

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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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. Several psychological explanations have also been proposed. Mueller & Plug (2006) examine the relationship of the five basic personality traits with earnings, and studies have demonstrated gender differences in competitive behavior (Niederle & Vesterlund, 2007) and risk preferences (Eckel & Grossman, 2008).¹ Bertrand *et al.* (2015) illustrate how gender identity can reinforce earnings inequality.

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.² 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

¹The effect of personality on the earnings of men and women is analyzed by Nyhus & Pons (2012). Kleinjans (2009) evaluates the impact of gender on competitive tastes and occupational choices, and Lemaster & Strough (2014) detail the influence of gender on risk aversion in financial decisions.

²On 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).

sibling influences.³ The seminal theory of Becker & Lewis (1973) has motivated several tests of a quantity-quality tradeoff in fertility, including recent work by Angrist *et al.* (2010). Related studies such as Black *et al.* (2005) distinguish birth order effects from the role of family size.⁴ In addition, the association between sibling configuration and intellectual ability has been extensively discussed by psychologists including Zajonc (1976).⁵

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

³See Steelman *et al.* (2002) for a review of previous research on sibship structure.

⁴Heiland (2009) estimates the impact of older siblings on cognitive maturation during childhood. Lampi & Nordblom (2010) link birth order to concerns about relative income.

⁵See Rodgers *et al.* (2000) for an overview of empirical evidence as well as theories like the confluence model, the dilution model, and the admixture hypothesis.

this gap has disappeared as documented by Charles & Luoh (2001). 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. Specifically, sibling sex composition may be endogenous as parents can condition their decision to have more children on the gender of previous offspring. This issue is resolved as in Vogl (2013) by using the gender of a next younger sibling as a natural experiment that creates exogenous variation in sibling sex. Furthermore, the wage rate is observed only for workers. The sample selection problem is addressed for women by applying a selection correction as in Heckman (1974) and for men by employing a median regression as in Neal & Johnson (1996).

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.⁶ 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

⁶Pasqua (2005) analyzes the consequences of child gender for schooling investment, and Gugl & Welling (2012) model the impact on time use by parents.

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

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.

2.1 Sibling Roster and Wage Rates

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.⁷ Only children are excluded from the analysis, and valid responses to the questions about the age and sex of each sibling are necessary for inclusion. In some households, both an individual and one or more siblings were interviewed.

Both the cross-sectional and supplemental samples of the NLSY79 are used,

⁷Many sibling studies including Kaestner (1997) rely on the 1993 wave of the NLSY79.

but not the ancillary sample of military personnel.⁸ For participants who worked since the last interview, information is provided on earnings at the current or most recent job.⁹ 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.¹⁰ 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 are high school graduates, but less than a quarter finished college.

2.2 Job Search Questionnaire

In order to illustrate labor market interactions, 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. About a fifth of workers get a job

⁸Blacks, 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.

⁹For a worker with multiple jobs, the hourly wage pertains to the employer for which he or she works the most hours.

¹⁰To 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.

through a relative, with a sibling being involved in about a fifth of such cases. For men, this sibling is three times more likely to be a brother than a sister, whereas the reverse holds for women.

2.3 Home Assessment Instrument

In order to evaluate parental investment, 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 individuals under 15 years old who have a brother or sister. 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.¹¹ 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.¹²

2.4 Gender Attitudes Survey

In order to identify role model effects, 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

¹¹Caldwell & Bradley (2003) provide documentation for the HOME inventory.

¹²Some economists like Todd & Wolpin (2007) and Akashi-Ronquest (2009) have employed the HOME inventory in research on human capital formation.

separate spheres for men and women.¹³

3 Methods

Section 3.1 specifies the main estimating equation as well as some variations, and section 3.2 addresses identification problems like endogeneity and selection. Section 3.3 explains potential channels for the effects.

3.1 Basic Strategy

We relate sibship gender composition to labor market outcomes. 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.¹⁴ The primary explanatory variable s is the fraction of siblings who are brothers.¹⁵

Partial effects are obtained by estimating the following linear probability model separately for men and women:

$$y = \gamma s + \Gamma'_x x + \Gamma'_f f + e, \quad (1)$$

where 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 γ captures the impact of sibling sex composition on the probability of reaching a given earnings level. The error term e is clustered by family so as to allow for arbitrary heteroscedasticity among observations on the same sibship.¹⁶

In order to evaluate the scope of the estimated effects, several outcomes besides

¹³Farré & Vella (2013) and Rahim (2014) use the survey module on family attitudes to assess gender stereotypes.

¹⁴Because the wage offers of nonworkers are unobserved, the analysis focuses on joint work-wage outcomes instead of log wages. The subsequent section presents techniques of handling self-selection that accommodate log wages given additional assumptions.

¹⁵The results are similar when the number of brothers is instead used as the main regressor.

¹⁶The findings do not change if the data are analyzed using a logit or probit regression.

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 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 γs . The parameters α_1 and α_2 designate the distinct effects of siblings on the two categories of individuals.

Another exercise involves examining the 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 γs 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 β_1 and β_2 denote the corresponding impacts of these variables.¹⁷

3.2 Econometric Issues

A potential 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

¹⁷If 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.

rules that depend on whether existing offspring are male or female.¹⁸ For example, a family seeking to have a male heir may continue 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.¹⁹

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.²⁰ Based on the subset of individuals with a younger sibling, the following specification is estimated separately by sex:

$$y = \theta g + \Theta'_x x + u, \quad (2)$$

where y is an earnings measure, x comprises basic demographics, and u is an error term. The coefficient θ 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.²¹

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

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

If the error term ϵ is correlated with the decision to participate in the work force,

¹⁸The 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.

¹⁹Yamaguchi (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.

²⁰Another 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.

²¹An 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.

then selection is non-random. Thus, ordinary least squares applied to the subsample of employed persons may generate inconsistent estimates of the key parameter λ 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.²² In particular, nonparticipants are assumed to have wage offers below the conditional median. 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, and equation (3) is fit to the male sample by the method of least absolute deviation. Provided that the error term in the log wage equation is symmetric, an estimate of the conditional expectation function is obtained.

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 the latent variable r is given by:

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

Assuming that the error term η is joint normally distributed with ϵ , 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 .²³ Because of the gender division in child care, the coefficient δ is likely to be negative among females, whereas fatherhood may not have such an impact on labor supply.

²²Lang & Manove (2011) implement a similar procedure to calculate racial differences in log wages.

²³Fernández & Fogli (2009) utilize a similar technique to analyze the log wages of married women.

3.3 Causal Pathways

Family networks in the labor market are studied by associating sibling gender with 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 linear probability model is estimated for each gender:

$$q = \phi s + \Phi'_x x + \Phi'_f f + o, \quad (5)$$

where x and f are covariates, and o is the error. The coefficient ϕ represents the effect of sibship sex composition s on job search methods.²⁴ Huber-White standard errors with clustering at the family level are computed.

We next identify the impact of sibling gender on caregiving inputs as measured 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, ψ is its partial effect, and ω_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 examined through the relationship between sibling gender and family attitudes. Equation (6) is reestimated on a sample of young adults with the response variable in each year being replaced by an indicator for holding a particular opinion about gender roles. Cluster-robust standard errors are employed so as to account for pure heteroscedasticity as well as correlation among observations

²⁴To evaluate selection into employment, the data were reanalyzed including nonworkers with a zero value of the dependent variable, and similar results were obtained.

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 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 \$10.²⁵ 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.

This result is formally presented in Table 2, which empirically implements equation (1). 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.²⁶ 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 ed-

²⁵Qualitatively similar results can be obtained using other measures of labor income.

²⁶In 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.

ucation, employment, or marriage and fertility. Since hourly wages seem to be uniquely affected, labor market interactions may be especially plausible as a mechanism. The strong evidence of a negative relationship between sibship size and school completion is consistent with substitution between quality and quantity in childbearing.

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.²⁷ The favorable influence of brothers on the wages of males is concentrated among whites.²⁸ A sibship with a high proportion of brothers has a strong positive effect on men when the total number of siblings is also large.²⁹ There is little discernable relationship between sibling gender and wage rates among females.

Table 5 documents the role of age structure. 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.³⁰ 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.³¹ Similarly aged siblings might have more opportunities to interact at home or in school.³²

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 dis-

²⁷For 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.

²⁸Several empirical studies including Korenman & Turner (1996) conclude that minorities experience fewer economic gains from the use of personal contacts in job search.

²⁹A sibship is classified as large if it contains at least 4 members. The results are robust to small changes in this cutoff value.

³⁰The minimum working age is defined as 14 years based on the Fair Labor Standards Act. A minor adjustment to this threshold does not greatly alter the findings.

³¹Siblings with an age gap of no more than 2 years are categorized as being close in age. This grouping can be modified slightly without changing the overall results.

³²A 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.

played in Table 6.³³ As in the baseline specification, women are unresponsive to sibling gender, while brothers elevate the earnings of men.³⁴ 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 to a sister.

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 work force decreases with the number of children. No significant impact of brothers on the earnings of women is uncovered by the Heckman selection model.

4.2 Exploration of Mechanisms

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.

³³More 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.

³⁴The 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.

This pattern is further analyzed in Table 8, which reports estimates of 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 potentially 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.³⁵ 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.

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.³⁶ This disadvantage 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.³⁷

Role model effects are evaluated in Table 10. Women with predominantly male siblings tend to have family attitudes that are relatively conservative towards wives. Statistical power is limited, but this effect is significant with regard to the belief that women are happier in traditional roles.³⁸ Such a sentiment may not be conducive to female success in the work force. Gender norms among men are apparently unresponsive to sibship sex composition.

³⁵One 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.

³⁶The 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.

³⁷To 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.

³⁸The 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. We prefer using a linear model with a dichotomous outcome because the parameters are easily interpretable in terms of the probability of holding a traditional belief.

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 findings are pertinent to policymakers seeking to moderate the gender gap in pay. Because sibling sex composition is a measure of social context, the relevance of this variable suggests that some gender differences may be attributable to environmental factors instead of being biologically predetermined. Therefore, the gap between sexes might be narrowed by changes to schooling, upbringing, and markets. The observed patterns of job finding display features of an old boy network, whereby men make greater use than women of male social connections. Although friends and relatives play a key role in labor markets, the implementation of more formal or neutral hiring practices could mitigate gender disparities. An equitable allocation of family resources for daughters and the presence of working female role models might also contribute to this aim.

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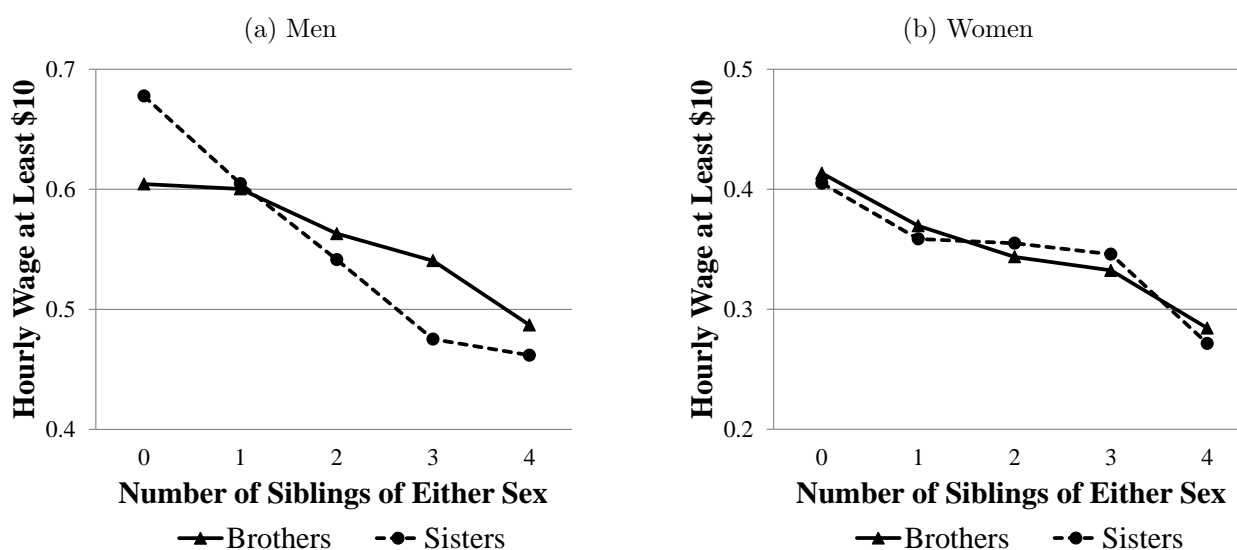
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Table 1: Descriptive Statistics for Main Estimation Sample

	Men	Women
<u>Basic Demographics</u>		
Pct. White	59.32	58.42
Pct. South	35.05	37.63
Mean (S.D.) Age	31.72 (2.21)	31.93 (2.25)
<u>Family Background</u>		
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
<u>Hourly Wage</u>		
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
<u>Non-Wage Outcomes</u>		
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
<u>Sample Size</u>		
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.

Table 2: Influence of Sibling 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
Fraction of Siblings Male	Linear Control for Sibship Size					Linear Control for Sibship Size					
	.0116 (.0123)	.0218 (.0167)	.0785*** (.0294)	.0336 (.0281)	.0376* (.0207)	.0193 (.0151)	-.0055 (.0233)	.0083 (.0262)	-.0075 (.0282)	-.0252 (.0219)	-.0049 (.0146)
Number of Siblings	Fixed Effects for Sibship Size					Fixed Effects for Sibship Size					
	-.0015 (.0036)	-.0026 (.0048)	-.0131* (.0074)	-.0015 (.0065)	-.0040 (.0052)	-.0041 (.0032)	-.0155*** (.0059)	-.0221*** (.0065)	-.0050 (.0060)	-.0017 (.0044)	-.0056** (.0024)
Fraction of Siblings Male	Yes					Yes					
	.0126 (.0131)	.0225 (.0167)	.0804*** (.0295)	.0350 (.0282)	.0380* (.0208)	.0194 (.0152)	-.0033 (.0233)	.0121 (.0263)	-.0056 (.0282)	-.0246 (.0219)	-.0053 (.0147)
Number of Siblings											
Observations	2,485					2,857					

Note: 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					
	Worked					Worked					
	H.S. Diploma	College Degree	Currently Employed	F.T.	Ever Married	Had Child	H.S. Diploma	College Degree	Currently Employed	F.T.	Ever Married
Fraction of Siblings Male	Linear Control for Sibship Size					Linear Control for Sibship Size					
	-.0020 (.0178)	.0243 (.0274)	-.0023 (.0199)	.0006 (.0252)	.0063 (.0224)	-.0245 (.0195)	-.0148 (.0149)	.0029 (.0261)	.0049 (.0262)	-.0334 (.0300)	.0019 (.0185)
Number of Siblings	Fixed Effects for Sibship Size					Fixed Effects for Sibship Size					
	-.0240*** (.0061)	-.0182*** (.0059)	-.0066 (.0057)	-.0049 (.0068)	-.0049 (.0058)	.0108*** (.0041)	-.0083** (.0042)	-.0046 (.0056)	-.0149** (.0065)	-.0107 (.0067)	.0038 (.0043)
Fraction of Siblings Male	Yes					Yes					
	-.0020 (.0178)	.0258 (.0274)	-.0026 (.0200)	.0009 (.0254)	.0060 (.0224)	-.0255 (.0194)	-.0126 (.0150)	.0001 (.0261)	.0064 (.0263)	-.0320 (.0301)	.0014 (.0185)
Number of Siblings											
Observations	2,481					2,853					

Note: 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	\$25	\$0	\$5	\$10	\$15	\$25	
	Different Racial Groups										
Fraction of Siblings Male × White	-.0013 (.0104)	.0125 (.0155)	.1001*** (.0350)	.0724** (.0358)	.0390 (.0270)	.0277 (.0206)	-.0211 (.0282)	-.0009 (.0319)	-.0211 (.0349)	-.0277 (.0283)	-.0034 (.0193)
Fraction of Siblings Male × Nonwhite	.0421 (.0342)	.0436 (.0403)	.0386 (.0547)	-.0443 (.0443)	.0357 (.0306)	.0019 (.0202)	.0296 (.0414)	.0360 (.0462)	.0231 (.0477)	-.0188 (.0338)	-.0060 (.0130)
	Different Family Sizes										
Fraction of Siblings Male × Large Sibship	.0356 (.0252)	.0515* (.0300)	.1314*** (.0488)	.0827* (.0449)	.0997*** (.0326)	.0407* (.0225)	.0239 (.0389)	.0274 (.0432)	-.0208 (.0440)	-.0358 (.0339)	-.0020 (.0108)
Fraction of Siblings Male × Small Sibship	-.0014 (.0142)	.0047 (.0195)	.0491 (.0370)	.0057 (.0363)	.0002 (.0270)	.0064 (.0202)	-.0211 (.0290)	.0020 (.0331)	.0044 (.0367)	-.0172 (.0288)	.0085 (.0146)
Observations	2,485					2,857					

Note: 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	\$25	\$0	\$5	\$10	\$15	\$25	
	Sibling Age Level										
Fraction of Working- Age Siblings Male	.0118 (.0130)	.0215 (.0166)	.0785*** (.0294)	.0340 (.0280)	.0389* (.0206)	.0205 (.0152)	.0001 (.0232)	.0153 (.0262)	.0000 (.0283)	-.0260 (.0218)	-.0051 (.0145)
Fraction of Other Siblings Male	.0308 (.0537)	.0284 (.0778)	.0143 (.1150)	-.0748 (.0913)	-.1007 (.0673)	-.0965* (.0506)	-.0431 (.0901)	-.0770 (.0931)	-.1076 (.0814)	-.0523 (.0673)	.0236 (.0244)
	Sibling Age Difference										
Fraction of Similar- Age Siblings Male	-.0156 (.0183)	.0124 (.0232)	.0495 (.0358)	.0532* (.0305)	.0721*** (.0231)	.0287 (.0178)	-.0371 (.0270)	-.0328 (.0307)	-.0074 (.0315)	.0013 (.0226)	-.0140 (.0080)
Fraction of Other Siblings Male	.0193 (.0131)	.0162 (.0174)	.0276 (.0298)	-.0088 (.0283)	.0035 (.0214)	.0057 (.0159)	.0197 (.0229)	.0234 (.0259)	-.0160 (.0281)	-.0181 (.0218)	-.0055 (.0098)
Observations	2,485					2,857					

Note: 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
Next Younger Sibling Male	.0104 (.0116)	.0145 (.0144)	.0239 (.0232)	.0412** (.0205)	.0390*** (.0148)	.0171* (.0101)	-.0110 (.0176)	-.0055 (.0200)	-.0104 (.0210)	-.0066 (.0154)	-.0027 (.0099)	-.0013 (.0062)
Observations	1,818				2,027							

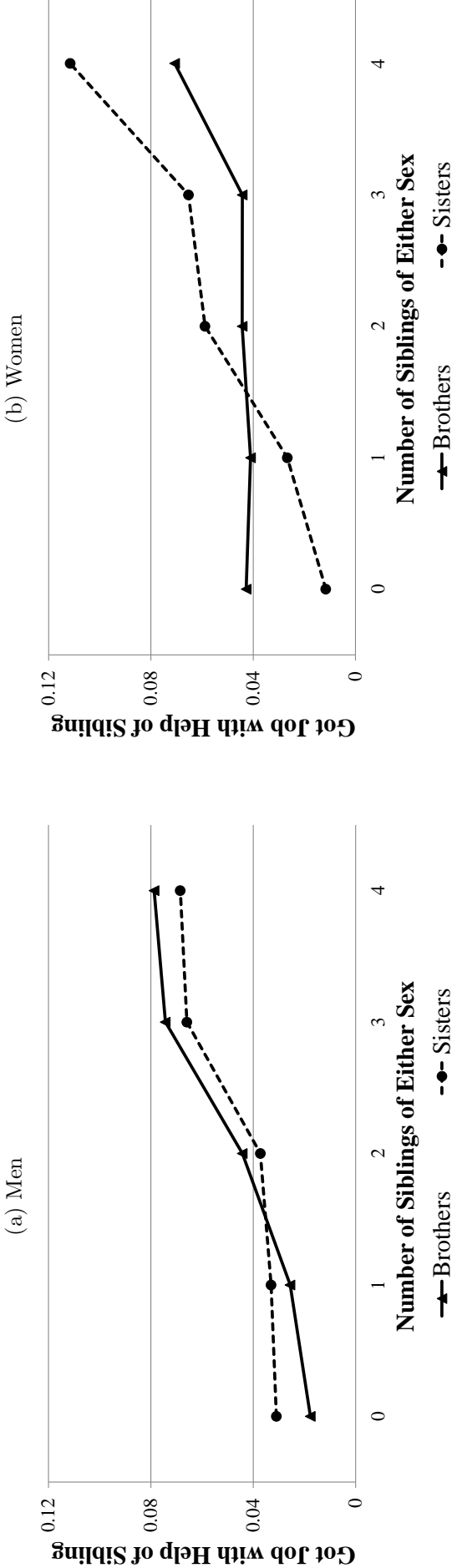
Note: The main estimation sample is restricted to respondents who have a next born sibling. For individuals with a twin, the gender of the child from the next pregnancy is the main regressor. If the next pregnancy results in a multiple birth, then the explanatory variable is the proportion of children 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)	-.0062 (.0885)	-.0015 (.0393)
Number of Children						-.0855*** (.0300)		-.0741*** (.0263)	
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. 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.

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 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	Brother	Sister	Sibling	Sister	Brother	Sister		
Fraction of Siblings Male	.0215*	-.0171***	.0315***	-.0118**	-.0467***	.0072	-.0539***	-.0303***	.0083	-.0386***
Number of Siblings	(.0111)	(.0094)	(.0097)	(.0053)	(.0122)	(.0059)	(.0104)	(.0111)	(.0057)	(.0091)
	.0021	.0017	.0023	.0006	.0058	.0016	.0042	.0054*	.0014	.0041
	(.0038)	(.0034)	(.0017)	(.0014)	(.0038)	(.0022)	(.0031)	(.0033)	(.0021)	(.0025)
	Fixed Effects for Sibship Size									
Fraction of Siblings Male	.0212*	-.0173***	.0314***	-.0117**	-.0484***	.0068	-.0552***	-.0321***	.0075	-.0396***
Number of Siblings	(.0111)	(.0094)	(.0097)	(.0053)	(.0125)	(.0059)	(.0106)	(.0113)	(.0057)	(.0093)
	Yes									
Observations	2,209								2,296	

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. 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

	Men	Women
Standardized Total Score on Home Environment Assessment		
Part A: Infant/Toddler		
Fraction of Siblings Male	.0029 (.0397)	-.0240 (.0396)
Observations	2,768	2,657
Part B: Early Childhood		
Fraction of Siblings Male	-.0034 (.0359)	-.0486 (.0368)
Observations	3,890	3,820
Part C: Middle Childhood		
Fraction of Siblings Male	-.0472 (.0343)	-.0936*** (.0362)
Observations	5,934	5,791
Part D: Early Adolescence		
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

	Men	Women
Is Place of Women in Home?		
Fraction of Siblings Male	-.0003 (.0134)	.0034 (.0110)
Does Wife with Family Have No Time for Other Employment?		
Fraction of Siblings Male	-.0083 (.0138)	.0116 (.0108)
Does Working Wife Feel More Useful?		
Fraction of Siblings Male	.0108 (.0192)	-.0377* (.0195)
Does Employment of Wives Lead to Juvenile Delinquency?		
Fraction of Siblings Male	.0093 (.0142)	.0118 (.0114)
Does Inflation Necessitate Employment of Both Parents?		
Fraction of Siblings Male	-.0057 (.0173)	-.0176 (.0170)
Are Traditional Husband and Wife Roles Best?		
Fraction of Siblings Male	-.0269 (.0187)	.0150 (.0159)
Should Men Share Housework?		
Fraction of Siblings Male	.0160 (.0103)	-.0128* (.0066)
Are Women Happier in Traditional Roles?		
Fraction of Siblings Male	.0264 (.0193)	.0366** (.0162)
Observations	4,877	5,190

Note: 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.