are affected by the relative bargaining power of husband and wife. The effect of a change in the couple's sharing rule on mother's work hours is ambiguous. Will a woman's utility be increased, *ceteris paribus*, by an increase in her hours at work or by an increase in her hours at home with a baby, which will almost certainly consist of very little leisure? The existing empirical evidence is contradictory--Gray (1998) finds that an increase in the bargaining power of married women (associated with changes in divorce and property laws) increased their market

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<sup>5</sup> Hiedemann and Joesch (2002) estimate the demand for childcare services allowing for the existence of childcare "vegetarians" who will not purchase market care at any price.

work, while Chiappori et al. (2002) find that cross-sectional variations in divorce laws and marriage market conditions favorable to women reduce their work hours within marriage. An additional strategic dimension is provided by Basu (2003) who allows bargaining power to evolve endogenously over the course of a marriage. If market work increases a woman's share of family resources in the future, then there will be an additional incentive for new mothers to bargain for continued work now.

A simple collective model of labor supply with children can illustrate the factors affecting specialization and the possible role of child gender in parental time allocation. A household consisting of two adult members, identified by  $f$  and  $m$ , maximize a weighted sum of individual lifetime utilities, where  $\mu$  is the weight on  $f$ 's utility:

$$\begin{aligned} & \mu[U_0^f(c_f, l_f, Q) + \rho E[V_1^f(y^f(h_f), y^m(h_m))]] \\ & + (1-\mu)[U_0^m(c_m, l_m, Q) + \rho E[V_1^m(y^f(h_f), y^m(h_m))]] \end{aligned} \quad (1)$$

Current utility in period 0,  $U_0^i$ , depends upon private consumption,  $c_i$ , hours devoted to leisure,  $l_i$ , and child services  $Q = q(k_f, k_m, k_p)$  where  $k_f$  and  $k_m$  are time spent in childcare by each family member and  $k_p$  is purchased childcare. The expected value of future wellbeing,  $V$ , depends upon the earnings opportunities  $y$  of each member in period 1, and these will be affected by hours worked in period 0. The indirect utility of each individual in the future can be specified to incorporate the probability of a future separation or a renegotiation of intrafamily sharing; future earnings opportunities can influence the way that resources are allocated between the partners, as well as the total resources available to an intact household. Each family member faces a time constraint (2), and jointly face a pooled budget constraint (3), where  $w_i$  is the market wage of person  $i$  in period 0.

$$T_i = k_i + h_i + l_i \quad \text{for } i = f, m \quad (2)$$

$$pk_p + c_f + c_m = w_f h_f + w_m h_m \quad (3)$$

Without further restrictions on preferences and household production, this model generates few predictions about work hours, but it does show that the degree of specialization in the time allocation of members  $m$  and  $f$  will depend upon several factors, including prices, the sharing rule (relative bargaining power), and expectations about

future living arrangements and household allocations (promises). The role of prices is standard—the labor supply of husband and wife will depend upon their market wages, the return to current work in the form of future earnings, and the parameters of the child services function. The relative power of the two agents is reflected in the sharing parameter,  $\mu$ , which will depend upon the legal and social environment as well as individual characteristics and prices. By promises, I mean the expected duration of the relationship, as it affects  $V$  and the implications of current time allocation for future wellbeing.

How might the birth of a son or daughter affect the extent of post-child specialization for the couple maximizing (1)? Recent research on the effects of child gender on parental behavior (surveyed in Lundberg, in press) suggests several possibilities. First, the child services production function may depend upon child gender. If sons and daughters have different care requirements, or if paternal time is believed to be more important to the development of sons, then child gender can affect the allocation of parental time.<sup>6</sup> Several studies have found that sons increase the expected duration of a relationship or marriage<sup>7</sup>--this effect should reduce the expected return to current work by one partner and promote specialization. Finally, if fathers prefer sons and therefore place a higher value on marriage and family after a son is born, this could increase the relative bargaining power of the mother (as well as the expected duration of the marriage).<sup>8</sup> If we index child gender by  $b=0,1$ , then the model in (1) becomes:

$$\begin{aligned} & \mu(b)[U_0^f(c_f, l_f, Q(k; b) + \rho E[V_1^f(y^f(h_f), y^m(h_m); b))] \\ & + (1 - \mu(b))[U_0^m(c_m, l_m, Q(k; b) + \rho E[V_1^m(y^f(h_f), y^m(h_m); b))] \end{aligned} \quad (4)$$

It is not clear *a priori* what the sign of a “son” effect on household specialization should be. An increase in the expected duration of marriage should increase traditional gender specialization (at least for couples in which the father’s potential earnings are greater than the mother’s), but the sign of the other two effects is ambiguous. As

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<sup>6</sup> Morgan et al. (1988) make this point. Lundberg, McLanahan, and Rose (2005) discuss the literature and present new results about father’s time with children.

<sup>7</sup> See Dahl and Moretti (2004), Lundberg and Rose (2003) and the references cited in these papers.

<sup>8</sup> These factors are also discussed, in the context of specialization, in Lundberg and Rose (2002).

discussed above, an increase in the mother's bargaining power will increase her share of total household resources, but she may either increase current leisure in response to this, or increase current market work and future earnings opportunities. Fathers may spend more time with sons and thus reduce their market work, but if boys receive more parental time inputs overall (either because parents wish to invest more in boys or boys needs are greater), then this may increase the degree of specialization for an already-specialized couple.

### **III. Data**

The National Longitudinal Survey of Youth, 1979 (NLSY79) is a nationally representative sample of 12,686 young men and women who were 14 to 22 years of age when first interviewed in 1979. They have been surveyed annually each year from 1979 to 1994, and biennially from 1996 through the present. These data provide extensive information on a large cohort of Americans born in the late 1950's and early 1960's. Retention rates in the survey have been excellent: more than 91% of the female respondents in 1979 were still in the sample in 1990.

In this study, I initially use information on female respondents in all subsamples of the NLSY79 who had a husband or partner present in her household before the birth of her first child.<sup>9</sup> Some estimates are based on a more homogeneous sample of non-black, non-Hispanic (white) women who were married before the child's birth. The key dependent variables are the market work hours of mothers and their husbands/partners during the three years following the child's birth. There are a number of reasons to think that labor supply decisions during this short period could have long-term consequences for the economic independence of the mothers. Most of these births occurred during the 1980s, when few workers were entitled to parental leave from their job and almost none

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<sup>9</sup> The NLSY79 consists of 3 subsamples: a cross-section sample of 6111 that is representative of the non-institutionalized, civilian population born between 1/1/57 and 12/31/64, a supplemental sample of 5295 that oversamples black, Hispanic, and economically-disadvantaged non-black, non-Hispanic civilians living in the United States in 1979, and a sample of 1280 young men and women enlisted in the military. Funding constraints led to most of the military sample being dropped in 1984, and the non-black, non-Hispanic portion of the supplemental sample being dropped in 1990.

received paid leave.<sup>10</sup> Therefore, a period of non-employment following childbirth was likely to be associated with job separation and a loss of specific human capital. The existence of a motherhood wage penalty is well-established in data from many countries, and much of this wage drop is associated with job changes and lost work experience.<sup>11</sup> For example, Lundberg and Rose (2000) document substantial post-child wage losses for women in the Panel Study of Income Dynamics, but find that women who maintain a consistent attachment to the labor force experience no child-related loss in wages. Therefore, an employment interruption immediately following a birth is likely to reduce a woman's wage rate, and this change in relative wages may reinforce future specialization as well.<sup>12</sup>

The first column of Table 1 reports summary statistics of the principal variables for the full sample of 1750 women who had a partner present before their first birth and who had some non-missing information about work hours during the 3 years following the birth (whether or not a partner was still present). Characteristics of the father are also reported for those cases in which the pre-birth partner is still present in the household—sample sizes are given for some key variables. Slightly over half of first-born children are boys, as we would expect in a random sample of births.<sup>13</sup> Black and Hispanic mothers each make up a little more than 10 percent of the full sample. Nearly one-third of both mothers and fathers are college graduates when the woman's first child is born, and another quarter have attended college. Mean age at birth for the mother is 27 years: this is rather high because births before 1980, and therefore some births to very young

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<sup>10</sup> Though Klerman and Liebowitz (1999) find high levels of job continuity among new mothers—sixty percent of women who work full-time before the birth of a child continue to work at the same job after the child is born.

<sup>11</sup> After controlling for lost work experience, Budig and England (2001) report a motherhood wage penalty of 5 percent per child for the women in the NLSY79. Anderson, Binder and Krause (2002) find that the penalty for child-related job exit varies by skill level, and Ejrnaes and Kunze (2004) find that wage drops after first birth in Germany are associated with firm mobility for unskilled women and with the duration of maternity leave for skilled women. Waldfogel (1998) finds that job-protected maternity leave has a substantial positive wage effect for mothers in the United States and Britain.

<sup>12</sup> Shapiro and Mott (1994) examine the relationship between a woman's work behavior over the long term and her employment activity in the period immediately surrounding the birth of her first child for an earlier NLS cohort of young women. They find that women who worked just before and after birth worked more than women who did not 14-19 years later, and received a substantial wage premium.

<sup>13</sup> However, some research suggests that child gender at birth may be correlated with parental characteristics and circumstances. Norberg [2004] finds that sons are more likely to be born to women who report living with a spouse or partner before the child's conception.

parents, will have been excluded by the partner-present restriction. Selected measures of the mother's family background measured as of age 14, including her parent's education and whether she lived with both parents, are included in some models. One disadvantage with using the NLSY79 data for a study of joint labor supply is that the information on spouses and partners of the survey respondent is somewhat limited. In this female sample, a great deal of background information is available for the women, but very little for their partners that is consistent throughout the years of the survey

Table 1 also reports the work hours of the mother and father in the year after the birth, and average annual hours during the three years following the birth.<sup>14</sup> For the female respondents, the labor supply measure is hours worked during the previous calendar year; for their partners, work hours are calculated as weeks worked times usual hours per week. The mothers work, on average, a little more than half-time, while fathers are reported to be working more than the standard 2000 fulltime hours. On average, then, these couples work one and one-half jobs in their first three years as parents. Figure 1 shows that this average is misleading, however—more than 25 percent of new mothers work fulltime or more during this period, and the same number do not work at all. Much of the intermediate density is contributed by women who move between no work and fulltime work during the three year period. Wages are calculated by dividing reported wage and salary income during the year prior to the child's birth by hours worked and adjusted to 1996 dollars.<sup>15</sup> Wages are missing for a modest proportion of the sample, including those who were unemployed or enrolled in school full-time during the year before the birth.

The second column of Table 1 reports similar summary statistics for the sample of white (non-black, non-Hispanic) mothers who were married before the birth, and the third column the selected subsample of couples who remain together for the 3 years following the birth (about 88 percent of the unselected sample). Most of the estimates in this paper are based on unselected samples of mothers: that is, the work hours of all women who

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<sup>14</sup> If work hours are missing for some years, the average of non-missing values is used.

<sup>15</sup> Wage rates are top-coded at \$100/hour and very low wage rates are set to \$1.

remain in the NLSY sample are included, even if they have separated from their partner. Therefore, some of the estimated effect of child gender on women's hours may occur as a result of son-daughter effects on the probability of separation. Estimates based on the selected subsample of intact couples permit us to separate a within-couple specialization effect from a family structure effect. Estimates of the father's labor supply, however, will always be based on selected samples, since the men remain in the sample only if they reside with a female NSLY respondent. If unobservables in the father's labor supply equation are correlated with his propensity to leave a daughter or a son, then the estimated effect of child gender on father's work hours can be biased due to this self-selection. A comparison of hours equations estimated using the first year following the birth with those that use the full 3 years can be used to test for such a selection effect.

#### **IV. Results**

The basic empirical model is an OLS regression of the mother's or father's average annual work hours during the 3 years following the mother's first birth on a dummy variable that takes the value 1 if the child is male, and 0 if the child is female. To allow heterogeneity in parental responses to child gender, I also estimate models with dummy variables for parental education and/or race and include interactions between these characteristics and child gender. Alternative specifications such as Tobit models for work hours or participation probits yield essentially identical patterns, and so are not reported.<sup>16</sup>

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<sup>16</sup> The empirical model uses a cross-section approach, modeling variability in the levels of work hours after the birth, rather than a fixed-effect model that focuses on changes in work hours. There are several reasons for this choice. First, a substantial proportion of the sample is lost if we require a pre-birth observation for both partners. This selection is not random: we tend to lose early first births, since they occur near the beginning of the sample and births that occur soon after marriage or school-leaving. Second, we can examine the effects of wage rates calculated prior to the birth in the analysis of post-birth labor supply; the use of contemporaneous wages results in division bias, since they are calculated from earnings and hours. Finally, and most important, the basic assumption of fixed-effect labor supply equations—that the fixed individual effect is additive—is unlikely to be valid in a study of hours changes surrounding childbirth. Preliminary fixed effects estimates were, in fact, similar to the cross-section results, suggesting that the heterogeneity in the labor supply responses to a first birth, particularly for mothers, appears not to be strongly correlated with the heterogeneity in pre-birth work hours.

Table 2 presents the main results for the full sample. Though child gender has no significant impact on mother's work hours in the full sample, baby boys are associated with work hours for fathers that are more than 60 hours per year less than the work hours of fathers of girls. Estimating the child gender effect separately by race and ethnicity produces no significant effects for mothers, and shows that the significant negative impact of a son is restricted to the white (non-black, non-Hispanic) sample. The coefficient on the boy/Hispanic interaction term is similar in magnitude, but imprecisely estimated. Allowing the effect of child gender to vary by the mother's education shows that some surprisingly large and variable effects are being hidden in the models that aggregate education groups. Women with less than a high school education work nearly 200 hours per year less if their first child is a boy, and a son also has a substantial negative effect on the work hours of mothers with some college. The most highly-educated women, however, work nearly 300 hours per year more if they have a son, relative to a daughter. For fathers, the negative effect of sons on work hours is concentrated in the most highly-educated groups—those with partners who have a college degree or more. For these couples, the birth of a son induces substantially less specialization than the birth of a daughter, but little change in total work hours.

Table 3 shows that 'son' effects across education categories is not uniform across race/ethnic groups, and that the pattern in the full sample reflects, to a large extent, the responses of the large non-black, non-Hispanic subsample. Sons increase specialization at low levels of education and reduce specialization for the college-educated for this group, but not for black or Hispanic parents. The negative effect of sons for some-college mothers is restricted to black women. The effects of child gender also vary by the prebirth marital status of the parents, and the cohabiting sample is too small to analyze separately. All subsequent estimates are based on a more homogeneous sample of white, married parents.

The education-child gender relationship for this sample can be seen very clearly in the raw data. Figure 2 shows the average labor supply measures for parents of sons and daughters for the 3 years post-birth compared to the pre-birth year for the five

education categories—less than high school, high school graduates, some college, college graduates, and more than college graduates. The patterns are very striking: the labor supply profiles of both men and women are flatter, as education increases, for same-sex children. For mother’s work hours, the differences between “boy” and “girl” are large and significant at each end of the education spectrum, and the proportion of women with boys who work at any time during the three year period is significantly higher for both the college graduate and more than college groups. Fathers of girls worked substantially more hours if they or their wives were college graduates or more than college graduates.<sup>17</sup>

The effects of child gender in this sample are robust to changes in model specification. Table 4 shows that the restriction of the sample to couples who were married in the year before the birth results in even larger son effects on the work hours of both parents, with less-educated mothers of sons working more than 400 hours per year less than mothers of daughters, highly-educated mothers of sons working 300 hours more than the mothers of daughters, and the husbands of the latter reducing their work hours by a similar amount. In column 2, mother’s education is replaced by father’s education, but the effects are very similar—though the negative effect of a son on mother’s work is no longer significant at the bottom of the education scale. In columns 3 and 4, other parental characteristics are added to the basic model, with little impact on the child gender effects.

As we might expect, prebirth wage rates are strongly correlated with work hours—own-wage effects for both mothers and fathers are positive, and the father’s wage has a significantly negative (and large) effect on mother’s work hours. For both men and women, the substitution effect of wages dominates, though this effect is notably stronger for women. Husband’s earnings appear to have a substantial income effect on his wife’s labor supply. Not surprisingly, a increase in the mother’s prebirth wage rate reduces specialization, while father’s wage rate increases it. Mother’s age at first birth has a strong positive effect on her own market work hours after the birth, and some positive

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<sup>17</sup> These results were not sensitive to the choice of father’s education or mother’s education to divide the subsamples; the graphs use father’s own education.

impact on her husband's hours as well (even when his own age is included), with a net negative effect on specialization, defined as the proportion of total work hours that are worked by the husband. The effect of mother's age illustrates the difficulties with making causal inferences from the extended model—women who are older when their first child is born may have made greater unobserved investments in market (or even firm-specific) skills that make an employment interruption costly, or women who are more committed to their jobs may delay fertility.

The estimated effects of sons and daughters on the work hours of NLSY79 parents are in sharp contrast to those of Choi et al. (2005) and Lundberg and Rose (2002), who find that the birth of a son, relative to a daughter, substantially increased the work hours of men born after 1950 in the German Socioeconomic Panel and the Panel Study of Income Dynamics respectively, and had no effect on the labor supply of mothers. Though these studies did not report separate child gender effects by education, there is no evidence of positive effects of sons on specialization for any group in the NLSY79. There are two important differences in these analyses that could potentially account for the different results: the later birth cohort, with greater job attachment for women, greater use of market childcare, and more egalitarian social norms and the narrower focus of the current study on 3 years post-birth, rather than all post-birth years.<sup>18</sup>

### **Selection Issues**

About 12% of the white married couples in the initial sample separate before the end of the 3-year postbirth period. The labor supply estimates for fathers are based on the sample of men who remain in the mother's household, while the mother's estimates include women who have separated from their partners. Attrition in the father sample may cause the child gender coefficients on father's work hours to be biased if unobservable characteristics that affect a man's relative tendency to stay with a daughter rather than a son are correlated with unobservable determinants of his labor supply.

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<sup>18</sup> Lundberg and Rose (2002) also restrict the sample to men age 25 and over. This cannot explain the different results: restricting the NLSY79 sample to births that occurred when the father was age 25 or more does not affect the pattern of child gender effects.

Preliminary work with suggests that this attrition may cause some bias in the effects of child gender on parental labor supply. Choi, Joesch, and Lundberg (2005) find some evidence of such a bias in the effects of sons and daughters on the work hours of German men. They find that the estimated effects of sons and daughters currently in a man's household are very different from the effects of children ever in the man's household, and the direction of the attrition bias indicates that men who stay with daughters are positively selected with respect to work hours, compared to fathers who stay with sons. For the NLSY79 men, we can compare child gender effects on the work hours of men who remain in the sample for 3 years with those who stay for at least the first year. These results (not shown) indicate a bias similar to that in the German data—child gender effects are smaller in the less-selected sample of fathers, so attrition is inducing a (relative) negative selection in the work hours of fathers of boys.

The child gender effects on women's work hours should be unbiased, but may reflect the effects of first-born sons and daughters on the probability of separation and on the probability of a second birth, as well as effects on parental specialization conditional on family structure. Table 5 shows that there are no significant effects of first-child gender on the probabilities that a couple separates or has a second child before their first-born is 3 years old, except for a marginally-significant negative effect of "boy" on separation for the some college sample. Table 6 compares the base estimates with those from two selected samples—mothers who did not separate from their partners and parents who did not have a second child. The relative effect of a son on the work hours of highly-educated mothers is essentially unchanged by the "no separation" restriction, but the negative effect of a son on the work hours of mothers with less than a high school education is smaller for the no-separation sample (though still large and significant). The "no second child" restriction, however, seems to reduce the son effect on the labor supply of both mothers and fathers in the high education group, indicating that part of the child gender effect on parental specialization is operating through subsequent fertility.

## V. Discussion and Time Use Results

What are the possible explanations for the apparent effect of a son, relative to a daughter, on parental specialization in the years following the birth--negative when the mother is at least a college graduate and positive for parents with low education levels? In the model presented in section II, child gender can affect specialization through differential effects of boys and girls on the expected duration of the marriage, the relative productivity of parental time inputs into the production of child services, and the bargaining power of husband and wife.<sup>19</sup> The impact of child gender on the expected duration of marriage does not provide a satisfactory explanation of the results presented above. If the birth of a boy reduces the probability of future divorce, then we would expect increased specialization to result for all groups of parents, since the mother would have a greater incentive to invest in marriage-specific home production.<sup>20</sup>

An alternative explanation for the variation in child gender effects across education groups can be based on input substitution in the production of child services as education increases. Parents with higher lifetime income can be expected to invest more in their children and it is possible that, as the desired level of child input rises, there will be substitution towards the time of the same-sex parent. Thus, college-educated dads will want to spend relatively more time with their sons, and college-educated mothers with their daughters. It is notable that total parental time at home is unaffected by child gender for the high-education groups: we don't see greater overall investment in sons. Nevertheless, it is a bit surprising to see more gender-specialized parenting in more-educated families, who tend to have more egalitarian attitudes. A possible test of this child input hypothesis is to examine the work hours of college-educated men who are married to women without a college degree. In this case, we do in fact see a large

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<sup>19</sup> Subsequent fertility may also play a role in determining labor supply in the three years following a first birth, but second birth timing is an integral part of the specialization response, rather than an exogenous determinant of it. In fact, the birth of a boy does significantly reduce the probability of a second birth within this period for the college-educated sample only.

<sup>20</sup> A Cox proportional hazard model of the duration from the birth of the first child to separation or divorce does produce a negative coefficient on "boy," but this effect is not significant for either the full sample or for any of the education groups.

negative effect of a son on the work hours of college-graduate fathers—significant and the same magnitude as the effect in the college graduate mother sample. This result gives some support to the hypothesis that child investment motives are driving the work patterns of fathers.

Finally, we can explain the specialization patterns by appealing to child gender effects on the mother's relative bargaining power. If men prefer sons and expect to have less contact with their children following a divorce, then divorce will be more costly for fathers of sons. A standard divorce-threat bargaining model will therefore predict that household resources will shift to the mother after the birth of a boy (McElroy and Horney, 1981). If the mother's utility depends, not only on her consumption of goods and leisure, but also on her future bargaining power, she may prefer to maintain some attachment to the labor force after the birth of her first child when work interruptions are costly. Since returns to work experience and tenure rise with education, the cost of a work interruption for less-educated women may be sufficiently small that redistribution takes the form of increased goods and/or leisure consumption. For women with a college degree, however, work interruptions are costly and purchased childcare is a cost-effective alternative to parental care. A son-produced increase in her relative bargaining power, then, may cause some substitution away from maternal childcare and towards purchased and paternal child inputs.

Both the child investment and marital bargaining stories imply that the birth of a son to highly-educated parents should be accompanied by an increase in the father's childcare time, as well as a decrease in his work hours. The marital bargaining explanation also requires sons increase the relative welfare of their mothers, compared to mothers of daughters, and this distribution effect could show up as an increase in leisure time; the child investment hypothesis has no implications for maternal leisure. Data on leisure and childcare time are not available for the NLSY79 sample, but the recent American Time Use Survey (ATUS) allows a broader comparison of the time allocation of parents of sons and daughters, and permits a test of the bargaining hypothesis.

ATUS provides detailed time-use data for individuals from a random sample of households completing their 8<sup>th</sup> and final rotation of the Current Population Survey in 2003. A designated individual age 15 or over in each household was asked for a 24-hour time diary, completed by telephone. Information was collected about primary activities, with childcare only included as a secondary activity. About half of the observations were for a weekday. Table 7 presents some summary statistics for ATUS samples of married couples with children under 18, and with at least one child under age 3. Samples of new parents were too small to permit reliable estimates of education-specific effects of child gender, so the full sample of parents with children was used, allowing for gender- and age-specific effects of children on time use.

Table 8 presents only the effects of boys and girls under age 3 (the equations also included the number of boys and girls between 3 and 6, and between 7 and 17, as well as a control for weekend observations) on daily minutes of market work, housework, primary and secondary childcare,<sup>21</sup> and leisure and socializing for married men and women. Though the effects of young sons and daughters on the market work hours of mothers are in the same direction as in the NLSY79 sample, the difference between them is not significant. For fathers with more than a college degree, however, young sons decrease work hours, and the difference between the effects of sons and daughters is significant.<sup>22</sup> The difference is more than one hour per day, which is loosely consistent with the 350 hours per year difference for the same education group in the NLSY79. There are also significantly positive effects of young sons on the childcare time of more-educated fathers (but also on the childcare time of more-educated mothers). These results provide no support for the hypothesis that the birth of a son increases the bargaining power of mothers—there is no significant effect of young sons on mothers' leisure and, in fact, sons seem to increase the leisure of highly-educated fathers.

These recent time-use data provide some support for the child gender effects on work hours observed in the NLSY79. Highly-educated fathers reduce their work hours

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<sup>21</sup> “Secondary” childcare means that some other activity was reported by the respondent as primary.

<sup>22</sup> Older sons and daughters do not have significantly different effects on the market work hours of either mothers or fathers.

more if they have a young son than if they have a young daughter, and this work time is replaced by increased childcare time, particularly secondary care. In fact, young sons are associated with significantly higher parental childcare time from both mothers and fathers. In general, these results are consistent with an interpretation of child gender effects on parental work hours based on differences in the perceived “child quality” functions for girls and boys, and therefore gender differences in optimal parental inputs.

## **VI. Conclusion**

This paper documents some distinct and surprising patterns of specialization among new parents in the NLSY79. Child gender has significant effects on the labor supply of both mothers and father, and these effects are opposite at the two ends of the education spectrum—boys reduce specialization among the college-educated and increase specialization among parents with less than a high school education. Estimates from the recent American Time Use Survey are generally consistent with the NLSY79 findings, and indicate that highly-educated parents devote more childcare time to young sons. The labor supply results are inconsistent with previous research that found boys substantially increase the work hours of their fathers relative to girls but have no effect on mother’s work hours. Possible explanations for the heterogeneous responses to sons and daughters across education groups include a bias towards same-sex parental inputs as desired child quality increases and child gender effects on the relative bargaining power of the mother and father. No evidence of improved maternal bargaining power can be found in the leisure consumption of mothers of young sons in the ATUS, but patterns in parental childcare time suggest gender differences in child production functions.

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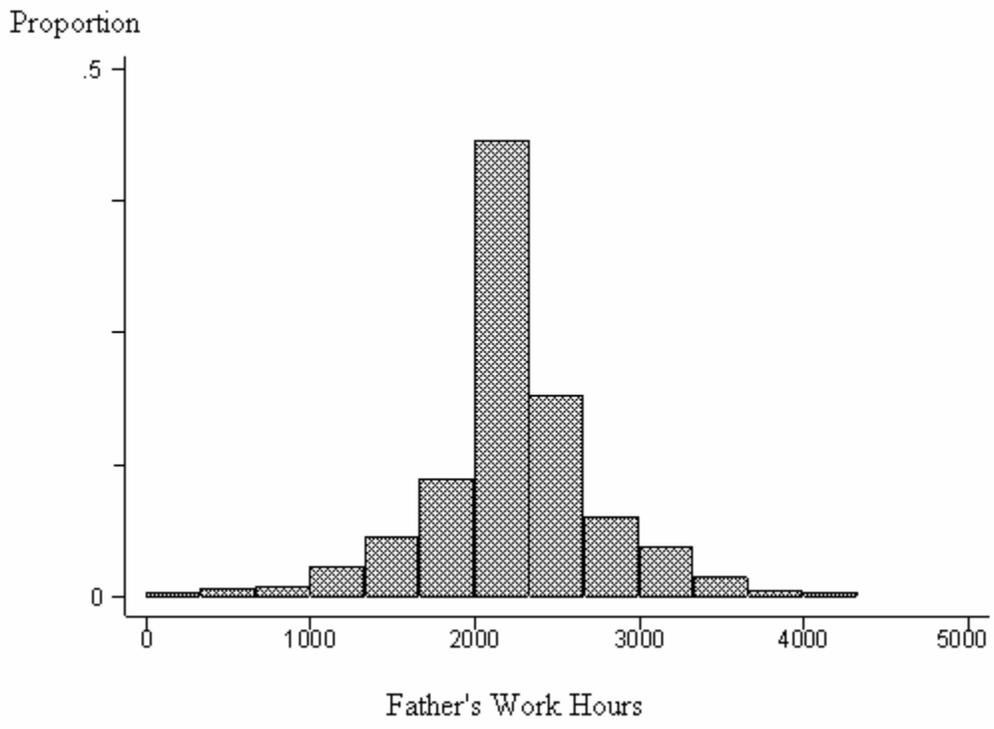
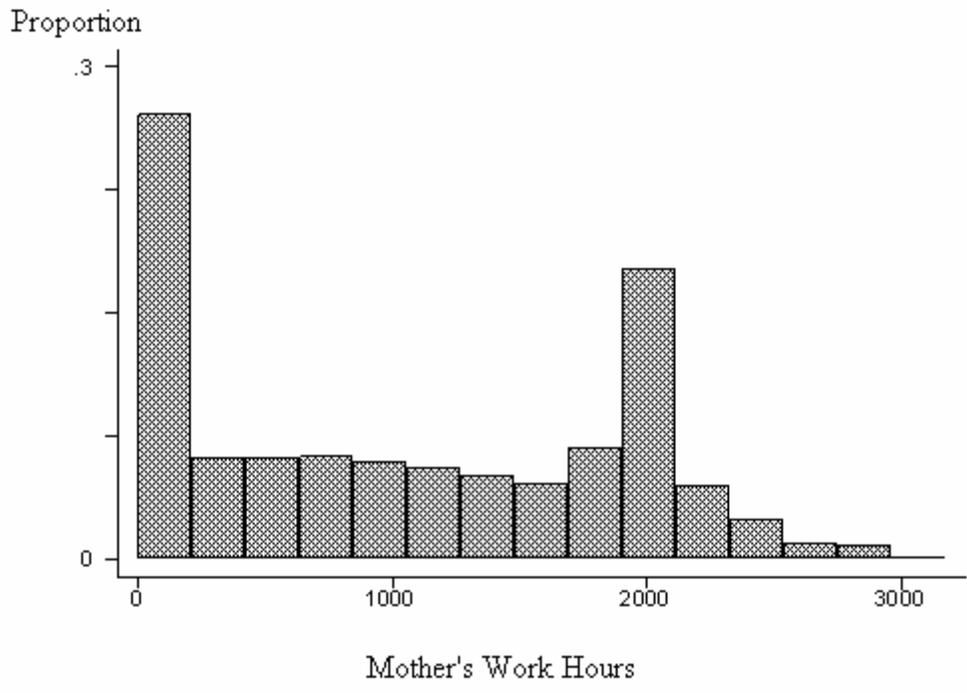
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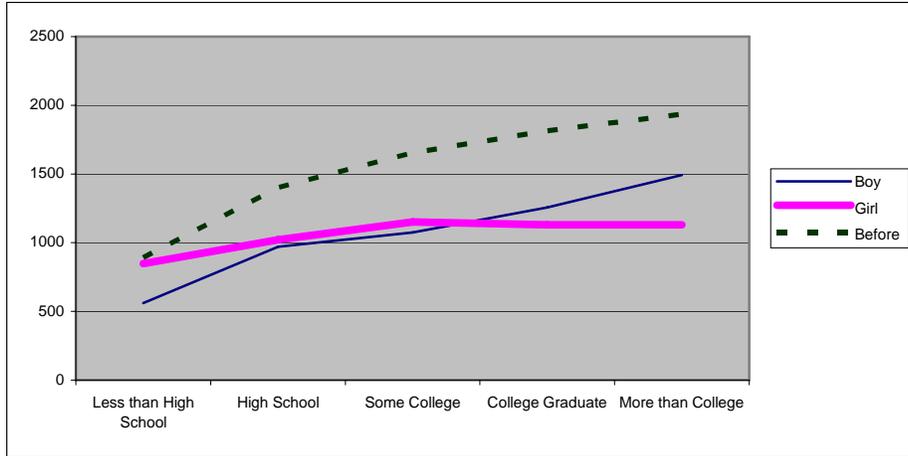
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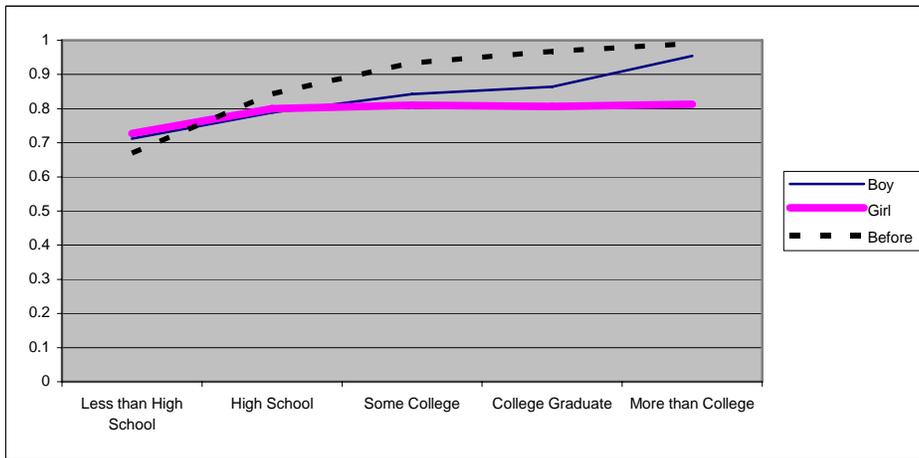
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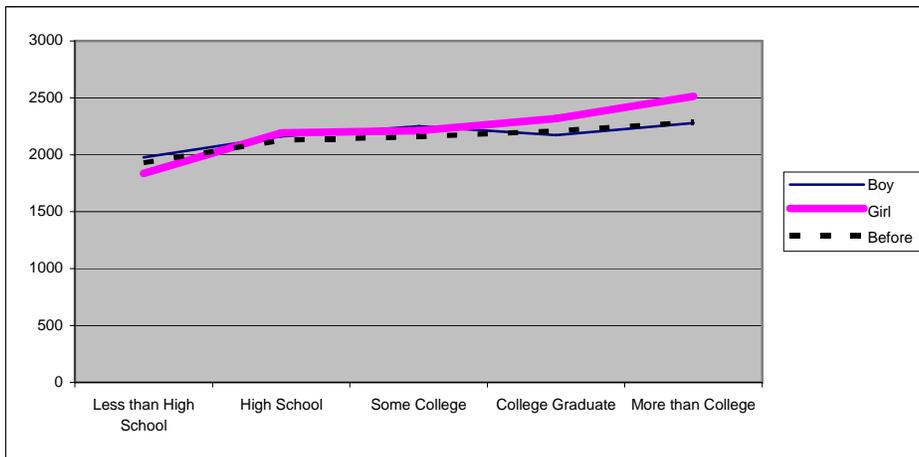
**Figure 1:**  
**Distribution of Average Annual Work Hours for Mothers and Fathers**  
**(Full 3-Year Sample)**



Average Annual Work Hours: Women



Participation Rate: Women



Average Annual Work Hours: Men

**Figure 2**  
**Work Hours and Participation by Education Group**  
**(White Married Sample)**

**Table 1: Variable Means (and Standard Deviations)  
NLSY79 Women with Husbands Present the Year before Birth of First Child**

	<b>Full Sample</b>	<b>White Married</b>	<b>White Married (3 years post- birth)</b>
Baby Boy	0.51	0.51	0.51
Black	.11	-	-
Hispanic	.13	-	-
Mother less than high school	0.12	0.09	0.07
Mother high school	0.38	0.41	0.40
Mother some college	0.23	0.19	0.20
Mother college	0.19	0.22	0.23
Mother more than college	0.09	0.10	0.11
Father less than high school	0.10	0.09	0.08
Father high school	0.39	0.39	0.38
Father some college	0.23	0.21	0.20
Father college	0.19	0.20	0.21
Father more than college	0.10	0.11	0.12
Mother's work hours (1 <sup>st</sup> yr)	1052.75	995.23	1020.34
Mother's work hours (3-yr avg)	1093.31	1036.63	1051.33
Father's work hours (1 <sup>st</sup> yr)	2170.62 (1370 obs)	2203.29 (978 obs)	2200.60 (888 obs)
Father's work hours (3-yr avg)	2194.31 (1609 obs)	2218.90 (1124 obs)	2221.26 (1008 obs)
Mother's prebirth wage (1996 \$)	\$10.79 (8.89)	\$11.22 (9.11)	\$11.34 (9.29)
Missing wage	0.24	0.22	0.19
Father's prebirth wage (1996 \$)	\$15.60 (12.79)	\$16.28 (13.54)	\$16.31 (13.59)
Missing wage	0.33	0.22	0.23
Mother's age at first birth	26.63	26.84	27.01
<u>Mother's family background (measured at age 14)</u>			
Lived with both parents	0.76	0.81	0.82
Number of siblings	3.39	3.03	3.01
Adult female in hh worked	0.55	0.53	0.53
Father's education	11.68	12.30	12.41
Mother's education	11.49	12.10	12.17
<b>Number of observations</b>	<b>1750</b>	<b>1172</b>	<b>1033</b>

**Table 2: Effects of First-born Son on Parent's Work Hours (average hours in first 3 years after birth) – Full Sample**

	Mother's Hours			Father's Hours		
Boy	-37.63 (41.30)			<b>-63.34</b> (29.22)		
<u>Boy*Mother's race/ ethnicity</u>						
Black		-175.89 (118.09)			106.02 (109.61)	
Hispanic		-32.03 (111.70)			-73.94 (83.02)	
Non-black, non- Hispanic		-28.69 (47.49)			<b>-82.49</b> (33.54)	
<u>Boy*Mother's education</u>						
Less than high school			<b>-190.31</b> (108.77)			-118.99 (103.59)
High school			-77.07 (65.76)			11.12 (48.57)
Some college			<b>-141.59</b> (85.08)			-34.53 (58.08)
College			88.96 (97.56)			<b>-95.81</b> (58.07)
More than college			<b>285.92</b> (139.63)			<b>-216.07</b> (101.17)
<b>Number of observations</b>	<b>1750</b>	<b>1733</b>	<b>1729</b>	<b>1426</b>	<b>1414</b>	<b>1408</b>

*Note:* Standard errors in parentheses. Constant in first regression and coefficients on race and education dummies not reported.

**Table 3: Effects of First-born Son on Parent's Work Hours by Education and Race/Ethnicity (average annual hours in first 3 years after birth)**

<u>Boy* Mother's education</u>	Mother's Hours			Father's Hours		
	Black	Hispanic	White	Black	Hispanic	White
Less than high school	287.89 (664.51)	70.23 (228.86)	<b>-315.98</b> (126.05)	-	<b>-514.83</b> (207.32)	46.04 (117.54)
High school	157.71 (226.87)	58.20 (194.48)	-117.71 (73.00)	-87.53 (180.33)	127.72 (129.25)	7.50 (54.76)
Some college	<b>-475.04</b> (195.71)	-68.56 (194.05)	-59.58 (107.83)	182.58 (114.09)	-29.12 (110.67)	-100.46 (77.26)
College	-129.61 (232.00)	3.77 (346.24)	135.77 (108.60)	48.25 (195.96)	-28.76 (233.62)	<b>-121.16</b> (63.31)
More than college	-76.19 (319.02)	<b>934.79</b> (434.50)	<b>270.85</b> (155.99)	590.43 (672.06)	179.73 (305.86)	<b>-351.33</b> (93.16)
<b>Number of observations</b>	<b>194</b>	<b>234</b>	<b>1304</b>	<b>138</b>	<b>186</b>	<b>1086</b>

*Note:* Coefficients on education dummies not reported.

**Table 4: Effects of First-born Son on Parent's Work Hours (average annual hours in first 3 years after birth) – White married sample**

	Mother's Hours				Father's Hours			
Boy*Mother's education								
Less than high school	<b>-469.45</b> (146.98)		<b>-374.17</b> (136.90)	<b>-300.60</b> (140.82)	41.09 (121.40)		30.25 (122.56)	27.90 (125.28)
High school	-46.76 (76.92)		-47.14 (73.29)	-32.31 (74.15)	33.40 (57.58)		31.17 (57.18)	24.64 (58.46)
Some college	-96.92 (114.90)		-126.64 (105.37)	-150.59 (105.11)	-78.60 (80.84)		-54.13 (80.40)	-37.03 (79.03)
College	170.22 (110.80)		161.42 (103.79)	142.12 (104.07)	<b>-120.25</b> (64.61)		<b>-117.56</b> (64.84)	<b>-110.55</b> (65.37)
More than college	<b>305.08</b> (159.88)		<b>306.99</b> (156.01)	<b>287.89</b> (154.30)	<b>-361.91</b> (94.86)		<b>-358.19</b> (95.81)	<b>-354.75</b> (93.98)
Boy*Father's education								
Less than high school		-195.13 (169.91)				119.64 (142.32)		
High school		-51.74 (115.20)				77.27 (68.22)		
Some college		-74.00 (80.06)				-50.60 (57.89)		
College		-15.50 (114.06)				<b>-164.53</b> (67.99)		
More than college		<b>294.15</b> (152.24)				<b>-381.76</b> (95.87)		
Mother's prebirth Wage			<b>244.99</b> (49.90)	<b>242.60</b> (50.57)			-47.28 (36.15)	-49.30 (36.34)
Father's prebirth wage			<b>-337.28</b> (44.92)	<b>-322.31</b> (50.57)			<b>92.27</b> (40.02)	<b>86.72</b> (40.55)
Mother's age at first birth			<b>30.33</b> (7.17)	<b>30.53</b> (7.26)			4.75 (4.77)	5.17 (4.82)
Mother's family background (measured at age 14)								
Lived with both parents				-19.64 (63.23)				-3.90 (49.00)
Number of siblings				-0.89 (11.94)				0.24 (9.33)
Adult female in hh worked				<b>160.71</b> (48.07)				-53.56 (35.27)
Father's education				-10.06 (9.49)				<b>13.29</b> (6.05)
Mother's education				<b>-23.99</b> (12.17)				2.89 (9.28)
<b>Number of observations</b>	<b>1157</b>	<b>1135</b>	<b>1157</b>	<b>1139</b>	<b>998</b>	<b>1000</b>	<b>998</b>	<b>982</b>

Note: Coefficients on dummies for mother's or father's education, and for missing wages or mother's parents' education not reported.

**Table 5: Effects of First-born Son on Parental Separation or Birth of Second Child before End of the Third Year – White Married Sample**

	Separation		Second Child	
Boy	-0.00 (0.10)		0.03 (0.07)	
<u>Boy*Mother's education</u>				
Less than high school		0.14 (0.27)		0.10 (0.25)
High school		-0.06 (0.14)		0.04 (0.12)
Some college		-0.22 (0.23)		<b>0.37</b> (0.17)
College		0.39 (0.24)		-0.25 (0.16)
More than college		-0.27 (0.51)		-0.15 (0.24)
<b>Number of observations</b>	<b>1172</b>	<b>1157</b>	<b>1161</b>	<b>1146</b>

*Note:* Probit estimates. Constant in first equation and education dummies not reported.

**Table 6: Effects of First-born Son on Parent's Work Hours in Selected and Unselected Samples – White Married Sample**

<u>Boy*Mother's education</u>	Mother's Hours			Father's Hours	
	All	No separation	No second child	All	No second child
Less than high school	<b>-469.45</b> (146.98)	<b>-341.86</b> (184.83)	<b>-423.06</b> (219.94)	41.09 (121.40)	38.92 (181.16)
High school	-46.76 (76.92)	-41.81 (82.80)	-36.73 (105.00)	33.40 (57.58)	-104.52 (78.81)
Some college	-96.92 (114.90)	-81.69 (120.56)	-46.58 (167.29)	-78.60 (80.84)	-14.43 (98.81)
College	170.22 (110.80)	161.49 (115.42)	-166.88 (175.93)	<b>-120.25</b> (64.61)	-33.92 (123.18)
More than college	<b>305.08</b> (159.88)	<b>331.69</b> (162.88)	264.57 (235.29)	<b>-361.91</b> (94.86)	<b>-286.94</b> (151.52)
<b>Number of observations</b>	<b>1157</b>	<b>1019</b>	<b>564</b>	<b>998</b>	<b>458</b>

*Note:* Coefficients on education dummies not reported.

**Table 7: Summary Statistics for Married Parents --American Time Use Survey (ATUS)**

	With Children Under Age 18		With at Least One Child Under Age 3	
	Mothers	Fathers	Mothers	Fathers
# of Boys 0-2	0.18	0.25	0.58	0.98
# of Boys 3-6	0.25	0.28	0.29	0.38
# of Boys 7-17	0.58	0.62	0.21	0.26
# of Girls 0-2	0.17	0.20	0.56	0.78
# of Girls 3-6	0.25	0.28	0.27	0.37
# of Girls 7-17	0.54	0.61	0.19	0.26
% ≤High School	0.32	0.36	0.29	0.37
% Some College	0.29	0.25	0.27	0.24
% College	0.26	0.24	0.29	0.25
% > College	0.13	0.16	0.16	0.14
Parent's Age	36.9	39.85	31.85	34.42
<b>Number of observations</b>	<b>2720</b>	<b>2154</b>	<b>848</b>	<b>541</b>
<b>Weekday</b>	<b>1719</b>	<b>1361</b>	<b>547</b>	<b>319</b>
<b>Weekend</b>	<b>1001</b>	<b>763</b>	<b>301</b>	<b>222</b>

*Note:* Non-black parents with < 10 children.

**Table 8a –Daily Minutes of Work and Other Activities  
Married Women with children under 18, ATUS**

	<b>High School</b>	<b>Some College</b>	<b>College Grad</b>	<b>More than College Grad</b>
<b>Market Work</b>				
Number of boys 0-2	-195.06	-170.85	-92.57	-98.22
Number of girls 0-2	-111.08	-168.25	-118.97	-157.04
P Value (Boy=Girl)	0.27	0.97	0.71	0.55
<b>Housework</b>				
Number of boys 0-2	3.83	7.88	3.65	-37.37
Number of girls 0-2	19.25	8.49	9.47	16.53
P Value (Boy=Girl)	0.4	0.98	0.75	<b>0.04</b>
<b>Primary Childcare</b>				
Number of boys 0-2	89.46	114.67	125.28	170.76
Number of girls 0-2	70.38	120.48	141.92	123.84
P Value (Boy=Girl)	0.21	0.72	0.27	<b>0.03</b>
<b>Secondary Childcare</b>				
Number of boys 0-2	165.31	171.25	108.15	136.61
Number of girls 0-2	132.97	130.28	140.58	146.41
P Value (Boy=Girl)	0.37	0.29	0.37	0.85
<b>Leisure and Socializing (OLS)</b>				
Number of boys 0-2	-13.51	-26.87	-23.48	-54.42
Number of girls 0-2	-14.66	-25.61	-36.88	-65.39
P Value (Boy=Girl)	0.95	0.95	0.44	0.66

*Note:* Tobits except for leisure. Also includes number of boys and girls age 3 to 6 and age 7 to 17 and weekend dummy.

**Table 8b –Daily Minutes of Work and Other Activities  
Married Men with children under 18, ATUS**

	<b>High School</b>	<b>Some College</b>	<b>College Grad</b>	<b>More than College Grad</b>
<b>Market Work</b>				
Number of boys 0-2	-30.3	5.58	-3.24	-59.94
Number of girls 0-2	-11.28	-46.35	-12.74	19.24
P Value (Boy=Girl)	0.54	0.12	0.77	<b>0.06</b>
<b>Housework</b>				
Number of boys 0-2	3.21	-1.09	0.1	-16.39
Number of girls 0-2	-31.52	6.1	4.64	-18.23
P Value (Boy=Girl)	<b>0.02</b>	0.6	0.72	0.91
<b>Primary Childcare</b>				
Number of boys 0-2	4.43	15.7	25.44	26.24
Number of girls 0-2	18.04	17.11	7.12	17.97
P Value (Boy=Girl)	0.18	0.89	<b>0.07</b>	0.47
<b>Secondary Childcare</b>				
Number of boys 0-2	36.42	8.27	23.01	63.52
Number of girls 0-2	44.44	22.82	43.16	15.43
P Value (Boy=Girl)	0.73	0.57	0.41	<b>0.09</b>
<b>Leisure and Socializing (OLS)</b>				
Number of boys 0-2	1.89	-15.36	-2.74	17.07
Number of girls 0-2	2.45	3.08	-1.88	-12.15
P Value (Boy=Girl)	0.96	0.13	0.94	<b>0.04</b>

*Note:* Tobits except for leisure. Also includes number of boys and girls age 3 to 6 and age 7 to 17 and weekend dummy.