Why the Apple Doesn't Fall Far From the Tree:
Individual Parent's Resources and Child Outcomes

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Table of Contents

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ABSTRACT

Contemporary issues of son-preference and infanticide in developing countries have encouraged extensive research into how gender bias in the allocation of parental resources affects the child(ren). Disparities in child physical health outcomes have received particular focus. Growing evidence from both developing and developed countries suggests mothers invest more in girls than boys, while fathers more in boys than girls. Following Duncan Thomas's convention in his 1994 piece on parental resources and child height, this paper updates the examination of the impact of parental education level on child health. We reject the unitary model as a description of household behavior and use individual parents' education as a measure of bargaining power. This study evaluates approximately 1800 subjects aged 20 to 26 in the U.S. using the 1997 National Longitudinal Survey of Youth data set. Preliminary results indicate that gender-preference in the allocation of household resources persists, depending on education level and race. High school completion and the linear measures of education, specifically among whites, demonstrate a tendency for mothers to favor their daughters and fathers, their sons. When parental education is highest by this indicator, the data show positive impacts on both female and male youth height. When controlling for heterogeneity across households, the results are mixed, suggesting the possibility that individual parental education is no longer a good measure of bargaining power in the household.

I. Introduction

The prevalence of "son-preference" and the associated family behavior in developing countries have received a great deal of attention (Thomas, 1990, 1994; Harris and Morgan, 1991; Lundberg, 2005). In China, a phenomenon termed by some to be a "gendercide" has transpired where families resort to abortion and infanticide to ensure their one child is a boy; speculations have been made that by 2011 there will be anywhere from 40 to 60 million "missing women" in China (Baculinao, 2004). These shocking practices alarm many U.S. observers, but the interplay between child gender and family life has often been reserved for discussions of South and East Asian countries. Wealthy, non-traditional societies are frequently perceived as resistant to child-gender bias despite sociological and psychological studies showing otherwise. More recently, contributions to the literature on child-gender disparities have materialized from an economic perspective, reinforcing the argument that this discrimination can cross national lines. Mounting evidence suggests that in both developing *and* developed countries, child gender affects family stability and the resource-allocation of parents. (Thomas, 1994; Dahl and Moretti, 2004; Lundberg, 2005; Godoy et. al., 2006).

While no overwhelming numbers of female children are "missing" in the U.S., son-preference may still exist in more subtle forms. Economic inquiries have focused on the evidence for this preference and its resulting impact within the household. In their groundbreaking and provocative study, Dahl and Moretti (2004) argued that American parents favor boys over girls, as evidenced through trends in divorce, child custody, shotgun marriage and fertility stopping rules (Dahl and Moretti, 2004). A decade before

Dahl and Moretti, Thomas (1994) found differences in the allocation of household resources depending on the gender of the child. For the United States, he observed mothers investing more in their daughters, and fathers more in their sons. If we allow for families to serve as microcosms of society, this evidence of bias in the individual parent's preference and the disproportionate allocation of resources to one child over another hold significant relevance to the persistence of gender inequality throughout the globe.

Accordingly, our research derives its broader context in the fact that despite heightened awareness of gender issues in the contemporary global community, no country has yet managed to completely eliminate the gender gap. The World Economic Forum annually publishes the *Global Gender Gap Report* with top rankings given to those countries that exhibit the greatest level of equality between men and women. The report covers a total of 128 countries representing over 90 percent of the world population. Variables measuring economic opportunity and participation, educational attainment, political empowerment, and health and survival were used to construct the global gender gap indexes by which the countries were ranked.[1] Figure 1 is the United States' basic profile in the report (Hausmann, Tyson, and Zahidi, 2007). In the 2007 Report, the U.S. found itself ranked 31st, *falling* eight spots from the previous year. The profile and ranking reveal that the "land of the free" is not immune to gender inequities. In this paper, we will further examine some of the trends documented in the report through an investigation of U.S. households.

[1] Specifically, the variables pertained to the following: economic opportunity and participation (e.g., ratio of female earned income to male income), educational attainment (e.g., ratio of female literacy to male literacy), political empowerment (ratio of females with seats in parliament to males with seats), and health and survival (e.g., ratio of female healthy life expectancy over male value).

Figure 1: Global Gender Gap Report 2007, Country Profiles

United States

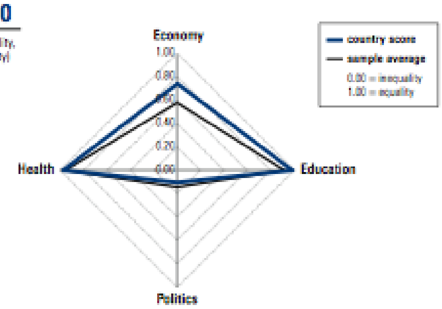
Gender Gap Index 2007

Rank **31** (out of 128 countries) Score **0.700** (0.00 = inequality, 1.00 = equality)

Key Indicators

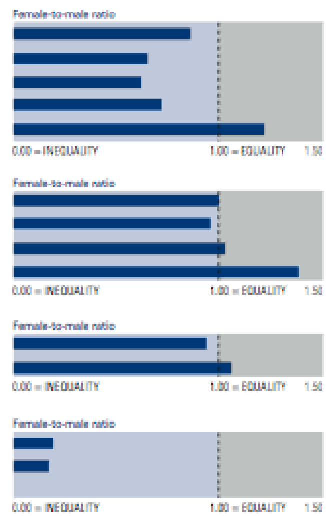
Total population (millions), 2005 .... 296.41
Population growth (in %) 0.96
GDP (US$ billions), 2005 .... 11,046.43
GDP (PPP) per capita 37,267

Mean age of marriage for women (years) 26
Fertility rate (births per woman) 2.00
Year women received right to vote 1965
Overall population sex ratio (male/female) 0.97



Gender Gap Subindexes

	Rank	Score	Sample average	Female	Male	Female-to-male ratio
Economic Participation and Opportunity	**14**	**0.738**	**0.577**			
Labour force participation	28	0.86	0.69	70%	82%	0.86
Wage equality for similar work (survey)	70	0.65	0.64	—	—	0.65
Income (PPP US$)	38	0.62	0.50	30,581	49,075	0.62
Legislators, senior officials, and managers	4	0.72	0.26	42%	58%	0.72
Professional and technical workers	1	1.00	0.68	55%	45%	1.22
Educational Attainment	**76**	**0.982**	**0.916**			
Literacy rate	1	1.00	0.85	99%	99%	1.00
Enrolment in primary education	106	0.96	0.97	90%	94%	0.96
Enrolment in secondary education	1	1.00	0.92	91%	88%	1.03
Enrolment in tertiary education	1	1.00	0.81	96%	69%	1.39
Health and Survival	**36**	**0.979**	**0.958**			
Sex ratio at birth (female/male)	1	0.94	0.92	49%	51%	0.94
Healthy life expectancy	59	1.06	1.04	71	67	1.06
Political Empowerment	**69**	**0.102**	**0.142**			
Women in parliament	63	0.19	0.19	16%	84%	0.19
Women in ministerial positions	51	0.17	0.13	14%	86%	0.17
Number of years with a female head of state (in last 50 years)	42	0.00	0.11	0	50	0.00



Additional Data

Maternity and Childbearing

Births attended by skilled health staff (as % of total) 99
Contraceptive prevalence, married women (%) 76
Infant mortality rate (per 1,000 live births) 7
Length of paid maternity leave .... 12 weeks
Maternity leave benefits (% of wages paid) 0%
Provider of maternity coverage .... No information
Maternal mortality ratio per 100,000 live births 14
Adolescent fertility rate (births per 1,000 women aged 15–19) 50.33

Education and Training

Percentage of female teachers, primary education 89
Percentage of female teachers, secondary education 63
Percentage of female teachers, tertiary education 43

Employment and Earnings

Female adult unemployment rate (%) 5
Male adult unemployment rate (%) 6
Women in non-agricultural paid labour (as % of total labour force) 49
Ability of women to rise to positions of enterprise leadership* 5.01

Basic Rights and Social Institutions**

Paternal versus maternal authority 0.00
Female genital mutilation 0.00
Polygamy 0.00
Existence of legislation punishing acts of violence against women 0.33

*survey data, responses on a 1-to-7 scale (1=worst score, 7=best score)
**data on a 0-to-1 scale (1=worst score, 0=best score)

Source: The Global Gender Gap Report 2007.

Reproduced with the permission of the World Economic Forum.

As aforementioned, in 1994 Duncan Thomas published the paper, “Like Father, Like Son; Like Mother, Like Daughter: Parental Resources and Child Height.” He specifically observed the relationship between parental education and child height, using household survey data from three countries: the U.S., Brazil, and Ghana. Using child height as a proxy for basic health and nutritional status, he found significant evidence of gender-based differences in the allocation of household resources. Our research updates Thomas’s study and use of the National Longitudinal Survey of Youth 1979 (“NLSY79”) and the NLS Mother-Child assessment from 1986. Focusing solely on the U.S., we use panel survey data from a more current National Longitudinal Survey of Youth, that of 1997 (“NLSY97”). In essence, we will determine the impact and effects of individual parent’s resources on child height, using a younger cohort in order to observe whether the child-gender preference is still prevalent within the U.S., a developed society.

Following Thomas and convention, we will use the youth’s height as an indicator of health and long-run nutritional status. Youth height is considered a useful indicator of basic child welfare, by nutritionists and economists alike. Child welfare, in turn, is related to several indicators of resource-availability within the household. How the parents allocate resources among their children is a direct result of the bargaining power they hold within the marriage and the household. We will use parental education, defined by the highest grade-level achieved, as a proxy for their bargaining power and the human capital they bring to the marriage or cohabitation (Quisumbing and Maluccio, 1999).

The structure of this paper is organized as follows: Section II presents the reader with a review of relevant literature, including specific attention to Duncan Thomas’s research. Section III explains the theoretical model used to analyze the effects of individual parent's resources on child height. Section IV is an overview of the National Longitudinal Survey of Youth 1997 and an explanation of key variables and restrictions imposed on our data. Section V is a detailed discussion of our empirical results. Section VI takes a closer look at our observations and elaborates on possible future research. Finally, the paper concludes in Section VII with relevant commentary and final thoughts.

II. Gender Biases in the Allocation of Individual Parents' Resources

Relevant scholarly material abounds on the division of parental resources and child outcomes. As mentioned earlier, there is great deal of discourse on the incidence of child-gender bias and preferential treatment in developing countries. Classified as a wealthy, non-traditional society, the U.S. has not historically received much attention in this regard. When attention has been paid and observations made, however, it seems that gender differences in resource allocations do in fact exist for the U.S.

Gender Preferences vs. Differences in Child-Rearing Technology:

Our paper stems from Duncan Thomas's, "Like Father, Like Son; Like Mother, Like Daughter: Parental Resources and Child Height"; however, it will differ in two important ways. Firstly, we will focus solely on the United States, whereas Thomas included the developing countries of Ghana and Brazil. Secondly, we use a more current data set, as previously noted. While there is substantial research regarding gender preferences in developing countries, such as the infanticide of daughters in China, we also highlight the relevant literature that examines child gender preferences in the allocation of parental resources in developed countries. Thomas examined the determinants of child anthropometric outcomes as a result of the disparate allocation of parental resources within a household. Following convention, he used child height as a proxy for nutritional status and development; we will do the same in this paper.

Growing research in economics suggests that the effect of a mother's education and income is larger on the health of her daughters than her sons, and that the education and income of the father has a bigger impact on the health of his sons than his daughters. The different amount of resources invested in the human capital of their children reflects, in part, the technology of child rearing, or the "sexual division of labor," and a difference in preferences towards sons versus daughters (Thomas, 1994). Evidence of the disparity in the technology of child rearing is that fathers spend more time with sons at an early age, and mothers exhibit the same trend with their daughters. Additionally, fathers spend more time with their children if at least one of them is a son (Harris and Morgan, 1991; Mammen, 2006). A third possibility, which Thomas proposed, is that the gender inequalities are a byproduct of the different returns to investment to the individual parents. For example, children are frequently a source of old-age security for parents. This phenomenon is more important for women, who live longer on average than men in the United States, and thus may explain why mothers treat their daughters preferentially (Thomas, 1994).

Thomas restricted his data sample to represent a disproportionately high number of families living below the poverty line, in order to better compare the United States to developing countries. In the United States, given the advancement of technology and health care, a more comprehensive picture of the effects of individual parents' allocation of resources on child outcomes might include alternative dependent variables to child height, such as educational attainment. We conjecture further on this point in the research extensions portion of Section VI.

Although this paper will focus specifically on updating Thomas's observations with respect to the United States sample, it is important to note his findings for other countries. In his paper, "Intra-Household Resource Allocation: An Inferential Approach," Thomas found that in Brazil, unearned income in the hands of the mother has a positive and greater impact on her family's health than unearned income under the control of the father; for child survival probabilities the effect is almost twenty times bigger (Thomas, 1990).[2]

Evidence of Son-Preference:

In a survey of the contemporary sociological and psychological literature on child gender preferences, Shelly Lundberg examined research on the effects of sons and daughters on family structure and parental involvement, mostly based on U.S. data. In her paper, "Sons, Daughters, and Parental Behavior," Lundberg displayed findings distinct from those of Thomas. For example, she found that both fathers *and* mothers tended to spend more time with sons than daughters, particularly when the children were young, and this difference is substantial for fathers of two sons, relative to two daughters. Total time spent with the child(ren) is divided into two sub-categories: educational time and recreational time. Lundberg found fathers spent significantly more time in recreational activities with sons than daughters, but only an insignificant difference in the educational time that individual parents spend with their child(ren). She explained that

[2] Unearned income is commonly used to represent exogenous income and thus solves the problems of endogeneity and earned income.

this finding could be a result of the father's preferences or a greater return to the investment in the son's physical ability. It is crucial to reiterate that this preference is not limited to the fathers; she also found a significantly positive "son-effect" on mothers' recreational childcare (Lundberg, 2005). Lundberg's findings support the "son-preference" phenomenon, but additional evidence points to a dichotomous scenario where fathers appear to favor their sons, and mothers their daughters.

Lundberg's paper also addressed the relationship between child gender and marital stability. She noted recent empirical studies that found small but significant and consistent impacts of child gender on the partnership status of parents and the living arrangements of the child. Basically, boys were found more likely to be living with their fathers than girls were. This aspect of her research, however, does not have real implications for our paper, due to the fact that we include only families where both biological parents are present in the household. Lundberg highlighted the consistency between these results and the extensive literature in the social sciences on greater father involvement with boys than with girls, and alluded to an economic interpretation that male children increase marital surplus. Further, she referred to a substantial collection of evidence where the presence of a male child increased the work hours of the father. This increase in household specialization may be the father's optimal response to greater expected marital stability (Lundberg, 2005).

Gordon B. Dahl and Enrico Moretti also discussed the impacts of gender composition of the family in the U.S. in "The Demand for Sons: Evidence from Divorce, Fertility, and Shotgun Marriage." Dahl and Moretti stated that although "son-preference" may only reveal itself subtly, it nevertheless exists, especially when evidence is considered collectively. The paper examined how parental preferences for sons versus daughters affect divorce, child custody, marriage, shotgun marriage when the sex of the child is known before birth, and fertility stopping rules. They documented that parents with girls are significantly more likely to be divorced, that divorced fathers are more likely to have custody of their sons, and that women with only girls are substantially more likely to have never been married (Dahl and Moretti, 2004). Thus, they discovered findings similar to those examined and discussed by Lundberg in her aforementioned survey of the relevant, contemporary literature on child gender preference (Lundberg, 2005).

Perhaps their most striking evidence came from the analysis of shotgun marriages. Dahl and Moretti found that among those who had an ultrasound test during their pregnancy, mothers carrying a boy were more likely to be married at delivery. When examining fertility, they observed that in families with at least two children, the probability of having another child is higher for all-girl families than all-boy families. They found this preference for sons to be largely driven by fathers, with men reporting they would rather have a boy by more than a two to one margin (Dahl and Moretti, 2004).

Individual Parents' Resource Constraints:

Richardo Godoy, et al tested the parental investment disparity between sons versus their daughters in his paper, "Why do mothers favor girls and fathers boys?" The study focused on a farming society in the Amazon and Godoy discussed gender differences in health outcomes as a result of the resources controlled by the individual parents. He approached the issue from a slightly different perspective than Lundberg and developed a hypothesis that predicted preferences for girls by the parent facing *more* resource constraints and preferences for boys by the parent facing less of a resource constraint. The tests demonstrated significant evidence that the mother's wealth had significant, positive effects on the daughter's body mass index (BMI), but the father's wealth had weak effects on boy's BMI (Godoy, 2006). Another interesting result of this paper is that parents favoring children of a certain birth-order may also impact child outcomes. The "birth-order preference" is not investigated in depth in our paper, but nonetheless serves as an alternative illustration of the presence of parental gender preference in contemporary society. One shortcoming of Godoy's paper is the sample population Godoy tested. Isolated effects from a farming society in Brazil may not be applicable to the data sample used in this paper.

III. Modeling Household Behavior: Theoretical Overview[3]

Assumptions of the Unitary Model and Child Health Outcomes:

The model used in this paper closely follows that which was set up and employed by Thomas in his aforementioned piece on parental allocation of resources and child height. The model develops a reduced form demand for child health function by integrating a health production function with a model of household decision-making. Child health, θ, depends on a set of inputs, M (e.g., diet, child care quality and frequency), individual characteristics, μ_i (including age and sex), family characteristics, μ_f

[3] To be clear and reiterate, the model and theoretical framework in this paper closely follows that used by Duncan Thomas in his paper, "Like Father, Like Son; Like Mother, Like Daughter: Parental Resources and Child Height" (1994). Adaptations and differences are noted. Please see the appendix for an extract of the empirical model.

(such as parental human capital), and community characteristics, μ_c (such as the healthiness of the environment).

a. $\theta_i = \theta_i\,(M, \mu_i\,, \mu_f\,, \mu_c\,, \eta_i\,)$,

where η_I represents individual-specific unobserved heterogeneity in health. The technology of the health production function may vary according to gender and age of the child; thus, gender specific differences in the impact of parental education on child height may simply reflect this technology.

We assume each household member, $m = 1,\ldots, M$, wishes to maximize his/her own utility given by the following:

b. $v_m(x\,, l\,, \theta\,; \mu\,, \varepsilon\,)$,

Here, x is a vector of goods demanded and l is a vector of leisure, respective of each individual in the household. In general, θ represents a vector of home produced commodities, although this paper focuses specifically on child health. Background characteristics, such as education, of all household members are represented by μ, and ε is a vector that accounts for unobserved tastes. If we treat the household as a set of individuals with common preferences, as most economic models of the household do, then the household welfare function (2) is maximized subject to a single budget constraint:

c. $px = \Sigma\, w_m\,(T_m - l_m) + y_m$,

The amount of time available for work is represented by T and w is a vector of wages. Nonlabor income, which we assume to be exogenous, is denoted by y_m.

The household optimizes with respect to the aforementioned budget constraint, resulting in household demand for each element of x, l, and θ. This paper will focus on one element of θ, namely child height, h, which depends on exogenous child, family, and community characteristics, μ_i, μ_f, and μ_c, respectively. Following the common preferences model, child height will depend on total household nonlabor income, Σy_m:

d. $h_i = h_i(\mu_i , \mu_f , \mu_c , \Sigma y_m , \xi_i)$,

Individual specific heterogeneity is represented by ξ_i.

As Thomas pointed out, maternal education may have a larger impact on the height of a daughter, relative to a son, for two reasons: firstly, the technology underlying the health production function, (1), may differ for boys and girls; secondly, the mother may prefer to allocate more time to the daughter. Estimates of the impact of parental education on child height in the reduced form do not permit the empirical differentiation of these two explanations.

Assessing the Impact of Bargaining Power:

Separating preferences from technology is only possible when we relax the assumption of common preferences. Rather than treat the household as a single individual, we would like to consider two alternative classes of models, as Thomas did. The first focuses on bargaining power, where the Nash equilibrium is the appropriate concept. Each individual seeks to maximize the difference between his/her utility achieved by cooperating within the household and the threat point, V_m. Also known as reservation utility, this is considered as the utility outside of the household (McElroy, 1990) or that achieved in a non-cooperative equilibrium (Ulph, 1988; Lundberg and Pollak, 1993). The household will maximize the product of these differences:

e. $\Pi\ [v_m(x, l, \theta;\ \mu, \varepsilon) - V_m(p, y_m, \mu_m)]$, where μ_m are any characteristics that would affect member *m*'s bargaining power or ability to assert his or her preferences within the household. Even with the common preferences assumption relaxed, the demand for health function will depend on the same individual, family, and community characteristics. The new element that affects the function is each member's bargaining power, which is determined by individual resources, such as individual nonlabor income.

The second alternative model assumes households make Pareto efficient allocations. It allows for household members' preferences to be altruistic, in that each cares about the other's wellbeing and consumption of goods. Browning and Chiappori (1998) show that for all Pareto efficient allocations, there exists a set of individual "welfare weights", ω, such that the household welfare function can be written as the weighted sum of all individual utility functions. Optimization of this household welfare function is subject to total household income. Thus, in this model, child height will depend on prices, incomes and the welfare weights, which in turn are dependent upon prices, individual incomes, and other factors that affect an individual's ability to bargain. It is important to reiterate that, in Thomas's model, it is individual and not household nonlabor income that affects child height. Insufficient nonlabor income data in the NLSY97 precluded its inclusion in our empirical model; thus, our model uses individual parent's education and household income as determinants of child height. Optimization within the bargaining model results in an outcome of an adjusted demand for child height,

(4') $h_i = h_i(\mu_i , \mu_f , \mu_c , y_h , \mu_1 , \mu_2 , \xi_i),$

where y_h represents household income, and μ_1 and μ_2 specifically represent father's and mother's education, respectively.

With this empirical setup in mind, we established the following regressions:[4]

$$Y_i = \alpha + \beta_{age}A_i + \beta_{asq}A^2 + \beta_{blk}B + \beta_{oth}O + \beta_{blk}A_iB + \beta_{oth}A_iO + \beta_{htm}H_m + \beta_{htf}H_f + \beta_{inc}I + \beta_{edm}E_m + \beta_{edf}E_f + \beta_{edm}E_m^2 + \beta_{edf}E_f^2 + \varepsilon_i,$$

where education variables are linear and squared terms, and:

$$Y_i = \alpha + \beta_{age}A_i + \beta_{asq}A^2 + \beta_{blk}B + \beta_{oth}O + \beta_{blk}A_iB + \beta_{oth}A_iO + \beta_{htm}H_m + \beta_{htf}H_f + \beta_{inc}I + \beta_{edm}E_{m;hs} + \beta_{edf}E_{f;hs} + \beta_{edm}E_{m;c} + \beta_{edf}E_{f;c} + \varepsilon_i,$$

where dummy variables for education are used to denote high school and college completion.

IV. Data Set Description and Explanation

The National Longitudinal Survey of Youth 1997 (NLSY97):

The National Longitudinal Survey for 1997 consists of a nationally representative cross-sectional and supplemental sample of approximately 9000 youths who were 12 to 16 years old as of December 31, 1997. Round 1 of the survey took place in 1997, where both the eligible youth and one of that youth's parents received hour-long personal interviews (http://www.bls.gov/nls/). Especially important to our research is the information collected on both parent and child anthropometry and household socioeconomic characteristics. Round 9, in 2005, is the most recent publicly available

[4] For a detailed list of the explanatory and dependent variables used, please refer to Table 1.

wave. By this wave, the youth were approximately ages 20 to 26. For the purposes of this study, we assume they have maintained their maximum adult height.

Key Variables and Notable Cuts:

Table 1 displays the summary statistics with respect to the dependent and explanatory variables. Note that the complete age range is from 20 to 26 years in Round 9 of the NLSY97 in 2005. On average, the youths in our pool are taller than their biological parents. Recall, as well, that the high school and college completion measures are dummy variables. A detailed explanation of the dependent and explanatory variables used in all regressions may be found in Table A1 of the appendix. Education of the residential mother and father is measured in two basic manners: the highest grade completed and the completion of high school or college (created as dummy variables). This is further explained in the section discussing the empirical results (Section IV). There were significantly more available data points for maternal education (n = 5658) than for paternal education (n = 3926) due to the fact that the responding parent of the youth was most often the mother. This trend also held for height of the biological parents and highest grade completed of the residential parents. Despite the discrepancy in sample size for parental education, a similar number of mothers (n = 1438) and fathers (n = 1393) completed college.

Explanation of Imposed Data Restrictions:

From the original sample size of approximately 8,984, we cleaned the data set of any non-responses, valid skips (instances where the respondent was not supposed to ask a

Table 1: Summary Statistics of Explanatory and Dependent Variables

Variable	*Symbol*	*Observations*		*Mean*		*Std. Dev.*		*Min.*		*Max.*	
		Females	***Males***	***Females***	***Males***	***Females***	***Males***	***Females***	***Males***	***Females***	***Males***
Independent											
Youth Age	A	3,638	3,634	22.94	22.92	1.43	1.42	20	20	26	26
Youth Age, Squared	A^2	3,638	3,634	528.41	527.56	65.88	65.42	400	400	676	676
Black Youth	B	1,190	1,198	---	---	---	---	---	---	---	---
"Other" Youth[1]	O	620	664	---	---	---	---	---	---	---	---
Youth Age * Black Race Dummy	A_iB	1,045	956	23.02	22.99	1.47	1.39	20	20	26	26
Youth Age * "Other" Race Dummy[1]	A_iO	506	525	22.88	23.00	1.36	1.46	20	20	25	26
Biological Mother's Height	H_m	3,502	3,627	5.35	5.35	0.23	0.23	4.00	4.00	6.67	6.50
Biological Father's Height	H_f	2,243	2,334	5.81	5.81	0.28	0.28	3.50	3.00	6.75	7.08
Gross Family Income	I	3,014	2,980	51,605.92	57,098.38	58,282.11	63,472.31	0	0	337,820.00	337,820.00
Highest Grade Completed by Residential Mother	E_f	3,906	4,099	12.47	12.58	2.97	2.94	1	1	20	20
Highest Grade Completed by Residential Father	E_m	2,701	3,003	12.91	12.85	3.27	3.33	2	1	20	20
Highest Grade Completed by Residential Mother, Squared	E_m^2	3,906	4,099	164.41	166.98	70.67	72.17	1	1	400	400
Highest Grade Completed by Residential Father, Squared	E_f^2	2,701	3,003	177.40	176.22	82.11	83.12	4	1	400	400
High School Completion Dummy, Residential Mother	$E_{m;hs}$	3,906	4,099	0.71	0.71	0.46	0.46	0	0	1	1
High School Completion Dummy, Residential Father	$E_{f;hs}$	2,701	3,003	0.69	0.68	0.46	0.46	0	0	1	1
College Completion Dummy, Residential Mother[2]	$E_{m;c}$	3,906	4,099	0.17	0.19	0.38	0.39	0	0	1	1
College Completion Dummy, Residential Father[2]	$E_{f;c}$	2,701	3,003	0.25	0.24	0.43	0.43	0	0	1	1
Dependent											
Youth Height (pooled)	Y_i	3,570	3,548	5.38	5.87	0.24	0.27	4.42	4.50	6.58	7.25

Note:

(1) "Other" race group defined as American Indian, Eskimo, Aleut, and Asian or Pacific Islander (n = 244)

(2) College completion is defined as completion of the fourth year of college

particular question), refusals to answer, and responses of "don't know." The NLSY97 assigns negative values to these variables in coding for them; thus, including them in our regressions would significantly skew any summary statistics. Table A2 in the appendix displays the scope of each cut. "Gross Family Income" (I_i) particularly influenced the final sample size. Due to the sensitivity and uncertainty related to income, a large number of related questions were left unanswered. Also, father's anthropometric and educational information heavily influenced the reductions in sample size due to high incidences of the aforementioned responses. Though significant, it was necessary to incur these losses to maintain the empirical foundation and observe our desired measure of bargaining power.

Data Difficulties:

In the process of connecting our theoretical model with our empirical analyses, we encountered certain difficulties with the data composition. Initially, we planned to follow Thomas's convention by including individual parent's nonlabor income, as is done in our theoretical set-up. Unfortunately, the NLSY97 does not separate annual nonlabor income figures for the parents. There was sufficient information regarding individual parent's income from labor market activities. From this portion of the data, we attempted to ameliorate the issue of endogeneity associated with labor income by determining wage rates. However, there was a significant lack of information collected on the individual hours worked per week and weeks worked per year. Consequently, we controlled for household socioeconomic characteristics with a gross family income variable and used parental educational attainment as our central measure of bargaining power.

V. Empirical Results: Height and Higher Education

In this round of regressions, parental education was examined through the use of two definitions. The first, more basic form, utilized the residential mother and father's highest grades completed as linear and squared variables. In the second run of regressions, levels of parental education were represented by two dummy variables: high school completion, defined as having completed between twelve and fifteen years of education, and college completion, defined as having completed four or more years of college. For each grouping of education, the effects of this parental resource were observed on youths of the same and different gender. For example, we examined effects of the residential mother's completion of high school, on both daughters and sons. Focusing on the education variables, the null hypothesis in each scenario is that parental education, measured by highest grade completed or as a dummy variable, has no effect on youth height (e.g., $\beta_{edm} = 0$; $\beta_{edf} = 0$).

A racial stratification was employed to capture additional information. The respondents were divided into three categories: "white," "black," and "other".[5] The white group of youths was the largest, consisting of 1306 males and females, followed by the black group at 300 youths and the smallest group, "other," was made up of 194 respondents. The respective results, pooled and stratified by race, are displayed in Tables 2 and 3. The absolute values of the t-statistics are reported below the regression coefficients. Following Thomas's convention, the third column of the individual stratifications displays an estimation of differences for the impact of the education

[5] "Other" racial group defined henceforth as American Indian, Eskimo, Aleut, and Asian or Pacific Islander.

variables on the male versus the female youth. An F-statistic is reported below those coefficients. The complete set of variables used in each regression is included in the appendix.

Regressing Youth Height from Parent's Education – Highest Grade Completed:

To reiterate, the regression equation used for this round is as follows:

$$Y_i = \alpha + \beta_{age}A_i + \beta_{asq}A^2 + \beta_{blk}B + \beta_{oth}O + \beta_{blk}A_iB + \beta_{oth}A_iO + \beta_{htm}H_m + \beta_{htf}H_f + \beta_{inc}I + \beta_{edm}E_m + \beta_{edf}E_f + \beta_{edm}E_m^2 + \beta_{edf}E_f^2 + \varepsilon_i$$

Table 2 presents the regression results when measuring parental education by highest grade completed. As previously noted, the stratifications by youth gender and race are implemented. The estimation of differences for the impact of the education variables on youth height is presented in the third column of the respective racial groups. Table A3, included in the appendix, displays the full list of explanatory variables regressed in this analysis.

Paternal and maternal heights are included in each regression to capture phenotype and genotype influences on child height. The biological mother and father's heights are positive and significant across the entire data set, including the stratification by race. The male gender is positively related to all youth heights, while the female gender negatively impacts all races, except blacks. The variables for youth age do not demonstrate statistical significance for males or females in any subgroup; thus, our assumption holds that the pool, aged 20 to 26, is fully grown (anthropometrically speaking). Race dummies indicate that black race has a positive, though not significant

Table 2

Effect of Parental Education on Youth Height by Gender: United States (NLSY97: 1997 and 2005 Cross-Sections)

Linear and Squared Education Variables, Pooled and Stratified by Race

Variable	***Pooled***			***Whites***			***Blacks***			***Other***		
	Females	Males	Difference[2]	Females	Males	Difference[2]	Females	Males	Difference[2]	Females	Males	Difference[2]
Highest Grade Completed by Residential Mother	0.013	-0.041	-0.054	0.001	-0.025	-0.026	-0.027	-0.059	-0.032	0.041	-0.072	-0.113
	(0.63)	(2.19)**	(3.83)**	(0.04)	(0.97)	(0.71)	(0.35)	(0.76)	(0.08)	(0.60)	(2.33)**	(2.30)
Highest Grade Completed by Residential Father	-0.039	0.004	0.043	-0.029	-0.010	0.019	0.004	0.006	0.002	-0.054	0.033	0.087
	(1.60)	(0.25)	(2.24)	(2.10)**	(0.44)	(0.52)	(0.09)	(0.11)	(0.00)	(0.77)	(1.25)	(1.34)
Highest Grade Completed by Residential Mother, Squared	-0.001	0.002	0.002	0.000	0.009	0.009	0.001	0.003	0.002	-0.001	0.003	0.005
	(0.79)	(2.31)**	(4.69)**	(0.23)	(1.00)	(0.93)	(0.20)	(0.89)	(0.24)	(0.55)	(2.41)**	(2.68)*
Highest Grade Completed by Residential Father, Squared	0.001	0.000	-0.002	0.001	0.000	-0.001	0.000	0.000	0.000	0.001	-0.002	-0.003
	(1.78)*	(0.25)	(2.69)*	(2.36)**	(0.45)	(0.82)	(0.11)	(0.05)	(0.00)	(0.60)	(1.61)	(1.61)
Sample Size			1800			1306			300			194
Coefficient of Determination (r^2)			0.9985			0.9987			0.9978			0.9976
F-Statistic			50539.97			55780.83			6758.90			7305.99

Note:

(1) "Other" race group defined as American Indian, Eskimo, Aleut, and Asian or Pacific Islander.

(4) An F- statistic is included, below the coefficient, in the estimation of differences.

(3) * denotes statistical significance at the 10% level; **, the 5% level; ***, the 1% level.

impact on youth height. This coincides with Thomas's findings for his U.S. data sample (Thomas, 1994). Household income figures for 2005 are also included and the effect is positive in all cases, except for black females, where it negatively impacts youth height. This positive impact of gross family income for 2005 is significant for the pooled males, and for white females and males.[6]

Focusing now on the education variables: for the pooled data, maternal education appears to negatively and significantly affect her son's height (β_{edm} = -0.039) and positively affect her daughter's (β_{edm} = 0.013), though not significantly. This trend holds when stratifying by race, except in the case of black mothers, where education negatively impacts both sons and daughters. Results for the pooled data also show that this negative impact on sons' height intensifies as the mothers' highest grade completed increases. Empirically speaking, the coefficient on the squared term for maternal education's impact on sons' height is positive and significant (β_{edm} = 0.002). For the pooled set and all racial subgroups, mother's education has a larger effect on the height of her daughter than her son; this holds for the pooled group at a five percent significance level (F = 3.83). This reinforces the hypothesis that most mothers devote more resources to the health of their daughters than to their sons.

In contrast, the father's education for the pooled data has a negative effect on daughters' (β_{edf} = -0.039) height, which is just above significance (at a ten percent size of

[6] It is important to note that in this first round of regressions, Gross Household Income figures for 2005 were observed as recorded in the NLSY97. The resulting sample size was cut significantly, as the data was susceptible to high incidences of "non-interviews" and "invalid skips". After running the regressions under these constraints, we relaxed certain assumptions to increase the sample size. When other valuable information was provided by the respective respondent (e.g., anthropometric data on the parent and youth[s] and educational information), we replaced all absent income information with the sample mean ($56,334.57). This resulted in approximately 300 more observations. Running the regressions, however, did not significantly change our initial results. Despite some decrease in statistical significant, the same trends held in the newer regressions.

test). Furthermore, the negative impact on daughter's height increases at the margin as the father's education increases. In other words, the squared education term (E_f^2) for the father's impact on daughters is positive and significant (β_{edf} = 0.001). For the pooled group, paternal education appears to positively impact sons, though not significantly. The differences reveal a tendency opposite to that of the mothers: father's education has a bigger effect on the height of his son than his daughter. Thus, for the pooled set, a similar argument can be made: fathers seem to devote more resources to the health of their sons than to their daughters.

Stratification by race presents informative results. As previously mentioned, the highest grade completed by the mother has a positive impact on her daughter for all racial groups, except blacks. The education of black mothers has negative impact on both her sons' and daughters' heights. The negative impact of maternal education on her son's height is present for all racial groups and significant for the group defined as "other" (β_{edm} = -0.072). For this racial subset, the mother's squared education variable is also positive (β_{edm} = 0.003) and significant (t = 2.41) at a five percent level, implying that the negative impact of her education on her son's height is larger in scope as her education increases.

Under the same race stratifications, paternal education appears to negatively affect daughters in the white and "other" racial groups. Specifically for whites, the effect of father's education is negative and significant (β_{edf} = -0.029; t = 2.10) on his daughter's health. This negative effect significantly increases in scope as the white father's education increases (β_{edf} = 0.001; t = 2.36). This is another instance where the negative effect of the parental education on youth height is exacerbated by increasing levels of education. When examining the impact of paternal education on sons, the results are mixed. The father's education has a negative impact on son's height for whites and a positive impact for blacks and "others," though none of these are significant. It appears that white fathers, in particular, are favoring neither sons nor daughters. Further, black and "other" fathers appear to favor their sons, but only slightly (and not in a statistically significant manner).

Collectively, the results suggest that maternal education negatively affects the son's height, while paternal education negatively impacts daughter's height. In essence, the child of opposite sex to the parent is most subject to the effects of limited allocation of resources. While instances of same-gender preference certainly appear, such as a mother favoring her daughter with respect to resource allocation and health outcomes, none of these are significant. These observations diverge slightly from the claim that mothers invest more in girls than boys, while fathers more in boys than girls (Thomas, 1994; Dahl and Moretti, 2004; Godoy et. al., 2006). Essentially, our results from this first round of regressions indicate that opposite-gender bias is more pronounced than the same-gender nepotism. In other words, for the U.S. sample, there seems to be a negative relationship between fathers and daughters' health outcomes, and the same for mothers and her sons' outcomes. In certain ways, this casts a darker shadow on the overarching issue. Our analyses have exposed a counteractive scenario: the health of the youth, gauged by height, is hindered by the increased education of the parent of the opposite sex. While the instances of gender-preference indicate constructive treatment, our results reveal cases of destructive treatment. In sum, it illustrates a situation where the parent's educational achievement is at odds with the health outcomes of the child of opposite gender.

Regressing Youth Height from Parent's Education – High School & College Completion:

The effects of residential parent's education, represented by high school completion and college completion dummy variables are displayed in Table 3. The following regression was established to test these specific dummy variables:

$$Y_i = \alpha + \beta_{age}A_i + \beta_{asq}A^2 + \beta_{blk}B + \beta_{oth}O + \beta_{blk}A_iB + \beta_{oth}A_iO + \beta_{htm}H_m + \beta_{htf}H_f + \beta_{inc}I + \beta_{edm}E_{m;hs} + \beta_{edf}E_{f;hs} + \beta_{edm}E_{m;c} + \beta_{edf}E_{f;c} + \varepsilon_i$$

Table A4, in the appendix, presents the coefficients from the full regression, once the regression equation (included above) was stratified by both gender and race. One of the main findings, reconciling with those from the linear and squared education variable regression, is that both the biological mother's height and the biological father's height exhibited moderately strong, positive and significant correlations to both female and male youth height, across all populations studied. It is noteworthy to indicate that the both the black male and female youth groups exhibited opposite correlations than the other racial groups of the same gender, with respect to the variable "youth age." Both the white and "other" female groups were positively impacted by youth age, while black females' height was negatively related to age (β= -0.061). The exact reverse trend held for the male subgroups, although none of these coefficients were significant at the ten percent level. Again, this lack of statistical significance reinforces our assumption that the youths in our data set have reached full physical maturity. Interestingly, while gross family

Table 3

Effect of Parental Education on Youth Height by Gender: United States (NLSY97: 1997 and 2005 Cross-Sections)

High School and College Education Dummy Variables, Pooled and Stratified by Race

Variable	***Pooled***			***Whites***			***Blacks***			***Other***		
	Females	Males	Difference[4]	Females	Males	Difference[4]	Females	Males	Difference[4]	Females	Males	Difference[4]
High School Completion by Residential Mother[2]	0.028	-0.028	-0.057	0.027	-0.022	-0.049	-0.027	-0.016	0.011	0.069	-0.072	-0.141
	(1.45)	(1.45)	(4.21)**	(1.33)	(1.05)	(2.84)*	(0.38)	(0.25)	(0.01)	(0.95)	(0.93)	(1.77)
High School Completion by Residential Father[2]	-0.020	0.020	0.041	-0.006	0.016	0.022	-0.002	0.007	0.008	-0.139	0.071	0.210
	(1.13)	(1.08)	(2.46)	(0.30)	(0.82)	(0.64)	(0.03)	(0.11)	(0.01)	(1.94)*	(0.92)	(3.99)**
College Completion by Residential Mother[3]	-0.013	0.019	0.032	-0.019	0.003	0.022	-0.029	0.082	0.110	0.072	0.077	0.005
	(0.64)	(0.91)	(1.20)	(0.88)	(0.15)	(0.55)	(0.42)	(1.18)	(1.29)	(0.69)	(0.78)	(0.00)
College Completion by Residential Father[3]	0.023	0.005	-0.017	0.033	0.017	-0.016	0.047	0.035	-0.012	-0.136	-0.119	0.017
	(1.13)	(0.27)	(0.37)	(1.64)*	(0.84)	(0.31)	(0.70)	(0.43)	(0.01)	(1.28)	(1.32)	(0.01)
Sample Size			1800			1306			300			194
Coefficient of Determination (r^2)			0.9985			0.9988			0.9979			0.9976
F-Statistic			41256.23			52409.26			6721.66			3562.29

Note:

(1) "Other" race group defined as American Indian, Eskimo, Aleut, and Asian or Pacific Islander.

(2) High school completion defined as having completed between twelve and fifteen years of education.

(3) College completion defined as having completed four or more years of college.

(4) An F- statistic is included, below the coefficient, in the estimation of differences

(5) * denotes statistical significance at the 10% level; **, the 5% level; ***, the 1% level.

income showed a positive trend across all race groups, the impact was significant on only white and pooled male youths (β= 0.000, β= 0.000, respectively). The same was true for males in the pooled and white groups in the first set of regressions (with linear and squared education variables).

Table 3 presents the coefficients for the education dummy variables, which is stratified by gender and race. The table also includes an estimation of differences for the impact of the explanatory variables on youth height. With respect to the education dummy variables, the most interesting finding is the difference in the impact of parental completion of high school on males and females. Across all the races, the coefficient on high school completion by residential father is negative for the female youth' height, while it shows a positive impact on male children. The difference between this effect on male versus female children is positive and significant for the "other" group at the one percent significance level (F= 3.99). In essence, this supports our notion that there is a significant difference in the way a father treats his son(s) versus his daughter(s). For mothers, completing high school is positively related to the height of the daughters in the pooled, white and black groups. Conversely, maternal high school completion has a negative impact on sons across all groups. The difference in impact between sons and daughters is significant for both the pooled and white groups. This reinforces the alternate relationship where mothers are favoring daughters over sons. It is worth noting that in the case of the black group, both sons and daughters are negatively affected by the mother's completion of high school. This is the only racial subgroup to diverge from the gender-preference trend. Overall, these correlations for the high school dummy variables provide evidence in support of the hypothesis that mothers invest more in girls than boys, while fathers more in boys than girls.

Interestingly, the story changes for college completion by residential mothers and fathers. College completion by the residential mother relates negatively to female height across the pooled, white, and black groups. Conversely, maternal college completion exhibits a positive relationship with the height of the male youth across all subgroups. It should be noted that the coefficients on college completion by the residential father for males and females were positive for all groups, and significant for white females (β=1.64). It seems that daughters are benefiting from the college-level educational attainments of their fathers. The results from the “other” group were unique and notable. Both sons and daughters benefited from the completion of college by the mother, but the father’s college completion negatively impacted them. Although seemingly counterintuitive, it appears from this data that female and male youths in the “other” race group are disadvantaged by the fact that their father has completed four or more years of college. However, the small sample size (n=194) for this racial subgroup hinders any generalized conclusions.

Two distinct themes emerge from this set of regressions. The high school completion dummy variables reinforce the hypothesis that mothers allocate more resources to their daughters, while fathers more to their sons. This coincides with some of the findings from the first regression (based on linear and squared variables of parent’s highest grade completed). With respect to college completion, the results suggest otherwise. In the case of fathers completing college, both genders benefited, except the "others" racial subgroup. Interestingly for maternal college completion, daughters were negatively impacted, while the sons benefited.

High School and College Completion – Including Household Fixed Effects:

For the subsample of 698 children in which there are at least two children in the household, we use household fixed effects to control for unobserved heterogeneity.[7] Including household fixed effects allows us to estimate the difference between the impact of individual parental education on a son relative to a daughter. Table 4 displays the results of these regressions, where a dummy for sons is interacted with the high school and college completion dummy variables for the respective parents. As done in the previous regressions, the results are stratified by race. The first column for each subgroup contains the OLS estimation of differences from Table 3.[8] The second column contains a sample of households in which there is more than one child and the third column includes only those households in which there are is at least a son and a daughter.

For the two fixed effects regressions, the mothers who completed high school appear to have a larger, positive impact on the heights of their sons, relative to their daughters. This was significant for blacks, although it is important to note the small sample size (n = 72 and n = 43; for columns 2 and 3, respectively). For mothers who have completed college, there is not a clear trend across racial subgroups. Looking at the pooled group, with the largest sample size, we find that maternal college completion

[7] For the NLSY97 cohort, 1,862 households included more than one NLSY97 youth respondent. Up to five youths were interviewed in a household. With respect to our desired information (e.g., anthropometric data on the parents and youths, parental education, and household income) the resulting multiple-youth household sample size was cut to 698. For households containing at least one son and one daughter, similar limitations applied, resulting in a sample size of 376.
[8] See previous footnote on changes to the income information and availability.

Table 4

Effect of Parental Education on Youth Height by Gender, Including Household Fixed Effects: United States (NLSY97: 1997 and 2005 Cross-Sections)

High School and College Education Dummy Variables, Pooled and Stratified by Race

	Pooled			***Whites***			***Blacks***			***Others*** [1]		
		Fixed Effects			Fixed Effects			Fixed Effects			Fixed Effects	
Interaction Between Dummy (1) for Son and	OLS[5]	2+ Youth HH	If Boy and Girl	OLS[5]	2+ Youth HH	If Boy and Girl	OLS[5]	2+ Youth HH	If Boy and Girl	OLS[5]	2+ Youth HH[6]	If Boy and Girl
High School Completion by Residential Mother[2]	-0.057	0.032	0.068	-0.049	0.003	0.071	0.011	0.319	0.367	-0.141	0.066	0.109
	(4.21)**	(0.96)	(1.72)*	(2.84)*	(0.09)	(1.34)	(0.01)	(2.53)***	(2.14)**	(1.77)	(0.54)	(0.68)
High School Completion by Residential Father[2]	0.041	-0.033	-0.024	0.022	-0.016	-0.055	0.008	-0.142	-0.014	0.210	-0.041	0.243
	(2.46)	(1.08)	(0.65)	(0.64)	0.47	(1.14)	(0.01)	(1.52)	(0.10)	(3.99)**	(0.34)	(1.40)
College Completion by Residential Mother[3]	0.032	-0.003	-0.004	0.022	0.000	-0.006	0.110	0.072	0.344	0.005	-0.142	-0.099
	(1.20)	(0.09)	(0.10)	(0.55)	(0.01)	(0.11)	(1.29)	(0.62)	(1.82)*	(0.00)	(1.30)	(0.53)
College Completion by Residential Father[3]	-0.017	0.018	0.006	-0.016	0.017	0.006	-0.012	-0.074	-0.087	0.017	0.128	---
	(0.37)	(0.54)	(0.16)	(0.31)	0.45	(0.13)	(0.01)	(0.57)	(0.47)	(0.01)	(1.38)	---
Sample Size	1800	698	376	1306	553	305	300	72	43	194	73	28

Note:

(1) "Other" race group defined as American Indian, Eskimo, Aleut, and Asian or Pacific Islander
(2) High school completion defined as having completed between twelve and fifteen years of education
(3) College completion defined as having completed four or more years of college
(4) * denotes statistical significance at the 10% level; **, the 5% level; ***, the 1% level
(5) First column in each block (OLS) is the estimate reported in the third column of each block in Table 3
(6) Robust standard errors used to correct for heteroskedasticity

negatively impacts sons relative to daughters, though the effect is small and insignificant. Under fixed effects, we observe fathers with high school education to have a negative impact on sons across all subgroups, except the "other" households with at least one son and one daughter. Where the residential fathers have completed college, sons in the pooled and white subgroups benefit relative to daughters, though not significantly.

While many of these results run counter to those of the previous OLS regressions, they are nonetheless informative and particularly valuable in comparison to Thomas's observations. He found differences in the allocation of household resources based on the gender of the child, which persisted even after controlling for heterogeneity in the household. As we did not find the same to hold true for our fixed effects groups, it is necessary to further examine the varying circumstances of our research. Firstly, there is a significant discrepancy in sample size between our fixed effects pool and his. From the NLSY79, Thomas studied a subsample of 2,820 children in which there were at least two children in the household. Additionally, he observed 1,702 children in households with at least one son and one daughter (Thomas, 1994). Thomas also utilized the NLS Mother-Child assessment, which began in 1986 and included detailed information on 5,000 children in the NLSY79 cohort. As we did not have access to a similar, cross-sectional data set for our youth cohort from 1997, we encountered greater problems of limited data information. This resulted in a significantly smaller sample size from which we were able to observe and control for heterogeneity across households. This reality also manifested itself in large standard errors.

Furthermore, Thomas included a mean for partner's education in his regressions, whereas we allowed for the residential father's education to assume a high school or college completion dummy variable. This was done in an effort to observe paternal education's impact on the son relative to a daughter. The only instance in which Thomas did the same, and presented the findings, was for the black race group. Interestingly, for the black race group, our findings coincide with those of Thomas's, once he allowed for variation in the paternal education variable. We both found that the residential father with the highest amount of education has a larger impact on girl's height than on boys; this persisted when controlling for household fixed effects.

VI. Discussion: Results, Observations, Extensions

Commonalities, Themes and Inferences:

We would like to begin by addressing some of the overarching themes that arise from the analysis of our first regressions, which include the OLS estimates. To clarify, this is the approach we took before observing household fixed effects. Across these initial regressions, the pooled and white groups seem to suggest similar findings, which is most likely to the whites (n = 1306) having the highest representation in the pooled sample (n = 1800). For the blacks, there is a lack of statistically significant data observed in both rounds of regressions. Finally, for the "others," their results often run counter to those from the pooled data.

Taking into account the first round of regressions with the results from the high school completion dummy variables, it appears that gender-preference exists in the household. Mothers are favoring their daughters and fathers are favoring sons. In doing so, they are disadvantaging the child of the opposite gender. Rather than conveying a supportive relationship between father and son or mother and daughter, these results suggest some potentially detrimental father-daughter and mother-son associations.

Anomalous to this trend, college completion by the respective parents suggests otherwise. Both sons and daughters appear to be benefiting from their father's college education. The father's college education plays a significantly positive role in the white subgroup, where household income is also a positive and significant factor in the youth's health outcomes. In general, college completion changes the landscape of the correlations between youth health outcomes and parental allocation of resources. Specifically, mothers' completion of college reversed the relationships that we had expected and observed with the mothers that completed high school. The negative correlation between college-educated mothers and their daughters' heights poses a perplexing analysis.

The decision to control for heterogeneity across households was made in an effort to replicate Thomas's findings. Our results vary, both from Thomas and within our own regressions, and this demonstrates the difficulty in making definitive conclusions from one empirical study. Nevertheless, it presents a scholarly opportunity to contemplate the underlying reasons for these discrepancies. Certainly, one of the first explanations may be that times have changed. Marital sorting trends show an increase in educational homogamy or assortative mating based on schooling (Pencavel, 1998; Schwartz and Mare, 2005). In terms of our research, this means that paternal and maternal education are not differing enough to allow for us to get a good measure of power differences within the household. This fact is reflected in the summary statistics for the subsample where we studied household fixed effects. Table A5, in the appendix, contains the mean figures for the parental education dummy variables and reveals that there is little difference in educational attainment of mothers versus fathers.

Another explanation for the dichotomy of our results may be that the first results observed, those without fixed effects, are biased. Essentially, without fixed effects, our regressions showed the key education variables are significant and similar to Thomas's results. The error term for these regressions may include unobserved behaviors, such as caring and nurturing of the child(ren), which in turn may have a positive correlation with the coefficients on some of our independent variables. Hence, the results for the estimated coefficients may contain omitted variable bias. Specifically, the coefficients on education may be biased upwards or downwards. In contrast, the regressions that include fixed family effects sweep out such possibilities and our disparity in results highlights the importance of controlling for heterogeneity across households in the U.S.

Future Work and Extensions:

One aspect of our research that we originally implemented dealt with a restriction on household composition characteristics. Initially, we purposefully restricted our subset of the NLSY97 data to include only youths who were living with both biological parents. The resulting youth sample size was significantly diminished by this imposed restriction, impeding substantive analysis and thus forcing us to relax the assumption. Nonetheless, this would be an interesting dimension of future analysis. It would control for potential child treatment discrepancies between biological parents and step-parents or live-in partners. Mistreatment of children by the step-parent or mother's partner, often termed the Cinderella or Cruel Step-Parent effect, is supported with evidence in the contemporary social-psychology literature (Daly and Wilson, 1998).

In analyzing child development in a developed country such as the U.S., we conjecture that it may be valuable to assess an alternate measure of progress. Duncan Thomas used child height, a variable with broader application, to assess both developed and developing countries. In less-developed countries, limited access to health care and a lack of nutritional standards have made height a conventional indicator of health. Dealing solely with a United States data sample affords the exploration of various varying measures of child progress and development. Diverging from anthropomorphic standards, youth educational attainment provides a different perspective. The youth's highest-grade-completed, collected in the NLSY97 in Round 9 (2005) permits the use of an alternative dependent variable by which to observe the effects of individual parental resources. Of course, with our sample of ages 20 to 26, some may still be completing their education; thus, it is necessary to address the youth's highest grade completed with respect to the age and the *expected* educational level at the respective age. Observing the degree to which the youth's personal educational achievements are affected by child gender preference in the household would provide an insightful addition to our current research.

Another extension of our research lies in the observation of less-developed countries. As previously stated, Duncan Thomas also examined data samples from Ghana and Brazil. An interesting facet of his research was his inclusion of the socioeconomic and cultural factors in the respective countries studied. By expanding future research to include a diverse country base, we would like to consider countries where microfinance practices have taken hold. Microfinance plays a significant role in the development of many African, Asian and Latin American nations. By putting capital in the hands of the economically disadvantaged, microfinance initiatives may level the playing field and lead to a convergence of child health outcomes in developed and developing countries.

VII. Conclusion and Closing Thoughts

Upon examining our preliminary evidence, we were prepared to definitively suggest that parents invest different amounts of resources in their children. It seemed that the human capital of the child was positively impacted by the human capital of the parent of the same gender. Specifically, we observed that the education of the parent affected child health outcomes. Mothers appeared to devote more resources to their daughters, and fathers seemed to allocate more to their sons. At the parent's highest observed level of human capital, namely college completion, both sons and daughters benefited. As our paper updated Duncan Thomas's 1994 findings, it was certainly informative to find that many of his conclusions held, despite a change in generations.

The inclusion of household fixed effects challenged many of the previously stated conclusions. The claim that mothers favor daughters and fathers favor sons was undermined by the results suggesting otherwise. The contrasting findings did not negate our preliminary speculations; rather, they encouraged a more thorough investigation of the underlying differences between Thomas's research and our own. Particularly, it forced us to contemplate the possibility that individual parental education is no longer a good measure of bargaining power in the household. The markedly small sample sizes disable us from valuing the fixed effects results over our initial estimates. The absence of significant discrepancies in the wellbeing of boys and girls does not imply that child gender has no impact on family life and parental behavior in wealthy, industrialized societies (Dahl and Moretti, 2004). Gender disparity may still exist in the U.S., in even subtler forms. Thus, more novel approaches from the economic perspective will be required to monitor and detect it. While our research focused on an objective measure of child welfare (e.g., height), a growing body of literature looks into the subjective measures of the gender gap. The findings indicate that female happiness, since the late 1970s, has been declining relative to male happiness. The measures of subjective well-being provide an alternative perspective and reveal that a new gender gap has emerged (Wolfers and Stevenson, 2007).

Most contemporary and popular media sources report increasing numbers of women pursuing higher education and entering the workforce. This is currently epitomized by a female successfully campaigning for the Democratic Presidential nomination. It would appear that the playing field, both academically and professionally, is leveling and that America's future is "gender-neutral". Many of the findings, as we have discovered, depend on the measures and processes of investigation. Because gender inequity is still a present-day concern, it is an issue that will require continuous and sophisticated study.

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Appendix

Table A1: Definition of Explanatory and Dependent Variables

Variable	*Symbol*	*Coding*	*Round*	*Survey Year*
Independent				
Gender	d1, d2	Dummy variable for gender of the youth (d1 = male; d2 = female)	1	1997
Youth Age	A_i	Age as of interview date, in years	9	2005
Youth Age, Squared	A_i^2	Age as of interview date, in years; squared	9	2005
Black Youth	B	Dummy variable for race, black	1	1997
"Other" Youth[1]	O	Dummy variable for race, "other"	1	1997
Youth Age * Black Race Dummy	A_iB	Child age multiplied by race	9	2005
Youth Age * "Other" Race Dummy[1]	A_iO	Child age multiplied by race	9	2005
Biological Mother's Height	H_m	Biological mother's height, in feet	1	1997
Biological Father's Height	H_f	Biological father's height, in feet	1	1997
Gross Family Income	I	Gross family income in the previous year	9	2005
Highest Grade Completed by Residential Mother	E_f	Highest grade completed by residential mother	1	1997
Highest Grade Completed by Residential Father	E_m	Highest grade completed by residential father	1	1997
Highest Grade Completed by Residential Mother, Squared	E_m^2	Highest grade completed by residential mother; squared	1	1997
Highest Grade Completed by Residential Father, Squared	E_f^2	Highest grade completed by residential father; squared	1	1997
High School Completion Dummy, Residential Mother	$E_{m;hs}$	Completion of 12 to less than 16 years of schooling	1	1997
High School Completion Dummy, Residential Father	$E_{f;hs}$	Completion of 12 to less than 16 years of schooling	1	1997
College Completion Dummy, Residential Mother[2]	$E_{m;c}$	Completion of 4 or more years of college	1	1997
College Completion Dummy, Residential Father[2]	$E_{f;c}$	Completion of 4 or more years of college	1	1997
Dependent				
Youth Height (pooled)	Y_i	Height of child, in feet (pooled)	9	2005

Note:

(1) "Other" race group defined as American Indian, Eskimo, Aleut, and Asian or Pacific Islander (n = 244)

Table A2: Representation of Data Cuts

From First and Second Round Regressions

Variable	*Symbol*	*Original Sample*	*Cuts* [3]	*Available*	*Balance* [4]
					n = 8984
Independent					
Gender	d1, d2	8984	0	8984	
Youth Age	A_i	8984	1712	7272	7272
Youth Age, Squared	A_i^2	8984	---	7272	7272
Black Youth	B	8984	6596	2388	7214
"Other" Youth[1]	O	8984	7700	1284	7214
Youth Age * Black Race Dummy	A_iB	8984	---	2388	7214
Youth Age * "Other" Race Dummy[1]	A_iO	8984	---	1284	7214
Biological Mother's Height	H_m	8984	1855	7129	5798
Biological Father's Height	H_f	8984	4407	4577	3355
Gross Family Income	I	8984	2990	5994	2770
Highest Grade Completed by Residential Mother	E_f	8984	979	8005	2557
Highest Grade Completed by Residential Father	E_m	8984	3280	5704	1816
Highest Grade Completed by Residential Mother, Squared	E_m^2	8984	---	8005	1816
Highest Grade Completed by Residential Father, Squared	E_f^2	8984	---	5704	1816
High School Completion Dummy, Residential Mother	$E_{m;hs}$	8984	3326	5658	1816
High School Completion Dummy, Residential Father	$E_{f;hs}$	8984	5058	3926	1816
College Completion Dummy, Residential Mother[2]	$E_{m;c}$	8984	7546	1438	1816
College Completion Dummy, Residential Father[2]	$E_{f;c}$	8984	7591	1393	1816
Dependent					
Youth Height (pooled)	Y_i	8984	1868	7116	**1800**

Note:

(1) "Other" race group defined as American Indian, Eskimo, Aleut, and Asian or Pacific Islander (n = 244)

(2) College completion is defined as completion of the fourth year of college.

(3) Coded by the NLSY97 as non-responses, valid skips, refusals to answer, and responses of “don’t know.”

(4) Numbers in the Balance column take into account the net effect of all missing data pieces mentioned in note 3.

Table A3

Effect of Parental Education on Youth Height by Gender: United States (NLSY97: 1997 and 2005 Cross-Sections)

Linear and Squared Education Variables, Pooled and Stratified by Race

Variable	***Females***				***Males***			
	Pooled[2]	White[2]	Black	Other[2]	Pooled[2]	White[2]	Black	Other[2]
Gender	-0.604	-0.729	3.352	-5.915	3.516	3.536	3.216	7.371
	(0.32)	(0.35)	(0.57)	(0.61)	(1.77)*	(1.64)*	(0.51)	(0.97)
Youth Age	0.203	0.191	-0.069	0.714	-0.157	-0.198	0.026	-0.505
	(1.27)	(1.08)	(0.14)	(0.85)	(0.92)	(1.07)	(0.05)	(0.77)
Youth Age, Squared	-0.004	-0.004	0.001	-0.015	0.003	0.004	-0.001	0.011
	(1.18)	(1.01)	(0.14)	(0.85)	(0.94)	(1.09)	(0.09)	(0.81)
Black Youth	0.351	---	---	---	0.490	---	---	---
	(1.16)				(1.03)			
"Other" Youth[1]	0.267	---	---	---	-0.737	---	---	---
	(0.62)				(1.61)			
Youth Age * Black Race Dummy Variable	-0.016	---	---	---	-0.022	---	---	---
	(1.22)				(1.03)			
Youth Age * "Other" Race Dummy Variable[1]	-0.011	---	---	---	0.030	---	---	---
	(0.59)				(1.54)			
Biological Mother's Height	0.392	0.404	0.283	0.387	0.438	0.488	0.367	0.254
	(12.75)***	(12.02)***	(2.86)***	(3.08)***	(11.90)***	(11.91)***	(3.83)***	(2.07)**
Biological Father's Height	0.272	0.305	0.258	0.197	0.345	0.376	0.143	0.510
	(7.62)***	(9.46)***	(2.93)***	(1.97)**	(10.22)***	(11.27)***	(1.65)*	(4.03)***
Gross Family Income	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(0.96)	(1.82)*	(1.26)	(0.10)	(2.02)**	(2.13)**	(0.16)	(0.56)
Highest Grade Completed by Residential Mother	0.013	0.001	-0.027	0.041	-0.041	-0.025	-0.059	-0.072
	(0.63)	(0.04)	(0.35)	(0.60)	(2.19)**	(0.97)	(0.76)	(2.33)**
Highest Grade Completed by Residential Father	-0.039	-0.029	0.004	-0.054	0.004	-0.010	0.006	0.033
	(1.60)	(2.10)**	(0.09)	(0.77)	(0.25)	(0.44)	(0.11)	(1.25)
Highest Grade Completed by Residential Mother, Squared	-0.001	0.000	0.001	-0.001	0.002	0.009	0.003	0.003
	(0.79)	(0.23)	(0.20)	(0.55)	(2.31)**	(1.00)	(0.89)	(2.41)**
Highest Grade Completed by Residential Father, Squared	0.001	0.001	0.000	0.001	0.000	0.000	0.000	-0.002
	(1.78)*	(2.36)**	(0.11)	(0.60)	(0.25)	(0.45)	(0.05)	(1.61)

Note:

(1) "Other" race group defined as American Indian, Eskimo, Aleut, and Asian or Pacific Islander.

(2) Robust standard errors used to correct for heteroskedasticity

(3) * denotes statistical significance at the 10% level; **, the 5% level; ***, the 1% level

Table A4

Effect of Parental Education on Youth Height by Gender: United States (NLSY97: 1997 and 2005 Cross-Sections)

High School and College Education Dummy Variables, Pooled and Stratified by Race

Variable	***Females***				***Males***			
	Pooled	White	Black	Other	Pooled	White	Black	Other
Gender	-0.637	-0.808	3.132	-8.654	3.163	3.307	2.632	6.405
	(0.31)	(0.38)	(0.53)	(0.77)	(1.52)	(1.51)	(0.43)	(0.68)
Youth Age	0.202	0.197	-0.061	0.923	-0.138	-0.190	0.058	-0.395
	(1.14)	(1.08)	(0.12)	(0.93)	(0.77)	(1.00)	(0.11)	(0.48)
Youth Age, Squared	-0.004	-0.004	0.001	-0.020	0.003	0.004	-0.002	0.009
	(1.07)	(1.01)	(0.12)	(0.93)	(0.79)	(1.02)		(0.52)
Black Youth	0.306	---	---	---	0.492	---	---	---
	(1.00)				(1.46)			
"Other" Youth[1]	0.132	---	---	---	-0.779	---	---	---
	(0.31)				(1.9)*			
Youth Age * Black Race Dummy Variable	-0.014	---	---	---	-0.022	---	---	---
	(1.08)				(1.52)			
Youth Age * "Other" Race Dummy Variable[1]	-0.005	---	---	---	0.032	---	---	---
	(0.28)				(1.86)*			
Biological Mother's Height	0.383	0.388	0.284	0.417	0.434	0.486	0.375	0.232
	(11.13)***	(10.66)***	(2.88)***	(2.71)***	(13.08)***	(13.84)***	(3.94)***	(1.73)*
Biological Father's Height	0.258	0.290	0.255	0.205	0.331	0.362	0.136	0.426
	(8.69)***	(8.67)***	(2.89)***	(2.23)**	(11.05)***	(11.45)***	(1.60)	(3.26)***
Gross Family Income	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(0.70)	(1.46)	(1.37)	(0.01)	(1.89)*	(2.19)**	(0.12)	(0.52)
High School Completion by Residential Mother[2]	0.028	0.027	-0.027	0.069	-0.028	-0.022	-0.016	-0.072
	(1.45)	(1.33)	(0.38)	(0.95)	(1.45)	(1.05)	(0.25)	(0.93)
High School Completion by Residential Father[2]	-0.020	-0.006	-0.002	-0.139	0.020	0.016	0.007	0.071
	(1.13)	(0.30)	(0.03)	(1.94)*	(1.08)	(0.82)	(0.11)	(0.92)
College Completion by Residential Mother[3]	-0.013	-0.019	-0.029	0.072	0.019	0.003	0.082	0.077
	(0.64)	(0.88)	(0.42)	(0.69)	(0.91)	(0.15)	(1.18)	(0.78)
College Completion by Residential Father[3]	0.023	0.033	0.047	-0.136	0.005	0.017	0.035	-0.119
	(1.13)	(1.64)*	(0.70)	(1.28)	(0.27)	(0.84)	(0.43)	(1.32)

Note:

(1) "Other" race group defined as American Indian, Eskimo, Aleut, and Asian or Pacific Islander.

(2) High school completion defined as having completed between twelve and fifteen years of education.

(3) College completion defined as having completed four or more years of college.

(4) * denotes statistical significance at the 10% level; **, the 5% level; ***, the 1% level.

Table A5: Summary Statistics of Explanatory and Dependent Variables
Impact of Education on Child Height, Including Household Fixed Effects

Variable	*Symbol*	*Observations*		*Mean*	*Std. Dev.*	*Min.*	*Max.*
		Females	*Males*	*Males*	*Males*	*Males*	*Males*
Two or More Youths in Household							
Independent							
Biological Mother's Height	H_m	341	357	5.37	0.24	4.08	6.00
Gross Family Income	I	341	357	70,938.79	69,261.51	250.00	337,820.00
Highest Grade Completed by Residential Mother	E_f	341	357	13.44	2.82	1	20
Highest Grade Completed by Residential Father	E_m	341	357	13.73	3.13	3	20
Highest Grade Completed by Residential Mother, Squared	E_m^2	341	357	188.48	71.88	1	400
Highest Grade Completed by Residential Father, Squared	E_f^2	341	357	198.39	84.95	9	400
High School Completion Dummy, Residential Mother	$E_{m;hs}$	341	357	0.77	0.42	0	1
High School Completion Dummy, Residential Father	$E_{f;hs}$	341	357	0.69	0.46	0	1
College Completion Dummy, Residential Mother[2]	$E_{m;c}$	341	357	0.28	0.45	0	1
College Completion Dummy, Residential Father[2]	$E_{f;c}$	341	357	0.32	0.47	0	1
Dependent							
Youth Height (pooled)	Y_i	341	357	5.91	0.25	5.25	6.83
Households in Which There is at Least One Son and One Daughter							
Independent							
Biological Mother's Height		193	183	5.37	0.21	4.58	5.83
Gross Family Income		193	183	74,864.13	76,454.00	250.00	337,820.00
Highest Grade Completed by Residential Mother		193	183	13.26	2.94	1	19
Highest Grade Completed by Residential Father		193	183	13.58	3.14	3	20
Highest Grade Completed by Residential Mother, Squared		193	183	184.36	71.55	1	361
Highest Grade Completed by Residential Father, Squared		193	183	194.33	82.06	9	400
High School Completion Dummy, Residential Mother		193	183	0.77	0.43	0	1
High School Completion Dummy, Residential Father		193	183	0.72	0.45	0	1
College Completion Dummy, Residential Mother[2]		193	183	0.28	0.45	0	1
College Completion Dummy, Residential Father[2]		193	183	0.33	0.47	0	1
Dependent							
Youth Height (pooled)	Y_i	193	183	5.91	0.24	5.25	6.50

Note:
(1) "Other" race group defined as American Indian, Eskimo, Aleut, and Asian or Pacific Islander (n = 244)
(2) College completion is defined as completion of the fourth year of college
(3) Summary statistics for females not included as household fixed effects were observed through the interaction between dummy (1) for sons and the explanatory variable

Table A6

Effect of Parental Education on Youth Height by Gender, Including Household Fixed Effects: United States (NLSY97: 1997 and 2005 Cross-Sections)

Linear and Squared Education Variables, Pooled and Stratified by Race

	Pooled			***Whites***			***Blacks***			***Others*** [1]		
		Fixed Effects			Fixed Effects			Fixed Effects			Fixed Effects	
Interaction Between Dummy (1) for Son and	OLS[4]	2+ Youth HH	If Boy and Girl	OLS[4]	2+ Youth HH	If Boy and Girl	OLS[4]	2+ Youth HH	If Boy and Girl	OLS[4]	2+ Youth HH	If Boy and Girl
Highest Grade Completed by Residential Mother	-0.054	0.013	-0.013	-0.026	0.010	0.011	-0.032	0.192	0.026	-0.113	-0.058	-0.114
	(3.83)**	(0.50)	(0.41)	(0.71)	(0.33)	(0.33)	(0.08)	(1.56)	(0.19)	(2.30)	(0.73)	(0.92)
Highest Grade Completed by Residential Father	0.043	-0.022	0.014	0.019	-0.024	-0.014	0.002	-0.219	-0.035	0.087	0.848	0.155
	(2.24)	(0.80)	(0.43)	(0.52)	(0.68)	(0.34)	(0.00)	(2.45)**	(0.26)	(1.34)	(1.31)	(1.46)
Highest Grade Completed by Residential Mother, Squared	0.002	-0.001	0.000	0.009	0.000	-0.001	0.002	-0.007	0.000	0.005	0.002	0.006
	(4.69)**	(0.49)	(0.06)	(0.93)	(0.41)	(0.59)	(0.24)	(1.43)	(0.06)	(2.68)*	0.67	(0.79)
Highest Grade Completed by Residential Father, Squared	-0.002	0.009	0.000	-0.001	0.001	0.001	0.000	0.008	0.003	-0.003	-0.003	-0.007
	(2.69)*	(0.89)	(0.15)	(0.82)	(0.84)	(0.49)	(0.00)	(2.33)**	(0.51)	(1.61)	(1.31)	(1.23)
Sample Size	1800	698	376	1306	553	305	300	72	43	194	73	28

Note:

(1) "Other" race group defined as American Indian, Eskimo, Aleut, and Asian or Pacific Islander.

(2) * denotes statistical significance at the 10% level; **, the 5% level; ***, the 1% level

(3) First column in each block (OLS) is the estimate reported in the third column of each block in Table 2; F-Statistic is reported below the coefficient