

# Sibling Gender and Wage Differences\*

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## Abstract

Family influences on economic performance are investigated. In particular, sibship sex composition is related to hourly wages using data from the National Longitudinal Survey of Youth 1979. The wages of men are increasing in the proportion of siblings who are brothers, but the wages of women are insensitive to sibling gender. Non-wage outcomes are generally unaffected. Contrasts by age structure and demographic group are also presented. The analysis addresses econometric challenges like the endogeneity of fertility and selection into the workforce. In addition, mechanisms such as labor market interactions, human capital investment, and role model effects are documented. A questionnaire on job search indicates a same-gender bias in the use of brothers and sisters in obtaining employment. Developmental and psychological assessments suggest that brothers may be associated with worse childhood home environments and more traditional family attitudes among women. The findings are policy relevant and contribute to an understanding of gender differences and earnings inequality.

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**Keywords:** sibling effects, gender differences, wage equation,  
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## 1 Introduction

In recent decades, women have equalled or surpassed men in education, but the gender gap in wages still favors men. Blau & Kahn (2000) document a slowdown in the convergence of the earnings differential between sexes, and Goldin (2014) notes the growing relevance of residual differences in pay. This persistent disparity has stimulated much research. Economists have assessed the role of flexibility in work hours, choice of college major, and statistical discrimination by employers. Flabbi & Moro (2012) infer from a structural model of job search that preferences for flexible hours considerably influence the wages of women but not unemployment. According to Zafar (2013), women are less sensitive than men to monetary factors when selecting a college major. Gayle & Golan (2012) identify statistical discrimination against women based on the likelihood of leaving the workforce.

Several psychological explanations have also been proposed. Mueller & Plug (2006) examine the relationship of the five basic personality traits with earnings. Agreeableness is seen to have an appreciable impact on gender differences in wages, with men exhibiting greater levels of and returns to antagonism than women. Studies indicate that women tend to be less competitively inclined (Niederle & Vesterlund, 2007) and more risk averse (Eckel & Grossman, 2008).<sup>1</sup> Bertrand *et al.* (2015) illustrate how gender identity can reinforce earnings inequality by discouraging women from outearning their husbands.

Understanding the causes of sex differences is important for designing policies to close the pay gap. Some authors explore a biological basis, whereas others emphasize environmental phenomena related to socialization.<sup>2</sup> The current paper focuses on the role of families. Based on American survey data, we estimate the relationship between sibling gender and wage rates. Brothers are seen to have a positive influence relative to sisters on men, but not women. The potential channels for this effect are also investigated. Gender is shown to be a key factor in labor market interactions among brothers and sisters. Brothers may adversely impact the work attitudes and home environments of women, but not men.

The results contribute to a substantial literature in economics and sociology on sibling influences, much of which is surveyed by Steelman *et al.* (2002). The seminal theory of Becker & Lewis (1973) has motivated several tests of a quantity-quality tradeoff in fertility, including the recent work of Angrist *et al.* (2010). Related studies such as Black *et al.* (2005) distinguish birth order effects from the role of family size.<sup>3</sup> In addition, the association between sibling configuration and intellectual ability has been extensively discussed by psychologists including Zajonc

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<sup>1</sup>The effect of personality on the pay gap between sexes is analyzed by Nyhus & Pons (2012), who find that agreeableness is greater among women and negatively related to earnings and that openness is greater among men and positively related to earnings. Kleijnans (2009) argues that a dislike of competition may induce women to choose occupations like education over careers in business. Lemaster & Strough (2014) observe that risk aversion in financial decisions is increasing in feminine stereotypes and female identification among women.

<sup>2</sup>On the one hand, Gielen *et al.* (2016) identify the impact of testosterone on labor income. On the other, the influence of schoolmates on achievement is examined by Lavy & Schlosser (2011).

<sup>3</sup>Heiland (2009) estimates the impact of older siblings on cognitive maturation during childhood. Lampi & Nordblom (2010) link birth order to concerns about relative income.

(1976). The empirical evidence and theories like the confluence model, the dilution model, and the admixture hypothesis are reviewed by Rodgers *et al.* (2000).

The impact of sibling gender is comparatively less well established. Butcher & Case (1994) observe a positive influence of brothers on the schooling of women, but Hauser & Kuo (1998) find no such relationship. Parish & Willis (1993) suggest that sibling gender may be relevant for human capital investment and economic development. In addition, psychologists have studied how sibling sex constellation might affect interactions with friends and parents as well as activities and interests during childhood (McHale *et al.*, 1999).

Whereas the economic literature on this topic focuses on education, we analyze labor market outcomes. There is little research about the impact of sibling gender on wages, and the current paper addresses this gap. In fact, Butcher & Case (1994) argue that sibling sex composition should plausibly have no direct effect on wages and may be used as an instrument for estimating the effect of schooling on earnings. Some studies of developing countries like Edmonds (2006) relate sibling gender to the work hours of children. By contrast, we examine the wage rate of adults in an advanced economy, and so the mechanisms of sibling influence are likely to differ.

Extending the literature from schooling to wages is appropriate given the convergence of the gender gap in education. Prior studies like Butcher & Case (1994) were motivated by differences in completed schooling between men and women, but this gap has disappeared as documented by Charles & Luoh (2003). Therefore, the importance of sibling gender for educational attainment might be diminished in recent cohorts. Nonetheless, the earnings differential between sexes remains, and an inquiry into wage rates and sibling gender can illuminate family influences.

The analysis entails some econometric complications. One issue is the potential endogeneity of sibship sex composition due to parental preferences regarding the gender of offspring. Specifically, Dahl & Moretti (2008) detect a partiality for boys while Angrist *et al.* (2010) describe a desire for balance between sexes. Couples can exert some control over the gender mix of their progeny by conditioning their decision to have more children on the gender of previous offspring. For example, a family might choose to have a second child if the first is a daughter or to have a third child if the first two are of the same sex. Demand for sons and daughters can vary across households based on parenting styles, social attitudes, and economic status. Therefore, the gender mix of children might be associated with family background variables that influence beliefs, tastes, and skills.

The resulting correlation between sibship sex composition and underlying determinants of earnings can lead to omitted variables bias. This problem is resolved as in Vogl (2013) by using the sex of a next younger sibling as a source of random variation in sibling gender. Given that a couple has another child, the sex of that child is plausibly exogenous, especially when sex selection through ultrasound and abortion is limited. Hence, the presence of a younger brother as opposed to a younger sister provides a natural experiment for identifying the causal effect of siblings as distinct from confounding parental attributes.

Another issue is that the wage rate is observed only for individuals who are employed. An or-

dinary least squares regression on the sample of workers may produce inconsistent estimates of the offered wage equation. This problem is addressed for women by applying a selection correction as in Heckman (1974), where the number of children serves as an instrument that impacts asking wages but not potential earnings. A median regression as in Neal & Johnson (1996) is employed to account for sample selection among men, with nonworkers being assigned wages less than the median.

In addition, we provide novel evidence on the pathways through which families affect economic performance. A potential mechanism involves labor market interactions between relatives. For example, Kramarz & Skans (2014) describe how parents assist young adults in obtaining employment. The current paper examines job search among siblings based on a survey module about the use of social networks.

Other mechanisms operate in the parental home prior to labor market entry. A major determinant of life success is the acquisition of human capital. Dahl & Moretti (2008) find that educational achievement is related to sibling sex composition because child gender has ramifications for marital stability. Pasqua (2005) analyzes the consequences of child gender for schooling investment, and Gugl & Welling (2012) model the impact on time use by parents. In our study, the quality of parental caregiving and the home environment is measured using an assessment tool from the child development literature. Adult outcomes may also be shaped by role model effects. Fernández *et al.* (2004) identify the transmission of preferences from working mothers to sons, and Crouter *et al.* (2007) examine how parents and siblings influence beliefs about gender roles. Our study analyzes data from a questionnaire that evaluates the traditionality of attitudes towards family and work.

The remainder of this paper is organized as follows. Section 2 summarizes data sources and describes sample selection. Section 3 discusses the empirical strategy. Estimation results are presented in section 4. Section 5 concludes and suggests policy implications.

## **2 Data**

A dataset is constructed for estimating models with sibship sex composition as an explanatory variable and labor income as the dependent variable. Specifications are also reported in which the response variables are education, employment, and marital status. A few related samples are used to fit models in which the main regressor is sibling gender and the regressands are measures of job search through siblings, the family environment as a child, and beliefs about gender roles. Basic demographic and family background characteristics are included as covariates.

The data have been derived from the National Longitudinal Survey of Youth 1979 (NLSY79) along with its Child (CH) and Young Adult (YA) supplements. Section 2.1 describes the main estimation sample for the analysis of sibling gender and wage rates. The information on search methods, home environments, and gender stereotypes is documented in sections 2.2, 2.3, and 2.4.

The datasets below are related as follows. The results on job search are based on a subset of

individuals from the main estimation sample. Children born to female members of the main estimation sample are used to study the parental home. Some of these children were later interviewed about gender attitudes.

## 2.1 Sibling Roster and Wage Rates

We start by describing the data used to estimate the coefficient on sibling gender in a wage equation. Men and women are treated separately. The specifications control for important personal characteristics. Non-wage outcomes are also examined.

The NLSY79 comprises 12,686 men and women in the United States who were aged 14 to 22 when initially surveyed. Interviews were conducted annually until 1994 and biennially thereafter. The dataset contains key economic variables like education, earnings, and employment as well as demographic information related to marriage and families. We use the 1993 round of the survey, which contains a special module that elicited information about siblings. Many sibling studies including Kaestner (1997) rely on the 1993 wave of the NLSY79. Valid responses to the questions about the age and sex of each sibling are necessary for inclusion in the analysis. In some households, both an individual and one or more siblings were interviewed. Only children are excluded because the study focuses on the gender of siblings as opposed to the presence of siblings. Moreover, the primary explanatory variable, which is the fraction of siblings who are male, is not properly defined for individuals without a brother or sister.<sup>4</sup>

Both the cross-sectional and supplemental samples of the NLSY79 are used, but not the ancillary sample of military personnel.<sup>5</sup> For participants who worked since the last interview, information is provided on earnings at the current or most recent job. For a worker with multiple jobs, the hourly wage pertains to the employer for which he or she works the most hours. The hourly wage is calculated by the Bureau of Labor Statistics, which administers the survey. The computation is based on the reported pay rate, the time unit of pay, and usual work hours.<sup>6</sup> Individuals who did not work since the last interview as well as workers with non-missing wages are included in the analysis.

Table 1 displays summary statistics for the main estimation sample, which consists of 2,485 men and 2,857 women. Respondents are between 28 and 36 years old, and so have typically left school and started their careers. Many individuals were born during the Baby Boom, and family sizes are large with four to five children on average. In 1993, the federal minimum wage was \$4.25 an hour, and the Consumer Price Index was 40% lower than today. Over four-fifths of participants

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<sup>4</sup>Table A1 in the supplemental appendix presents regression results that include only children, who constitute a comparison group for identifying the effect of having a sibling on earnings and employment. There is only weak evidence of an impact from just one sibling. Additional sisters are associated with significantly lower wages. Having more brothers instead of more sisters raises labor income for men but not for women.

<sup>5</sup>Blacks, hispanics, and disadvantaged whites are overrepresented in the supplemental sample. The results do not change substantially when restricted to the cross-sectional sample, which is nationally representative.

<sup>6</sup>To eliminate implausible values, respondents with an hourly wage less than \$1 or greater than \$100 are dropped, which is a standard practice. For example, Lange (2007) applies the same criterion to wages from the NLSY79. The estimates are similar if such observations are retained.

are high school graduates, but less than a quarter finished college.

The raw data on sibling gender and wage rates are depicted in Figure 1. The numbers of brothers and sisters are related to the fraction of individuals of each sex earning an hourly wage of at least \$10.<sup>7</sup> Men with few sisters earn more than those with few brothers, while men with many brothers earn more than those with many sisters. No analogous pattern is observed for women. Brothers appear to enhance the economic performance of men but not women.

## 2.2 Job Search Questionnaire

In order to illustrate labor market interactions, models relating sibship sex composition to the probability of finding a job through a brother or sister are estimated. We utilize data on job search, which were collected in the 1982 wave of the NLSY79. Individuals ranged in age from 17 to 25 years, and so were largely transitioning between school and work. Respondents who worked in the past year were asked whether a personal contact helped them obtain their current or most recent job. If so, they were questioned about this person's employer and relationship to them.

The analysis sample excludes only children, and siblings not yet born are omitted when computing measures of sibship structure. The individuals used to study search methods belong to the main estimation sample. However, some members of the main estimation sample from the 1993 wave of the survey did not participate in the job search questionnaire from the 1982 wave because they had not been working. These respondents are excluded when estimating job finding through brothers and sisters, but the results are robust to including them in the dataset as individuals who did not find a job through a sibling.

Descriptive statistics on search patterns are presented in Table A2 in the supplemental appendix. About a fifth of workers get a job through a relative, with a sibling being involved in about a fifth of such cases. For men, this sibling is over twice as often a brother as a sister, whereas the reverse holds for women. Relatives are more likely to help an individual obtain a position at their own employer than at another firm.

Figure 2 visualizes the relationship between sibship sex composition and labor market search. The probability of getting a job through a sibling is graphed against the number of siblings of each gender. The evidence suggests an own-gender bias. Individuals with few same-sex siblings are less likely to obtain help from a sibling than those with few opposite-sex siblings, but people with many same-sex siblings have a greater propensity to rely on a sibling than those with many opposite-sex siblings.

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<sup>7</sup>Qualitatively similar results can be obtained for other measures of labor income besides the hourly wage from the primary employer. Robustness was assessed using the level and log of usual weekly earnings at the main job or all jobs as well as the wage and salary income of an individual or household in the past year. Averages of the nonmissing or nonzero values of these variables were computed. Also analyzed were the probabilities of each outcome reaching different thresholds, for example, weekly earnings being at least \$400 or annual income being at least \$20,000.

### 2.3 Home Assessment Instrument

In order to evaluate parental investment, a regression of childrearing variables on sibling gender is performed. A sample is constructed from the NLSY79-CH, which is a biennial survey from 1986 to 2012 of children born to female participants in the NLSY79. We focus on those under 15 years old who have a brother or sister. Individuals aged 15 and over may have left their childhood residence and are not covered by the assessment tool, so the survey does not collect data on their home environment. The family structure variables may change over time with the birth of further offspring.

The quality of caregiving inputs is assessed based on the short form of the Home Observation for Measurement of the Environment (HOME) inventory, which is documented by Caldwell & Bradley (2003). The scores on this instrument combine maternal reports with observer comments. There are four age-appropriate versions: part A (ages 0-2), part B (ages 3-5), part C (ages 6-9), and part D (ages 10-14). The items cover topics such as children's books, educational trips, family meals, time allocation, parental instruction, household chores, disciplinary methods, and physical cleanliness. This tool has been used by many psychologists including Linver *et al.* (2002) to study child development. Some economists like Todd & Wolpin (2007) and Akashi-Ronquest (2009) have employed the HOME inventory in research on human capital formation.

Table A3 in the supplemental appendix outlines the sample of children. The home assessment was conducted every other year between 1986 and 2012 inclusive, with the average individual being interviewed during the 1990's. Children were administered the version of the instrument that corresponded to their age when surveyed. The number of observations is greater than the number of individuals. Since the evaluation was performed in multiple years, the home environment of each person could be observed more than once.

### 2.4 Gender Attitudes Survey

In order to identify role model effects, estimates are computed for specifications with sibling gender as an explanatory variable and gender opinions as dependent variables. We analyze a questionnaire from the NLSY79-YA, which was administered every other year between 1994 and 2012 to respondents in the NLSY79-CH after reaching age 15. Attention is restricted to individuals with a sibling. The survey contains a battery of questions about gender attitudes towards family and work. Respondents are asked whether they agree or disagree with a variety of statements about working wives, traditional roles, and separate spheres for men and women. Farré & Vella (2013) and Rahim (2014) use the survey module on family attitudes to assess gender stereotypes.

The young adults surveyed about family attitudes are largely a subset of the children who participated in the home assessments. While aged less than 15, individuals provided information on the home environment. When 15 or more years old, respondents instead answered questions about family beliefs. Some people were surveyed before but not after turning 15, in which case data are available on the family environment but not gender attitudes. The opposite holds in a few

instances.

Table A4 in the supplemental appendix describes the information from young adults. Individuals were on average surveyed in the 2000's when aged in their early 20's. Men tend to express more restrictive views than women, with about three-tenths of males and two-tenths of females agreeing with traditional gender roles.

### **3 Methods**

This section presents the econometric models, ranging from broad to narrow in scope. Section 3.1 introduces the general specification for the impact of sibship sex composition on wages. The main estimating equation is extended in specific ways to study additional outcomes, moderator variables, and interaction effects. Section 3.2 probes more deeply into the determinants of the explanatory and dependent variables. The endogeneity of sibling gender and selection into wage earning are addressed. Section 3.3 describes precise channels involving job search, role modeling, and child development that may contribute to the overall effect of brothers and sisters on earnings.

#### **3.1 Basic Strategy**

The analysis proceeds in a hierarchical manner. We begin with a baseline regression of pay rates on sibling sex. In order to determine whether the findings are specific to wages, a variety of non-wage outcomes are next examined. More complex specifications are then estimated that distinguish between demographic groups and age structures.

We relate sibship gender composition to labor market outcomes. The study of wage data may be complicated by sample selection. Since individuals work only if the market wage meets or exceeds the reservation wage, the potential earnings of nonworkers are unobserved. A regression on the sample of employed individuals may generate inconsistent estimates of the log wage offer equation. Likewise, consistent estimates of the conditional expectation of offered wages cannot ordinarily be obtained by assigning nonworkers a wage of zero in a least squares regression.

To acknowledge the interrelationship between earnings capacity and market participation, the analysis focuses on joint work-wage outcomes instead of the log wage. In general, the dependent variable  $y$  is an indicator that is equal to one if the respondent worked in the past year and earned an hourly wage no less than a specified threshold and that is otherwise set to zero. Although the subsequent section presents techniques of handling self-selection that accommodate the log wage as the regressand, they rely on additional assumptions involving the relative wages of a jobless person or a variable excluded from the offer equation.

The primary explanatory variable  $s$  is the fraction of siblings who are brothers, but the results are similar when the number of brothers is instead used as the main regressor. By examining the conditional probabilities of reaching various income levels, the influence of the regressors on different parts of the earnings distribution can be identified. For example, a change in the probability of earning a moderate versus low wage can be distinguished from a change in the



probability of earning a high versus moderate wage, although both effects may produce a similar change in the mean wage. A relatively detailed characterization of the wage structure is thereby provided.

As a starting point, the following probit model is estimated separately for men and women by the method of maximum likelihood:

$$y = \mathbb{I}(\gamma s + \Gamma'_x x + \Gamma'_f f + e > 0), \quad (1)$$

where the error term  $e$  is a standard normal random variable, and  $\mathbb{I}$  is an indicator function equal to unity when its argument is true and to zero otherwise. The vector  $x$  contains essential determinants of wages like age and race as well as region and urbanicity, and the vector  $f$  represents family background variables like sibship size, birth order, and parental age and education. The coefficient  $\gamma$  captures the impact of sibling sex composition on the probability of reaching a given earnings level. Standard errors are clustered by family so as to allow for arbitrary heteroscedasticity among observations on the same sibship. The findings do not change if the data are instead analyzed using a logistic regression or linear probability model.

In order to evaluate the scope of the estimated effects, several individual outcomes besides the wage are investigated. The response variable in equation (1) is replaced with indicators for education, employment, and marriage. This extension can help distinguish between underlying mechanisms. If only the wage is affected by sibling gender, then labor market interactions may be especially important. If siblings also influence education, then pre-market factors are relevant too.

The role of sibship sex composition is explored by Butcher & Case (1994), who find that brothers may increase educational attainment among females. In turn, higher levels of education are associated with a decline or delay in marriage and fertility due to the time investment in schooling and the opportunity cost of childbearing (Isen & Stevenson, 2010). Another mechanism involves peer effects on fertility, which are documented by Lyngstad & Prskawetz (2010). A person might learn information from a sibling about raising children or feel social pressure to have a child when a sibling has one. These processes could vary systematically with sibling gender because of a division between men and women in caregiving responsibilities. The impact of siblings on family formation has also been studied in the context of developing societies. According to Vogl (2013), younger sisters hasten marriage due to competition among sisters over the spouses available to a family.

The specification is next expanded to test for a moderating role of demographic variables. The impact of sibling gender is allowed to differ between whites and nonwhites, and members of big sibships are compared to individuals from small families. Let  $d_1$  and  $d_2$  respectively be dummy variables for belonging to the first and second groups. A variant of equation (1) is estimated in which the expression  $\alpha_1 s \times d_1 + \alpha_2 s \times d_2$  is substituted for the term  $\gamma s$ . The parameters  $\alpha_1$  and  $\alpha_2$  designate the distinct effects of siblings on the two categories of individuals.

The relationship of sibling gender to labor market outcomes may vary by race because of economic, social, and cultural factors. According to Holzer (1987), blacks could have trouble

finding employment through social networks because of a lack of qualified personal contacts or employer discrimination against nonwhite references. Hence, siblings might be relatively unhelpful to minorities in job search. Other disparities may originate at home or in school. Black and Hispanic children are more likely than their white counterparts to grow up in a single-parent household (McLanahan & Percheski, 2008). Due to parental absence, siblings and extended family members might assume additional caretaking functions, which could differ by sex. In addition, disadvantaged groups may develop oppositional identities, whereby peers disapprove of behavior conducive to mainstream success (Austen-Smith & Fryer, 2005). While siblings could serve as positive role models in white families, individuals from minority backgrounds may feel discouraged by their brothers and sisters.

Another way to extend the framework is to add an interaction between the age and gender of siblings. Brothers and sisters old enough to work are differentiated from those too young, and siblings near in age to the respondent are contrasted with those farther away. In particular, equation (1) is modified by replacing the term  $\gamma s$  with  $\beta_1 s_1 + \beta_2 s_2$ , where  $s_1$  and  $s_2$  are the respective shares of siblings in the first and second age brackets who are male, and  $\beta_1$  and  $\beta_2$  denote the corresponding impacts of these variables.<sup>8</sup>

### 3.2 Econometric Details

We consider the underlying properties of the regression variables. A specific source of exogenous variation in sibship gender composition is proposed. Explicit assumptions are made regarding employment decisions and selection patterns.

A particular issue is the endogeneity of the main regressor. Parents may desire to have children of a particular gender. Even without the use of sex selection technologies, couples can influence the gender composition of progeny through stopping rules that depend on whether existing offspring are male or female.<sup>9</sup> For example, a family seeking to have a male heir may keep on bearing children until the delivery of a son. Consequently, sibling gender could be correlated with unobserved parental characteristics that are related to preferences and endowments. Yamaguchi (1989) formally explains how the application of stopping rules by gender-biased parents can produce differences in birth order and sibship size between boys and girls.

This matter is handled by letting the primary explanatory variable  $g$  be the gender of the next younger sibling. Conditional on a family having another child, the sex of that child is exogenous, especially in the absence of gender selection.<sup>10</sup> Although fertility decisions are endogenously determined by the preferences of and constraints on families, couples have little control over the

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<sup>8</sup>If an individual has no siblings in a given age bracket, then the fraction of such siblings who are brothers is set equal to zero. Fixed effects for the number of siblings in each age bracket are also included in the specification, thereby controlling for the lack of suitably aged siblings.

<sup>9</sup>The cohorts studied were born during an era when abortion was illegal and fetal ultrasound was relatively uncommon. Therefore, sex selection may have been less practicable during this period than it is today.

<sup>10</sup>Another natural experiment involves twin births. Using the gender of a twin as a source of exogenous variation, we find corroborating evidence of sibling influences on wages, but statistical power is limited due to the rarity of multiple births in the sample.

sex of an additional child, so that people whose next younger sibling is a brother can be compared to those with a sister instead. By contrast, the gender of an older sibling may not be exogenous because parents who choose to give birth again after having a son could differ systematically from those who continue to bear offspring following the arrival of a daughter. Based on the subset of individuals with a younger sibling, the following specification is estimated separately by sex:

$$y = \mathbb{I}(\theta g + \Theta'_x x + u > 0), \quad (2)$$

where  $y$  is a binary measure of earnings,  $x$  comprises basic demographics,  $u$  is a standard normal error term, and  $\mathbb{I}$  denotes the indicator function. The coefficient  $\theta$  reflects a sibling effect. The estimating equation is comparatively parsimonious. Because variables like sibship size and parental education may be endogenous, family background  $f$  is omitted from the list of regressors.<sup>11</sup>

Another point of complication is selection into employment, whereby the wage offer  $w$  is observed only for workers. Suppose that the log wage can be expressed as:

$$\ln(w) = \lambda s + \Lambda'_x x + \Lambda'_f f + \varepsilon. \quad (3)$$

If the error term  $\varepsilon$  is correlated with the decision to participate in the workforce, then selection is non-random. For example, individuals with better earnings opportunities could have a stronger incentive to get a job. Thus, ordinary least squares applied to the subsample of employed persons may generate inconsistent estimates of the key parameter  $\lambda$  along with the other coefficients.

For men, this consideration is taken into account using a median regression under the premise that jobless individuals are negatively selected. A similar procedure is implemented by Lang & Manove (2011) to calculate racial differences in log wages. In particular, nonparticipants are assumed to have wage offers below the conditional median, meaning that the potential earnings of a nonworker should be less than the fiftieth percentile among individuals with similar values of the covariates. Given that over half of individuals are employed, nonworkers can be allocated to the bottom of the wage offer distribution without changing the median. Accordingly, nonemployed persons are assigned a wage of one cent, an extremely low value that is certainly less than the conditional median. Equation (3) is then fit to the male sample by the method of least absolute deviation, which identifies the conditional median by minimizing the sum of absolute residuals. Provided that the error term in the log wage equation is symmetric, an estimate of the conditional expectation function is obtained because the mean of a symmetric distribution coincides with the median.

For women, assumptions about the wage ranking of nonworkers are untenable, and so a Heckman selection model is enlisted. An individual works if and only if  $r \geq 0$ , where  $r$  is given by:

$$r = \delta c + \pi s + \Pi'_x x + \Pi'_f f + \eta. \quad (4)$$

The latent variable  $r$  can be interpreted economically as the difference between the market and reservation wage, and the condition  $r \geq 0$  requires the wage offered by the market to be no less than

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<sup>11</sup>An extension of this approach might be to use the gender of the next younger sibling as an instrument for the fraction of siblings that are brothers. This methodology yields supportive results, but the exclusion restriction imposes a functional form assumption on the relationship of sibling sex composition to labor income.

the reservation level. Assuming that the error term  $\eta$  is joint normally distributed with  $\varepsilon$ , equation (4) is estimated together with (3) by the method of maximum likelihood. Proper identification is achieved from the traditional exclusion restriction that the error term in the log wage equation is independent of the number of children  $c$ . This assumption means that responsibility for children may introduce constraints affecting the asking wage but is not a factor in determining market wage offers. A similar technique is utilized by Fernández & Fogli (2009) to analyze the log wages of married women. Because of the gender division in child care, mothers may be less likely to work outside the home, so that the coefficient  $\delta$  is negative for females, whereas fatherhood may not have such an impact on labor supply.

### 3.3 Causal Pathways

We inquire into the separate processes behind the combined influence of siblings on earnings. Labor market activity is first explored, followed by an analysis of childrearing and socialization.

Family networks in the labor market are studied by associating sibling gender with certain aspects of job search. The dependent variable  $q$  is one of a set of indicators for having gotten a job through a brother, sister, or sibling. In addition, regressions are performed in which the response variable is a dummy for also working at the same employer as this relative. Using a sample of working youth, the following probit model is estimated for each gender:

$$q = \mathbb{I}(\phi s + \Phi'_x x + \Phi'_f f + o > 0), \quad (5)$$

where  $\mathbb{I}$  is an indicator function,  $x$  and  $f$  are covariates, and  $o$  is a standard normal error. The coefficient  $\phi$  represents the effect of sibship sex composition  $s$  on job search methods. Huber-White standard errors with clustering at the family level are computed. To evaluate selection into employment, the data were reanalyzed including nonworkers with a zero value of the dependent variable, and similar results were obtained.

We next identify the impact of sibling gender on caregiving inputs as measured particularly by parenting assessments. The regressand is the standardized total score  $h_t$  on the HOME inventory in year  $t$ . A sample of children of similar age and sex is used to fit the equation:

$$h_t = \psi s_t + \Psi'_x x_t + \Psi'_f f_t + \omega_t, \quad (6)$$

where  $s_t$  is sibship sex composition,  $\psi$  is its partial effect, and  $\omega_t$  is a stochastic error. The vectors  $x_t$  and  $f_t$  contain demographic and background characteristics. The regressors can vary by year  $t$  because of processes like aging and childbirth.

Role model effects are specifically examined through the relationship between sibling gender and family attitudes. The response variable  $b_t$  is an indicator for holding a particular opinion about gender roles. Using a sample of young adults, the following specification is estimated by probit regression:

$$b_t = \mathbb{I}(\xi s_t + \Xi'_x x_t + \Xi'_f f_t + v_t > 0), \quad (7)$$

where  $v_t$  is a random error. The parameter  $\xi$  reflects the effect of brothers and sisters on beliefs.

Cluster-robust standard errors are employed so as to account for a correlation among observations on the same family over time.

## **4 Results**

Section 4.1 characterizes the impact of sibship sex composition on labor market outcomes, and section 4.2 elucidates the channels whereby such an effect might operate.

### **4.1 Analysis of Outcomes**

The relationship between sibling gender and wage rates is formally presented in Table 2, which empirically implements equation (1). To facilitate interpretation, marginal effects are displayed, which are the average derivatives of the probability of an outcome with respect to the explanatory variables. For men, the estimated coefficient on male siblings is positive in all cases. The impact of brothers on receiving a wage no less than \$10 is statistically significant at the 1% level. The effect is also large in size, implying that the probability of reaching this earnings threshold would increase by over 7 percentage points if a man with only sisters were to instead have only brothers. No significant effect of sibship sex composition is detected for women, with the point estimates varying in sign. In addition, the equality between men and women in the coefficients on the fraction of siblings male can be rejected at the 5% level of significance when the dependent variable is receipt of an hourly wage no less than \$10 and at the 10% level when the respective outcomes are earning at least \$15 and \$20 hourly. The number of siblings is negatively associated with wages, particularly among women.

Table 3 evaluates the influence of sibling gender on non-wage outcomes. The proportion of siblings who are brothers does not have a significant impact on education, employment, or marriage and fertility. Since hourly wages seem to be uniquely affected, labor market interactions may be especially plausible as a mechanism. The evidence of a negative relationship between sibship size and school completion is consistent with substitution between quality and quantity in childbearing.

The principal finding from the baseline analysis is the positive and highly significant influence of brothers on the probability of men reaching the \$10 earnings threshold. The impacts of sibship sex composition on the other wage outcomes are similar in sign but smaller in magnitude and not as statistically significant. Thus, the effect of brothers may be mainly to increase the probability of men earning at least \$10 but less than \$15 per hour while decreasing their likelihood of having an hourly wage no less than \$5 but below \$10. For the purpose of interpretation, Table A5 in the supplemental appendix reports the most frequent occupations in each pay range. In both of the aforementioned wage intervals, blue-collar workers are prevalent, with construction laborers and transportation operatives being common. As shown in Table A6 in the supplemental appendix, sibling gender does not appear to affect occupational affiliation, as measured by the probabilities of holding white-collar, blue-collar, and service jobs.

These results can be explained in terms of personal networks in the labor market. Brothers may assist men with job search by providing information about better paying jobs in a given occupational group. However, family relations may not enable an individual to advance in the occupational hierarchy because additional qualifications are required for upper level positions. Indeed, sibship sex composition is not seen to be significantly associated with educational attainment. The role of relatives in job finding may be larger for blue-collar workers than in some white-collar fields with relatively formal hiring processes. Based on the job search module from the 1982 administration of the NLSY79, about 5% of operatives and laborers but only 1% of professionals obtain employment with the help of a sibling.

The moderating effect of demographics is examined in Table 4, which estimates the coefficient on sibship sex composition separately by racial group and family size. The favorable influence of brothers on the wages of males is concentrated among whites. Relatedly, several empirical studies including Korenman & Turner (1996) conclude that minorities experience fewer economic gains from the use of personal contacts in job search. A sibship with a high proportion of brothers has a strong positive effect on men when the total number of siblings is also large, being at least 4. This cutoff can be modified slightly without greatly altering the findings. For men, the equality between races in the coefficients on male siblings can be rejected at the 5% significance level when the wage threshold is \$15 hourly, and the difference by sibship size in the impacts of brothers on hourly earnings of at least \$20 is significant at the 5% level. There is little discernable relationship between sibling gender and wage rates among females.

Table 5 documents the role of age structure. The minimum working age is defined as 14 years based on the Fair Labor Standards Act. Siblings with an age gap of no more than 2 years are categorized as being close in age. Small adjustments to these criteria do not change the overall results. The earnings of women are generally unaffected by the sexes of their siblings. By contrast, men experience substantial wage gains from brothers of working age. This detail is suggestive of family networks in the labor market. In addition, the wages of men exhibit an especially strong connection with the genders of siblings close in age to them. Similarly aged siblings might have more opportunities to interact at home or in school.<sup>12</sup>

In order to circumvent the endogeneity problem, the gender of the next younger sibling is used as the main regressor in equation (2), estimates for which are displayed in Table 6.<sup>13</sup> As in the baseline specification, women are unresponsive to sibling gender, while brothers elevate the earnings of men. The effect of a younger brother on a male achieving hourly earnings of \$20 is statistically significant at the 1% level. In terms of magnitude, the probability of a man attaining this status rises by about 4 percentage points when his next younger sibling is a brother as opposed

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<sup>12</sup>A model was also estimated that distinguishes between a person's younger and older siblings. The sex compositions of one's younger and older siblings do not enter with significantly different coefficients. The observed sibling influences can be attributed primarily to closely spaced individuals, who may be too similar in age to have disparate effects.

<sup>13</sup>More precisely, the explanatory variable is the fraction of siblings from the next pregnancy who are male. The findings are insensitive to the exclusion of individuals who are twins or whose next born siblings are twins.

to a sister. The differences between sexes in the coefficients on the gender of the next younger sibling are respectively significant at the 5% and 10% levels for hourly earnings thresholds of \$20 and \$15.

Table 7 accounts for selection into employment. In a wage-level or log-wage regression on the subsample of workers, the effect of brothers is inconsequential for women but advantageous for men. Applying a median regression to fit specification (3) for men, the coefficient on the fraction of siblings male continues to be significantly positive. Having all brothers instead of all sisters is associated with a wage gain for men of approximately 10% or \$1. Estimates of equation (4) indicate that participation by women in the workforce decreases with the number of children. No significant impact of brothers on the earnings of women is uncovered by the Heckman selection model.

We can compare and contrast our findings with those of Butcher & Case (1994). For men, there is no discrepancy since our analysis like theirs shows no significant association between sibling gender and schooling levels. Although we find that brothers are positively related to male wages, those authors simply do not examine the income of men because their emphasis is on educational mechanisms. For women, they detect a negative impact of having a sister on schooling, although Hauser & Kuo (1998) fail to confirm this result. In addition, Butcher & Case (1994) argue that the presence of a sister might serve as an instrumental variable for identifying the effect of education on female earnings. By contrast, we find no significant effect of sibship sex composition on the schooling or earnings of women.

Our results may differ from those in Butcher & Case (1994) because we focus on more recent birth cohorts. In fact, those authors note that the effect of sibling gender on educational progress is weaker among younger women in their study. Their estimates are based on people with birth years ranging from the early 1920's to the early 1960's, whereas our main estimation sample comprises individuals born in the late 1950's and early 1960's. A major change across cohorts is that the gender gap in education has closed or reversed, which might be explained in terms of cultural shifts, contraceptive access, and antidiscrimination policies along with sex differences in noncognitive skills (Goldin *et al.*, 2006). For most of the period studied by Butcher & Case (1994), men completed more years of schooling on average than women, although parity between genders was gradually achieved. Our sample exhibits a small but statistically significant difference in the opposite direction.

In light of the evolving pattern of gender differences, the presence of a sister may have ceased to be a disadvantage for women. McHale *et al.* (1999) describe how older siblings act as role models for younger siblings. As women increasingly outperformed men in school, sisters may have come to serve as examples that encourage academic achievement. Behrman *et al.* (1982) analyze parental aversion to inequality among children. If families sought to suppress differences in schooling among siblings, then investment in education might have been higher for a child with a brother when men tended to get more schooling than women, but the opposite could have applied once women surpassed men. In a study of the United States in 1920, Manacorda (2006) reasons

that working children may have raised school attendance among their siblings by supplementing family income. Since boys were more likely to work than girls, male children could have supported the education of siblings, but this effect might have diminished as child labor declined due to legal and economic factors.

In addition, there are several ways in which having brothers may not be beneficial to women. Since behavior and conduct disorders are more common among boys than girls (Bertrand & Pan, 2013), families with a male child may experience elevated stress and tension. Given the finding in section 2.4 that men are more likely than women to believe in conventional gender divisions, girls who socialize with a brother may be dissuaded from pursuing careers. Insofar as men and women are systematically employed in different occupations (Blau *et al.*, 1998), brothers may be less useful than sisters to women who are looking for work.

## 4.2 Exploration of Mechanisms

Social networks are extensively involved in the matching of workers to firms. According to the studies surveyed by Montgomery (1991), about one- to two-thirds of jobs are obtained through a personal contact. The seminal research of Granovetter (1973) focuses on weak ties like acquaintances, who may provide sources of novel information as well as opportunities for career advancement. Recent work such as Kramarz & Skans (2014) reemphasizes the importance of strong ties like relatives, who may be especially helpful in securing employment because of nepotism, homophily, and trust. Interactions among siblings are investigated in what follows.

The role of sibship sex composition in labor market search is analyzed in Table 8, which reports marginal effects from estimating expression (5). A greater preponderance of male over female siblings increases the use of brothers by men in job search while reducing reliance on sisters, with the former effect outweighing the latter. Women with more brothers relative to sisters are less inclined to find employment through a sister or a sibling in general, but the likelihood of receiving assistance from a brother is not substantially higher. Male siblings do not seem to be as helpful to women as to men in the labor market. One can reject at the 1% level of significance the equality between genders in the effects of male siblings on the probabilities of getting a job through a brother, sister, or sibling. The results are comparable when the dependent variable is the probability of both getting a job through and having the same employer as a sibling.

Sibling gender influences the probability of men finding jobs through brothers, and a corresponding impact is found on male wages. However, employment is not significantly affected, which can be explained in several ways. As noted by Meghir & Phillips (2010), participation by men in the labor market is almost perfectly inelastic with respect to the wage. Despite brothers raising the wages offered to men, employment rates may change little in response. Furthermore, Mortensen (1986) explains that a rise in the arrival rate of employment opportunities has an ambiguous effect on the duration of unemployment spells. Even if male siblings increase the frequency of job offers, reservation wages may rise, causing individuals to become more selective in



accepting a position.

Another hypothesis is that job search is less productive for the unemployed than the employed (Blau & Robins, 1990). Reasons might include the depreciation of skills, a lack of work ethic, or stigmatization by employers. Hence, jobless individuals may not be well positioned to avail themselves of employment assistance from a sibling, although a person who is already working may be helped by a sibling to find a higher paying job. In addition, the labor force statuses of personal contacts are positively related (Calvò-Armengol & Jackson, 2004). People on the margin between employment and joblessness may be unable to obtain a job through a sibling because members of their social network are likely to be out of work.

The prevalence and effectiveness of job search through personal networks may vary across demographic groups. The tabulations in Bortnick & Ports (1992) indicate a lower use of friends and relatives among unemployed women than men as well as a smaller likelihood of finding employment conditional on their use. Moreover, we find that men take advantage of additional brothers in obtaining employment, whereas women do not. This disparity might be a consequence of the lower workforce attachment of women, which impairs the accumulation of human capital (Mincer & Polachek, 1974). Even with access to networks of referrals, women may be disadvantaged in the hiring process due to gaps in work history.

A related phenomenon is occupational segregation, whereby women are disproportionately employed in some fields while being underrepresented in others. These imbalances may stem from the deterioration of skills because of labor force interruptions due to childrearing, a preference for workplaces with flexibility and proximity to home, and discrimination by firms (Blau *et al.*, 1998). Some analysts like Drentea (1998) argue that sex segregation in the labor market is reinforced by women receiving information through social circles that largely contain other women. Our results reveal that even a woman who has high exposure to male contacts in the form of brothers makes little use of them in job finding. The low utilization of male relatives by female searchers might reflect gender differences in tastes for jobs or unequal treatment by employers and referrers.

The data show considerable evidence of occupational segregation, which may contribute to a gender asymmetry in search networks. Table A7 in the supplemental appendix describes the sex composition of jobs held by men and women. The average individual is employed in an occupation where over two thirds of workers are of the same gender as he or she. A same-sex bias remains for jobs obtained through a sibling but is lower when an opposite-sex sibling helps a person find employment. Table A8 in the supplemental appendix relates the gender compositions of one's occupation and sibship. No significant association between the variables is detected for men or women, which suggests that brothers and sisters do little to aggravate or alleviate occupational segregation.

A fundamental question in education policy is the importance of homes relative to schools in determining economic success. The pioneering work of Coleman (1996) uncovers a powerful impact of family background on educational achievement. Moreover, the literature on human capital identifies childhood as a critical period for skill acquisition (Cunha & Heckman, 2007).

Given their presence in the parental household early in the life of a person, siblings may influence the process through which a family invests in a child. The connection between sibling gender and completed schooling is studied by Butcher & Case (1994). We assess the home setting as a mechanism behind such a relationship.

Table 9 investigates parental investment in children by estimating equation (6). Brothers are seen to have an adverse impact on the home environment of girls, particularly during middle childhood.<sup>14</sup> This detriment might contribute to the absence of a positive effect of brothers on the wages of women. For boys, the influence of sibship sex composition on household surroundings is insignificant at every phase of development.<sup>15</sup>

As explained by Butcher & Case (1994), an effect of brothers and sisters on the upbringing of a child might be attributed to the preferences and constraints of couples as well as interactions among offspring. If parents are biased towards sons (Dahl & Moretti, 2008), then a girl with a brother may be relatively deprived because of an intrafamily allocation of resources that favors male progeny. In addition, childrearing might be costlier when offspring are of different genders due to less sharing of material inputs like clothes, rooms, and playthings (Rosenzweig & Wolpin, 2000). Another issue is the greater incidence of behavioral problems among boys (Bertrand & Pan, 2013), which may increase stress and disorder in households with a son.

Gender is a key dimension of the psychological concept of identity, which refers to how people construe themselves. Akerlof & Kranton (2000) develop a formal model of self-image in which the utility of an individual depends on whether an action conforms with the prescribed behavior for a social category. By determining appropriate activities for men and women, traditional notions of identity might give rise to gender disparities in the labor market. Fernández *et al.* (2004) suggest that the labor force status of mothers influences the attitudes of sons towards the roles of husbands and wives. Siblings may also be involved in the formation of identity.

Role model effects are evaluated in Table 10, which contains estimated marginal effects for equation (7). Women with predominantly male siblings tend to have family attitudes that are relatively conservative towards wives. This effect is significant with regard to beliefs about men sharing housework, working wives feeling more useful, and women being happier in traditional roles.<sup>16</sup> Such a sentiment may not be conducive to female success in the workforce. Gender norms among men are apparently unresponsive to sibship sex composition.

Child psychologists, including McHale *et al.* (1999), have hypothesized about how siblings figure in the socialization of children into sex roles. Interactions with brothers might induce a girl either to adopt masculine traits because of imitative learning or to intensify feminine qualities so as to distinguish herself from the other children in her family. As noted in section 2.4, men

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<sup>14</sup>The total score on the HOME inventory combines the cognitive stimulation and emotional support subscores, both of which for girls appear to be negatively affected by male siblings.

<sup>15</sup>To probe the factors behind aggregate scores, we examined the association of sibling gender with specific parenting behaviors related to breastfeeding, discipline, extracurriculars, meals, trips, and other items. These results are available on request from the authors.

<sup>16</sup>The survey also elicited information about the intensity of attitudes on a four-point Likert scale. Fitting an ordinal probit model to the data yields a qualitatively similar and marginally significant result.

express less egalitarian opinions about gender than women. Accordingly, females growing up in largely male sibships may develop less progressive views on family matters. In addition, Carli (2001) reviews evidence suggesting that men are more influential in social networks while women are more influenceable. Correspondingly, brothers seem to affect the beliefs of women, whereas sisters are not associated with more liberal perspectives among men.

## 5 Conclusion

The relationship between sibling gender and hourly wages was examined so as to delineate the impact of families on labor market outcomes. The earnings of men but not women are rising in the fraction of siblings that are male. The results are robust to adjustments for the endogeneity of fertility and selection into working. Data on home environments, gender attitudes, and job search were analyzed to illuminate the potential mechanisms behind such effects.

The results are pertinent to the debate over how nature and nurture contribute to economic success. Biological channels are the focus of some researchers like Gielen *et al.* (2016), who detect a positive impact of fetal testosterone on the wages of men but not women. Culture is emphasized by other investigators like Gneezy *et al.* (2009), who reveal that the relative competitiveness of men and women differs between matriarchal and patriarchal societies. We examine sibship sex composition and its association with the caregiving behavior of parents, the conception of sex roles, and job information networks. Because sibling gender is a measure of social context, its relevance for labor market performance suggests that some disparities may be attributable to the environment instead of being physiologically predetermined.

Complementarities between nature and nurture may also be relevant because external variables can modify the impact of intrinsic differences (Cunha & Heckman, 2007). Consider, for example, the finding that brothers provide less help to women than to men in obtaining employment. This asymmetry may reflect occupational segregation between genders in the labor force, which could be explained to some extent by the biological function of women in childbearing and the concomitant time spent on home production instead of market work. Nonetheless, female involvement in child care and its effect on economic outcomes might depend on social forces like customs regarding gender divisions and on policy factors like rules governing parental leave.

Another debate relates to the significance of pre-market influences from home and school in generating inequality as compared to labor market processes. On the one hand, Dahl & Moretti (2008) observe that boys are more likely to grow up in intact families, and Gemici & Wiswall (2014) analyze the tendency of women to select college majors with lower pay. On the other hand, Gayle & Golan (2012) quantify statistical discrimination by employers with respect to gender. Our study straddles both sides of the issue. Sibling sex is an aspect of family composition, but interactions in the labor market could be an important pathway of family influence. Although brothers elevate earnings among males, non-wage outcomes like education are unaffected.

The analysis suggests a number of mechanisms that might play a part in the gender wage gap.

A relevant question is what changes could policymakers implement to moderate differentials in pay. The parental household is a critical setting for child development, and brothers seem to negatively affect the household environment of girls. A way to help individuals from disadvantaged homes may be early childhood education. In particular, Heckman (2006) notes that preschool interventions like the Perry and Abecedarian programs can produce lasting improvements in human capital. Family structure may also have implications for the welfare of children, and marriage regulations like minimum ages and separation periods can affect the durability of unions. For example, Gruber (2004) argues that laws permitting unilateral divorce instead of requiring mutual consent facilitate the breakup of marriages and may impair the life success of children.

In addition, young women with a preponderance of male siblings appear to express relatively traditional gender stereotypes. A way to counteract this propensity might be to increase the exposure of girls to female role models. In school, teachers and students may provide signals of appropriate behavior. Dee (2007) identifies a positive effect of having a same-sex teacher on a student's test scores and interest in a subject, and Booth & Nolen (2012) show that risk aversion is lower among females in all-girls schools than in coeducational institutions. At home, parents can inculcate beliefs and values in children, so that customary patterns of female labor force participation may be transmitted between generations (Fernández & Fogli, 2009). Policies like expanded access to contraception and abortion, which might raise female labor supply by lowering fertility, could have broader effects through changes in attitudes towards working women.

Significantly, the statistics on job finding display features of an old boy network, whereby women make less use than men of male social connections. This tendency can exacerbate sex segregation in the workforce (Drentea, 1998). Despite the importance of employee referrals in the recruitment process, gender disparities might be mitigated by hiring workers through formal channels like placement agencies, employment fairs, and internet job boards. A contributor to occupational segregation may be the disproportionate role of women in childrearing. Family policies could be designed to promote gender integration, although the effects of such programs may be complex as explained by Olivetti & Petrongolo (2017). Parental leave allowances for fathers as well as mothers might encourage an equitable distribution of caretaking responsibilities, and government subsidies for child care services could increase participation by mothers in the labor market.

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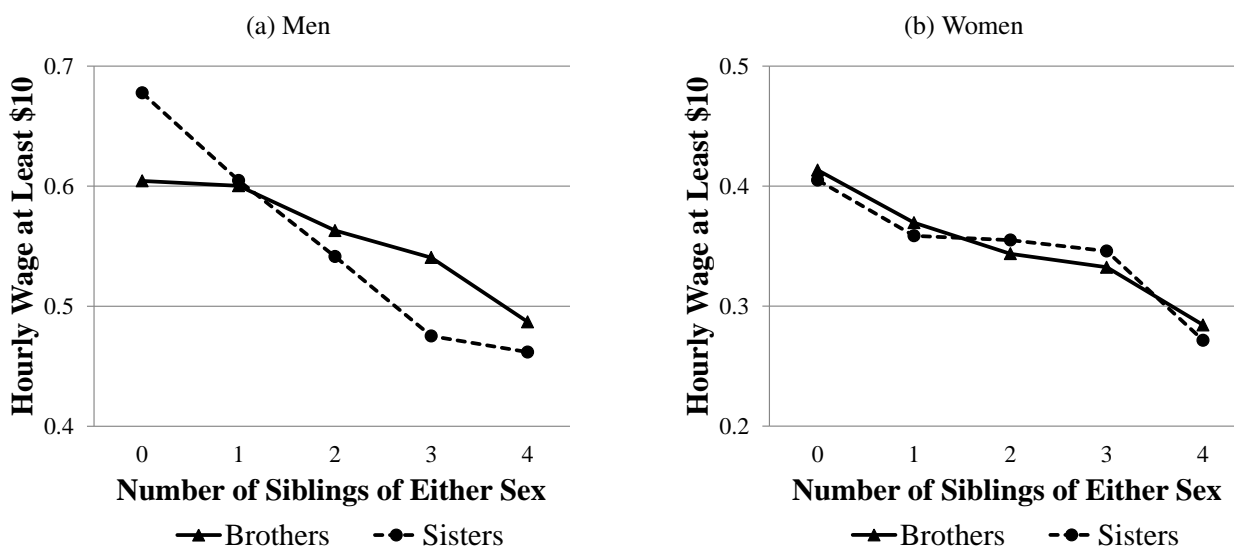


Table 1: Descriptive Statistics for Main Estimation Sample

	Men	Women
<b>Basic Demographics</b>		
Pct. White	59.32	58.42
Pct. South	35.05	37.63
Mean (S.D.) Age	31.72 (2.21)	31.93 (2.25)
<b>Family Background</b>		
Mean (S.D.) Sibship Size	4.551 (2.182)	4.700 (2.255)
Mean (S.D.) Birth Order	2.955 (1.921)	3.030 (1.999)
Pct. Siblings Male	50.73	51.34
<b>Hourly Wage</b>		
Pct. Worked in Past Year	94.21	81.17
Pct. Worked and Wage $\geq$ \$5	90.22	71.68
Pct. Worked and Wage $\geq$ \$10	56.98	35.32
Pct. Worked and Wage $\geq$ \$15	27.61	14.84
Pct. Worked and Wage $\geq$ \$20	12.23	5.57
Pct. Worked and Wage $\geq$ \$25	5.43	2.21
<b>Non-Wage Outcomes</b>		
Pct. High School Diploma	81.38	85.78
Pct. College Degree	24.91	24.11
Pct. Currently Employed	86.68	72.03
Pct. Worked Full Time	90.27	63.10
Pct. Ever Married	69.74	79.38
Pct. Had Child	71.84	72.50
<b>Sample Size</b>		
Individuals	2,485	2,857
Families	2,110	2,454

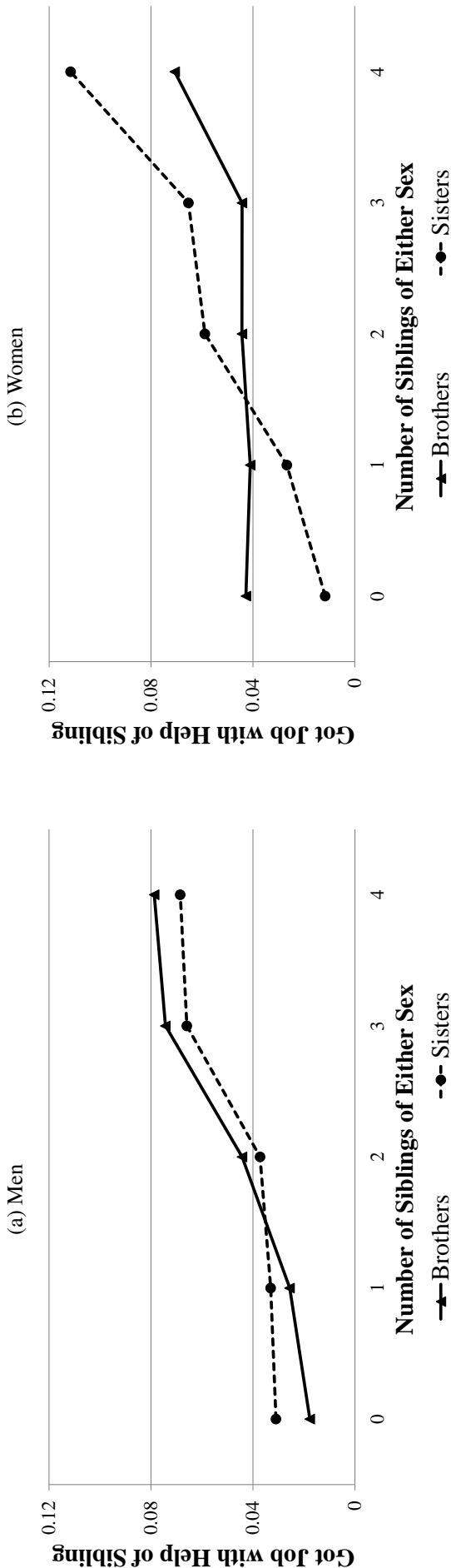
Note: The dataset comprises respondents in the 1993 wave of the NLSY79 with valid information on wages and siblings. Only children are excluded as are members of the military sample. High school and college graduates are those who respectively completed 12 and 16 years of schooling. A full-time employee is one who usually worked 40 or more hours per week while at his or her main job in the past year.

Figure 1: Relationship of Wage to Numbers of Brothers and Sisters



Note: The main estimation sample is used. The proportions of men and women who worked in the past year for a wage no less than \$10 are plotted against the number of siblings of each gender.

Figure 2: Relationship between Number of Siblings of Each Gender and Probability of Finding Job through Sibling



Note: The questionnaire on job search methods from the 1982 round of the NLSY79 is used. The dataset comprises individuals with valid sibling data who worked during the past year. Only children are excluded as are members of the military sample. The proportions of men and women who get a job with the help of a sibling are plotted against the numbers of brothers and sisters.

Table 2: Influence of Sibling Gender on Wages

	Men				Women							
	Worked in Past Year and Hourly Wage at Least		Linear Control for Sibship Size		Worked in Past Year and Hourly Wage at Least		Fixed Effects for Sibship Size					
	\$0	\$5	\$10	\$15	\$20	\$25	\$0	\$5	\$10	\$15	\$20	\$25
Fraction of Siblings Male	.0124 (.0139)	.0229 (.0176)	.0789*** (.0294)	.0328 (.0264)	.0355* (.0189)	.0169 (.0125)	-.0061 (.0240)	.0077 (.0271)	-.0068 (.0273)	-.0240 (.0201)	-.0049 (.0119)	.0019 (.0077)
Number of Siblings	-.0017 (.0029)	-.0017 (.0040)	-.0127* (.0073)	-.0034 (.0072)	-.0045 (.0061)	-.0045 (.0040)	-.0144*** (.0052)	-.0206*** (.0059)	-.0056 (.0062)	-.0024 (.0049)	-.0074** (.0032)	-.0038 (.0024)
Fraction of Siblings Male	.0136 (.0145)	.0242 (.0183)	.0810*** (.0295)	.0338 (.0265)	.0355* (.0189)	.0168 (.0125)	-.0043 (.0238)	.0108 (.0269)	-.0043 (.0273)	-.0233 (.0203)	-.0047 (.0123)	.0021 (.0079)
Number of Siblings			Yes				Yes					
Observations			2,485									2,857

Note: Average marginal effects from probit regressions are presented. The main estimation sample is used. All specifications control for race, region of residence, urban location, dummy variables for age, fixed effects for birth order, and indicator variables for parental age and education. Huber-White standard errors, clustered at the family level, are reported in parentheses. Single, double, and triple asterisks respectively denote statistical significance at the 10 percent, 5 percent, and 1 percent levels.

Table 3: Influence of Sibling Gender on Non-Wage Outcomes

	Men					Women						
	H.S. Diploma	College Degree	Currently Employed	Worked F.T.	Ever Married	Had Child	H.S. Diploma	College Degree	Currently Employed	Worked F.T.	Ever Married	Had Child
Fraction of Siblings Male	-.0051 (.0208)	.0245 (.0248)	-.0049 (.0214)	.0005 (.0260)	.0072 (.0231)	-.0099 (.0259)	-.0235 (.0194)	.0014 (.0249)	.0040 (.0268)	-.0331 (.0297)	.0012 (.0188)	.0106 (.0212)
Number of Siblings	-.0190*** (.0044)	-.0218*** (.0072)	-.0067 (.0049)	-.0049 (.0062)	-.0050 (.0054)	.0180*** (.0068)	-.0069* (.0035)	-.0053 (.0059)	-.0142** (.0060)	-.0108 (.0067)	.0023 (.0039)	.0155*** (.0051)
Fraction of Siblings Male	-.0038 (.0213)	.0260 (.0247)	-.0050 (.0219)	.0010 (.0262)	.0075 (.0233)	-.0099 (.0259)	-.0217 (.0192)	-.0013 (.0248)	.0050 (.0268)	-.0318 (.0298)	.0007 (.0191)	.0066 (.0213)
Number of Siblings			Yes			Yes				Yes		
Observations			2,481									2,853

Note: Average marginal effects from probit regressions are presented. The main estimation sample is used. All specifications control for race, region of residence, urban location, dummy variables for age, fixed effects for birth order, and indicator variables for parental age and education. Huber-White standard errors, clustered at the family level, are reported in parentheses. Single, double, and triple asterisks respectively denote statistical significance at the 10 percent, 5 percent, and 1 percent levels.

Table 4: Influence of Sibling Gender on Wages by Racial Group and Family Size

	Men					Women						
	Worked in Past Year and Hourly Wage at Least					Worked in Past Year and Hourly Wage at Least						
	\$0	\$5	\$10	\$15	\$20	\$25	\$0	\$5	\$10	\$15	\$20	\$25
Fraction of Siblings Male × White	-.0040 (.0192)	.0196 (.0239)	.1043*** (.0364)	.0650** (.0312)	.0323 (.0219)	.0199 (.0148)	-.0226 (.0293)	-.0005 (.0337)	-.0194 (.0335)	-.0268 (.0244)	-.0039 (.0147)	.0047 (.0087)
Fraction of Siblings Male × Nonwhite	.0278 (.0214)	.0290 (.0279)	.0362 (.0507)	-.0468 (.0496)	.0449 (.0370)	.0064 (.0239)	.0278 (.0404)	.0304 (.0450)	.0242 (.0470)	-.0156 (.0361)	-.0069 (.0220)	-.0064 (.0177)
Fraction of Siblings Male × Large Sibship	.0310 (.0215)	.0462* (.0277)	.1317*** (.0479)	.0832* (.0453)	.1129*** (.0345)	.0568** (.0257)	.0240 (.0368)	.0255 (.0413)	-.0213 (.0443)	-.0404 (.0350)	-.0328 (.0223)	-.0043 (.0161)
Fraction of Siblings Male × Small Sibship	-.0031 (.0197)	.0068 (.0242)	.0492 (.0375)	.0062 (.0327)	-.0031 (.0224)	.0014 (.0140)	-.0247 (.0313)	.0003 (.0356)	.0063 (.0347)	-.0136 (.0249)	.0078 (.0149)	.0041 (.0090)
Observations			2,485									2,857

Note: Average marginal effects from probit regressions are presented. The main estimation sample is used. All specifications control for race, region of residence, urban location, dummy variables for age, fixed effects for birth order and sibship size, and indicator variables for parental age and education. A sibship is classified as large or small depending on whether it has more than 3 or less than 4 members. Huber-White standard errors, clustered at the family level, are reported in parentheses. Single, double, and triple asterisks respectively denote statistical significance at the 10 percent, 5 percent, and 1 percent levels.

Table 5: Influence of Sibling Age and Gender on Wages

	Men					Women						
	Worked in Past Year and Hourly Wage at Least					Worked in Past Year and Hourly Wage at Least						
	\$0	\$5	\$10	\$15	\$20	\$25	\$0	\$5	\$10	\$15	\$20	\$25
						Sibling Age Level						
						.0176	-.0009	.0143	.0008	-.0247	-.0043	.0017
Fraction of Working-Age Siblings Male	.0126 (.0157)	.0225 (.0169)	.0790*** (.0284)	.0327 (.0298)	.0361* (.0195)	.0166 (.0236)	-.0009 (.0268)	.0143 (.0268)	.0008 (.0273)	-.0247 (.0202)	-.0043 (.0121)	.0017 (.0078)
Fraction of Other Siblings Male	.0331 (.1061)	.0205 (.0564)	.0170 (.1219)	-.0959 (.1349)	-.1261 (.0962)	-.1583 (.1036)	-.0305 (.0703)	-.0681 (.0838)	-.1300 (.0930)	-.0562 (.0623)	-.0137 (.0356)	.0254 (.0225)
						Sibling Age Difference						
						.0283	-.0342	-.0309	-.0100	.0020	-.0202	-.0136
Fraction of Similar-Age Siblings Male	-.0112 (.0149)	.0113 (.0194)	.0568* (.0344)	.0556* (.0316)	.0783*** (.0241)	.0179 (.0179)	-.0342 (.0254)	-.0309 (.0289)	-.0100 (.0307)	.0020 (.0231)	-.0202 (.0154)	-.0136 (.0117)
Fraction of Other Siblings Male	.0222 (.0141)	.0270 (.0179)	.0460 (.0282)	.0043 (.0252)	.0167 (.0179)	.0091 (.0119)	.0084 (.0224)	.0228 (.0252)	-.0026 (.0257)	-.0226 (.0191)	-.0034 (.0116)	.0010 (.0076)
Observations						2,485						2,857

Note: Average marginal effects from probit regressions are presented. The main estimation sample is used. All specifications control for race, region of residence, urban location, dummy variables for age, fixed effects for birth order and number of siblings in each age group, and indicator variables for parental age and education. A working-age sibling is one who is at least 14 years old. A similar-age sibling is one who is within 2 years of age of the respondent. The fraction of siblings in a given age group who are male is set to zero for individuals with no siblings in that age group, and an indicator variable for such individuals is included in each specification. Huber-White standard errors, clustered at the family level, are reported in parentheses. Single, double, and triple asterisks respectively denote statistical significance at the 10 percent, 5 percent, and 1 percent levels.

Table 6: Impact of Gender of Next Younger Sibling on Wages

	Men					Women						
	Worked in Past Year and Hourly Wage at Least					Worked in Past Year and Hourly Wage at Least						
	\$0	\$5	\$10	\$15	\$20	\$25	\$0	\$5	\$10	\$15	\$20	\$25
						.0160	-.0108	-.0074	-.0053	-.0021	-.0013	-.0012
Next Younger Sibling Male	.0094 (.0113)	.0140 (.0142)	.0238 (.0230)	.0403*** (.0203)	.0385*** (.0148)	.0160 (.0099)	-.0108 (.0172)	-.0074 (.0196)	-.0053 (.0206)	-.0021 (.0150)	-.0013 (.0094)	-.0012 (.0058)
Observations						1,818						2,027

Note: Average marginal effects from probit regressions are presented. The main estimation sample is restricted to respondents who have a next born sibling. For individuals with a twin, the gender of the child from the next pregnancy is the main regressor. If the next pregnancy results in a multiple birth, then the explanatory variable is the proportion of children from that pregnancy who are male. All specifications control for race, region of residence, urban location, and dummy variables for age. Huber-White standard errors, clustered at the family level, are reported in parentheses. Single, double, and triple asterisks respectively denote statistical significance at the 10 percent, 5 percent, and 1 percent levels.

Table 7: Role of Labor Market Participation in Relationship of Wages to Sibling Gender

	Men				Women			
	Worked in Past Year		Worked or Did Not		Worked in Past Year		Worked or Did Not	
	OLS	Log Wage	Median Regression	Log Wage	OLS	Log Wage	Heckman Selection	Log Wage
Fraction of Siblings Male	1.3240** (.5247)	.0816*** (.0317)	.9587** (.4185)	.1015*** (.0382)	.1151 (.4416)	-.0062 (.0371)	.1208 (.4379)	-.0015 (.0393)
Number of Children								
Observations	2,341		2,485		2,319		2,857	

Note: The main estimation sample is used. Results are presented for workers only and for both workers and nonworkers. The wage is expressed in dollars. The Heckman selection models for women are estimated by the method of maximum likelihood with the number of children being the excluded instrument. Reported estimates of the selection equation are average marginal effects. The median regression models for men are estimated by the method of least absolute deviation with nonworkers being assigned a wage of one cent. All specifications control for race, region of residence, urban location, dummy variables for age, fixed effects for birth order and sibship size, and indicator variables for parental age and education. Huber-White standard errors, clustered at the family level, are reported in parentheses. Single, double, and triple asterisks respectively denote statistical significance at the 10 percent, 5 percent, and 1 percent levels.

Table 8: Relationship of Sibling Gender to Probability of Getting Job with Help of Sibling

	Men				Women			
	Had Help Getting Job from		Also Had Same Employer as		Had Help Getting Job from		Also Had Same Employer as	
	Sibling	Sister	Sibling	Sister	Sibling	Sister	Sibling	Sister
Fraction of Siblings Male	.0295** (.0141)	-.0276*** (.0093)	.0264** (.0124)	.0482*** (.0120)	-.0630*** (.0152)	-.0761*** (.0138)	-.0401*** (.0133)	-.0559*** (.0121)
Number of Siblings	.0038 (.0033)	.0018 (.0021)	.0035 (.0029)	.0033 (.0026)	.0057* (.0030)	.0012 (.0017)	.0051** (.0025)	.0012 (.0017)
Fraction of Siblings Male	.0302** (.0146)	-.0320*** (.0106)	.0264** (.0123)	.0477*** (.0119)	-.0650*** (.0154)	-.0779*** (.0140)	-.0418*** (.0134)	-.0581*** (.0125)
Number of Siblings								
Observations			2,209				2,296	

Note: Average marginal effects from probit regressions are presented. The questionnaire on job search methods from the 1982 round of the NLSY79 is used. The dataset comprises individuals with valid sibling data who worked during the past year. Only children are excluded as are members of the military sample. All specifications control for race, region of residence, urban location, dummy variables for age, fixed effects for birth order, and indicator variables for parental age and education. Huber-White standard errors, clustered at the family level, are reported in parentheses. Single, double, and triple asterisks respectively denote statistical significance at the 10 percent, 5 percent, and 1 percent levels.

Table 9: Influence of Sibling Gender on Home Environment

	Boys	Girls
<u>Standardized Total Score on Home Environment Assessment</u>		
<u>Part A: Infant/Toddler</u>		
Fraction of Siblings Male	.0029 (.0397)	-.0240 (.0396)
Observations	2,768	2,657
<u>Part B: Early Childhood</u>		
Fraction of Siblings Male	-.0034 (.0359)	-.0486 (.0368)
Observations	3,890	3,820
<u>Part C: Middle Childhood</u>		
Fraction of Siblings Male	-.0472 (.0343)	-.0936*** (.0362)
Observations	5,934	5,791
<u>Part D: Early Adolescence</u>		
Fraction of Siblings Male	.0059 (.0386)	-.0635* (.0385)
Observations	6,062	6,063

Note: The HOME inventory from the NLSY79-CH is used. The scores for each part are standardized by age and gender. The dataset excludes only children, individuals without sibling data, and the progeny of military sample members. All specifications control for race, region of residence, dummy variables for age and survey year, fixed effects for birth order and sibship size, and indicator variables for maternal age, education, and marital status. Huber-White standard errors, clustered at the family level, are reported in parentheses. Single, double, and triple asterisks respectively denote statistical significance at the 10 percent, 5 percent, and 1 percent levels.

Table 10: Influence of Sibling Gender on Family Attitudes

	Young Men	Young Women
<u>Is Place of Women in Home?</u>		
Fraction of Siblings Male	-.0013 (.0137)	.0042 (.0111)
<u>Does Wife with Family Have No Time for Other Employment?</u>		
Fraction of Siblings Male	-.0100 (.0143)	.0127 (.0115)
<u>Does Working Wife Feel More Useful?</u>		
Fraction of Siblings Male	.0115 (.0192)	-.0380** (.0194)
<u>Does Employment of Wives Lead to Juvenile Delinquency?</u>		
Fraction of Siblings Male	.0098 (.0147)	.0129 (.0121)
<u>Does Inflation Necessitate Employment of Both Parents?</u>		
Fraction of Siblings Male	-.0063 (.0171)	-.0178 (.0169)
<u>Are Traditional Husband and Wife Roles Best?</u>		
Fraction of Siblings Male	-.0288 (.0191)	.0160 (.0165)
<u>Should Men Share Housework?</u>		
Fraction of Siblings Male	.0162 (.0102)	-.0139** (.0069)
<u>Are Women Happier in Traditional Roles?</u>		
Fraction of Siblings Male	.0272 (.0194)	.0384** (.0166)
Observations	4,877	5,190

Note: Average marginal effects from probit regressions are presented. The module on family attitudes from the NLSY79-YA is used. The dependent variable records agreement or disagreement with the specified question. The dataset excludes only children, individuals without sibling data, and the progeny of military sample members. All specifications control for race, region of residence, dummy variables for age and survey year, fixed effects for birth order and sibship size, and indicator variables for maternal age, education, and marital status. Huber-White standard errors, clustered at the family level, are reported in parentheses. Single, double, and triple asterisks respectively denote statistical significance at the 10 percent, 5 percent, and 1 percent levels.