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DISCUSSION PAPER SERIES

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ABSTRACT

Sibling Gender Composition and Women's Wages*

We examine the impact of sibling gender composition on women's adult earnings. Using data from Add Health, we find that women with any brothers earn roughly 10 percent less than women with no brothers in their late 20s and early 30s. This effect is primarily due to lower earnings within broadly defined education and occupation groups. We then explore mechanisms that may explain this result. We do not find strong evidence that differences in parental investment, cognitive ability, self-reported personality traits, or parental expectations drive our results. However, we find that more family-centered behavior (including family responsibilities, being in a committed relationship, and intention to have children) among those with brothers partially explains the result. We then confirm our results with data from the NLSY-CYA.

JEL Classification: J12, J13, J16, J31

Keywords: sibling sex composition, gender gap, gender roles, earnings

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1 Introduction

Despite gains in relative earnings over the past half-century, women continue to earn less than men on both an annual and weekly basis (Blau & Kahn, 2016). The wage gap between men's and women's earnings has persisted even as women have surpassed men in educational attainment and other observable human capital factors. As a result, researchers have begun to examine differences in unobservable characteristics between men and women, noting the role of cognitive differences in particular areas (such as mathematics and science) and gender identity differences [see, e.g., Pope and Sydnor (2010), Alesina, Giuliano, and Nunn (2013), and Bertrand, Kamenica, and Pan (2015)]. Although these factors appear to be important in explaining a portion of the wage gap, there is a limited understanding of their development and, in particular, the role of family environments.

Sibling relationships can be among the most intensive and influential relationships in an individual's life. Siblings spend a large fraction of their time together (McHale & Crouter, 1996), provide social support in childhood and adolescence (Connidis & Campbell, 1995), and often have some of the longest-lasting relationships in life (Cicirelli, 2013). Siblings may also impact parents' relationships with or investment in their other children, as has been shown most notably in the case of a disability or health concern (Breining, 2014; Parman, 2015; Yi, Heckman, Zhang, & Conti, 2015; Black et al., 2017). Based on the intensity and longevity of their relationships, we may expect siblings to influence each other's labor market outcomes. Although most sibling characteristics are strongly correlated with an individual's characteristics, one is plausibly exogenous: the gender of siblings.

This paper examines the impact of sibling gender on women's labor market earnings. The limited existing literature on sibling gender has focused largely on earlier cohorts (born 1920s-1960s), and has been unable to fully examine the mechanisms behind sibling gender impacts. This paper aims to complement the existing literature on this topic by examining a more recent cohort of women (in which labor market opportunities may be more extensive) and by more thoroughly examining the mechanisms. In examining

the role of early childhood and adolescent environments, this paper provides additional insight into the formation of gender roles, and their role in the continuing wage gap between men and women.

This paper makes use of a unique longitudinal dataset, Add Health, which provides a number of advantages. Add Health examines a more recent cohort of women (born in the late 1970s and early 1980s) relative to the more frequently used NLSY, and tracks them through their late 20s and early 30s (with additional waves of data to come). It asks detailed questions to both the student and to parents about childhood environment and activities; and also captures information on work, demographic, and attitudes variables later in life. This allows us to examine a wide variety of mechanisms, from investments in infancy (such as breastfeeding) to current demographics and attitudes.

We find that the presence of a brother decreases female wages by roughly 10 percent. Less than 1 percent is explained by differences in education and occupational choice, while the remainder is due to differences within education and occupation groups. We explore potential mechanisms through which this effect may occur. We do not find substantial differences in parental investment. However, we do find that women with brothers have more traditional gender roles and family responsibilities, a finding that is supported by the psychology literature on sibling sex-typing in mixed-sex environments [e.g., McHale, Crouter, and Tucker (1999)]. We find that our measure of gender roles accounts for 20 percent of the earnings difference between those with and without brothers. We also find that our mechanism of gender roles is further supported by the fact that results are stronger for those with the most highly educated mothers and two parent families (who face fewer investment constraints) and for those who are more religious (who may be more likely to be exposed to traditional gender roles). Our results are also consistent with those derived from the NLSY-CYA data.

This paper begins by discussing the theoretical background for the role of sibling gender on women's labor market outcomes. It notes that siblings may affect each other indirectly, by changing parents' investments or expectations for a particular child. Siblings may also affect each other directly through their interactions with each other. After

discussing the theoretical background, we provide a brief literature overview, highlighting the papers that have explored the role of sibling sex composition on later-life outcomes. We then discuss our primary data source, Add Health, detail our results, and explore mechanisms. Next, we examine heterogeneity of the effects across social and demographic characteristics. Finally, we examine the robustness of our results (including using another dataset, the NLSY-CYA, to establish external validity of our results).

2 Theoretical Overview

As noted above, siblings may influence female labor market outcomes indirectly or directly. First, siblings may indirectly influence females by changing parental investment decisions. According to the framework developed by Becker (1991), parents choosing to maximize the lifetime earnings of their children subject to a constraint will invest most in the child with the highest marginal return or lowest marginal cost. If males have a higher return on investment in the labor market relative to females, parents may invest more resources (money and time) in boys.[1] Similarly, if fathers find it easier to invest in boys relative to girls, they may invest more in male children. Therefore, in the presence of brothers, girls may receive lower levels of parental investment. This has been shown in Japan (Ono, 2004).

Although most models suggest that parents will invest in the child with the highest marginal returns (or lowest cost), this may not always be the case. As noted by Butcher and Case (1994), parents might also have an aversion to inequality in their children's lifetime outcomes. To avoid inequality, parents might invest more in the child with lower potential earnings. This could potentially benefit female children.

In addition to parental investment, siblings may also influence outcomes in more direct ways. Notably, siblings may directly influence females through the development of gendered attitudes and behaviors. The psychology literature indicates that opposite-gender siblings may encourage traditional sex-typed activities and interests [see (McHale

[1]This has been shown in developing countries such as India, see e.g., Barcellos, Carvalho, and Lleras-Muney (2014).

et al., 1999)]. The economics literature has also found patterns of sex-typing for women in mixed-gender environments. For example, Booth, Cardona-Sosa, and Nolen (2014) note that women exposed to coeducational environments become more risk averse than those placed in single-sex settings. In addition, Favara (2012) finds that students in mixed-sex schools make more gender-stereotypical education choices. Thus, it is possible that girls with brothers (who spend more time with males in childhood) may develop more traditionally feminine interests, activities, and opinions. These traditional attitudes may directly lead to lower wages if a more traditional female identity leads a woman to believe she should have less income than her husband or other males [as highlighted by Bertrand et al. (2015)].[2] These traditional attitudes may also reduce wages through higher rates of childbearing or household responsibilities.

In summary, siblings may affect each other indirectly (through parental investment) or directly (through gender role development).[3] The relative size of these mechanisms, as well as their effect on adult earnings of women, is therefore an empirical question.

3 Related Literature

Butcher and Case (1994) provide the first key paper examining the impact of sibling gender composition on later-life outcomes. They explore the role of siblings on female educational attainment, and find that those with brothers receive slightly higher average levels of education than those with sisters. Butcher and Case (1994) focus on women born from 1920-1965, and find the strongest effects for the earliest cohorts in their sample. They note that no commonly referenced mechanism (parental investment or gender role attitudes) can fully explain their results.[4] They propose that there is no direct effect of brothers on wages, and even suggest that the effect of siblings on earnings can be used an

[2]As found by Bertrand et al. (2015), the gender norm that "a woman should earn less than her husband" may cause women to reduce their earnings relative to husbands or to not be in the labor force if their incomes would be higher than those of their husbands.

[3]Three other mechanisms, namely cognitive differences, parental expectation differences, and personality trait differences, have also been referenced occasionally in the literature. We also examine the role of these in the Section 6.

[4]Notably, Butcher and Case (1994) do find a marginal positive impact of having sisters on the probability of being in the labor force for the younger cohort.

instrument to examine the impact of education on earnings. Kaestner (1997) and Hauser and Kuo (1998) attempt to replicate these results on later cohorts, but find no effect of sibling gender on the educational attainment of men or women.

Another strand of literature examines the impact of sibling gender composition on college major choice. Anelli and Peri (2015) examine the impact of sibling gender composition on college major choice in Italy. They find that males with sisters choose more traditionally-male disciplines than those with brothers, but fail to find any impact of sibling gender on female major choice. However, recent work by Brenøe (2017) also finds that opposite-gender siblings affect female major choices in Denmark. Brenøe (2017) uses Danish administrative data and finds that oldest children with an opposite-sex sibling are more likely to choose gender-traditional majors. In particular, Brenøe (2017) finds that women with an opposite-sex sibling are nine percent less likely to complete a STEM major. She attributes this finding (at least partially) to evidence suggesting that children with an opposite-sex sibling experience more "gendered parenting," that is, time with the same-sex parent relative to the opposite sex parent (which may influence preferences). Oguzoglu and Ozbeklik (2016) find similar impacts of gender on major choice in the United States. Using the NLSY, they find that women with fathers in STEM occupations are less likely to major in STEM if they have brothers. Oguzoglu and Ozbeklik (2016) infer that brothers block the intergenerational transmission of occupational preferences from fathers to daughters, but are unable to directly test this mechanism.

A set of papers most strongly related to ours examines the impact of siblings on adult wages. Peter, Lundborg, and Webbink (2015) examine outcomes of dizygotic twins in Sweden born between 1926-1958. They find that women with twin sisters give birth earlier and attain less education, while men with twin brothers have higher earnings and a higher likelihood of marriage. They suggest that these effects may be due to the development of gendered traits by interacting with different-gender versus same-gender siblings, or though differences in "reference points" (siblings compare themselves to each other, and therefore brothers compete with one another).[5] However, they do not have

[5]In the case of this paper, exposure to the same gender indicates more gender-stereotypical behavior. However, the evidence for this hypothesis is limited. They note that sibling competition may be greater

means of testing mechanisms through which sibling gender influences later-life outcomes. Additionally, Rao and Chatterjee (2016) examine the impact of sibling gender on adult wages using the NLSY (focusing on those born in the late 1950s to mid-1960s). They find that brothers positively influence male wages, but that sibling sex composition does not affect female wages. They attribute the impact of brothers on men to the ability of brothers to help each other find good jobs. We likely find different results due to examining a different cohort of women (who may be more likely to enter the workforce) and by using a dataset with a larger sample size.

Finally, two additional papers examine slightly more recent cohorts of women in Europe, and find some evidence that brothers lower female wages. First, Gielen, Holmes, and Myers (2016) examine individuals in the Netherlands, and find that women with closely-spaced opposite-sex siblings have lower labor market earnings.[6] Second, in a more recent paper on major choice (discussed above), Brenøe (2017) finds preliminary evidence that women in Denmark with opposite sex siblings face lower earnings. Like earlier work examining women in the U.S. [Peter et al. (2015) and Rao and Chatterjee (2016), discussed above] the earnings estimates in Brenøe (2017) are primarily for those born before 1977. Also, for both papers the available data does not allow for examinations of investment mechanisms such as breastfeeding and other mechanisms contributing to gender identity formation.

Our paper contributes to the literature by providing the first estimates of the impact of sibling gender on wages for U.S. women born after 1970. In contrast to previous studies, women in our sample may have been more likely to have working mothers and to view working throughout adulthood as a likely occurrence. They may also have a wider variety of opinions on gender roles in the family. In addition, parents in the late 1970s and 1980s may be more likely than those in earlier cohorts to view sons and daughters' employment outcomes as substitutes. Parents before 1980 had more additional children after a firstborn daughter relative to a firstborn son (Dahl & Moretti, 2008), but this son

among same-sex siblings, as found by Adams (1999).

[6]Their estimates indicate that the effect of a brother on annual earnings is roughly 2 percent. However, the primary focus of their paper is on twins and on in-utero testosterone exposure, and they do not examine the mechanisms behind this result.

preference has been generally eliminated in recent years (Blau, Kahn, Brummund, Cook, & Larson-Koester, 2017). Rather than continuing to have additional children until the birth of a son, parents in recent cohorts may be more likely to invest in daughters in the absence of sons. Thus, we may expect parental investment to differ based on sibling gender. Overall, the social and economic changes highlighted above suggest that gender role views, parental investment, and/or labor market outcomes may be more affected by sibling gender in our cohort relative to earlier studies.

Relative to other work, our data also allows us to more thoroughly investigate the different mechanisms of parental investment and gender role development, and examine whether and to what extent they can account for the wage penalty associated with brothers. This is because it provides unique information on breastfeeding in infancy, interactions with parents during high school, and desired family outcomes. Further details on our data and estimation are provided below.

4 Data

The primary data used in this paper is the National Longitudinal Survey of Adolescent Health (Add Health).[7] Add Health was designed to study the impact of family, neighborhood, and school environment on adolescents' behavior. In 1994-1995, it collected data from students in grades 7-12 from a nationally representative sample of about 130 private and public schools (Wave I). From the roughly 90,000 students sampled in 1994-1995, a subset of about 20,000 students was selected for a more detailed in-home interview (which included both a student and parent interview). This subsample was again interviewed in 1995-1996 (Wave II), in 2001-2002 (Wave III), and in 2008 (Wave IV). The longitudinal aspect of this data allows us to examine characteristics of the household in adolescence,

[7]This research uses data from Add Health, a program project directed by Kathleen Mullan Harris and designed by J. Richard Udry, Peter S. Bearman, and Kathleen Mullan Harris at the University of North Carolina at Chapel Hill, and funded by grant P01-HD31921 from the Eunice Kennedy Shriver National Institute of Child Health and Human Development, with cooperative funding from 23 other federal agencies and foundations. Special acknowledgment is due Ronald R. Rindfuss and Barbara Entwisle for assistance in the original design. Information on how to obtain the Add Health data files is available on the Add Health website (http://www.cpc.unc.edu/addhealth). No direct support was received from grant P01-HD31921 for this analysis.

and employment outcomes and family structure in adulthood.

We use data from Wave I to attain information about family characteristics of our sample. In the in-home survey, students are asked to give a detailed household roster listing up to 20 individuals and their relation to the student. We count as brothers those listed as any type of brother (e.g., full brother, half-brother, step-brother, adopted brother), and count as sisters those listed as any type of sister.[8] Total number of siblings in the household is then calculated as brothers plus sisters. Our key independent variable, any brother in household, is equal to 1 if total brothers in the household is at least 1 (and 0 otherwise).[9] Other individual and family characteristics pulled from Wave I include age, race, presence of parents in household, total number of children had by biological parents, family income, parents' education, whether the mother worked outside the home, parents' occupations, birth order, and religion practice. Finally, we also use data from Wave I on activities with parents.

Our key outcome variables are pulled from the Wave IV survey. Our main dependent variable is pre-tax income from personal earnings in the prior year (2007).[10] Other key variables include detailed occupation (SOC code), hours usually worked per week, total number of children, and marital status. A variety of attitudes variables are also available, including total number of children intended and information about satisfaction and commitment in one's current romantic relationship.

We supplement our Wave I and Wave IV data with a few attitudinal variables from other waves of the survey. In particular, we use answers to questions posed in Wave III about the importance of marriage and the desire to work for a "year or two" before marriage. These questions are available in Wave III, and allow us to develop a more complete measure of gender role attitudes.

For our final sample, we include females who participated in the Wave I, Wave III,

[8]We count only siblings under the age of 18. This is due to the fact nest-leaving differs by gender. For females in our sample, 50.6 percent of (in-household) siblings under 18 are male. In contrast, only 44.8 percent of (in-household) siblings 18 or older are male. This suggests that the gender of siblings ages 18 and older is not random.

[9]We provide results using an alternative specification of the dependent variable, percent brothers, in Section 8.

[10]We exclude those who report positive earnings but have never worked a full time job, report no hours worked at current or prior jobs, or who reported their last job ended before 2007.

and Wave IV in-home surveys. Following Butcher and Case (1994), Hauser and Kuo (1998), Kaestner (1997), Oguzoglu and Ozbeklik (2016), and Rao and Chatterjee (2016), we only include those who have at least one sibling in the household in Wave I. Table 1 presents balance tests for our final sample by the presence of any brother. Evidence showing that student and parent characteristics are the same across groups supports the assumption that brothers are distributed randomly. Table 1 indeed shows that differences between those with and without brothers are not generally statistically significant. Perhaps unsurprisingly, the groups do differ by family size and age/grade. First, those with more siblings are more likely to have a brother, since the addition of each sibling increases the chances of having a brother. In addition, if girls are older, parents have more time to have additional siblings (who are still in the household); therefore, those who are older are more likely to have a brother. In our regressions, we control for age and family size to ensure that our results are not primarily due to either of these variables. In addition, Black, Devereux, and Salvanes (2005) note that family size likely has little effect on adults outcomes.[11]

Although females with and without brothers are similar across most observed characteristics, there may be concerns about differences in unobserved characteristics. In particular, families with strong preferences for a son or strong preferences for gender diversification of children may continue having children until they have a son (Angrist & Evans, 1998; Dahl & Moretti, 2008). To address this concern, we also examine the gender of the next youngest sibling only, in line with a recent literature using this estimation strategy to rule out selection from the decision of parents to have an additional child (Brenøe, 2017; Peter et al., 2015). This strategy is detailed in Section 5.

There is potential for measurement error because we are only able to observe gender for siblings in the household. As shown in Table 1, the average total siblings in the household in Wave I is 1.68. Therefore, on average, there are 2.68 total children in the household (the individual plus her siblings). To see how many siblings are not in the household (and thus do not have gender information), we can compare this figure with

[11]Note there are also small differences in parental occupation. We include a full set of parental occupational dummies in our regressions.

the reported total children of biological parents (2.77). Therefore we see that, on average, we are unable to track gender for an average of 0.09 biological siblings. This is less than one-tenth of the entire sample, and should be randomly distributed across groups. If anything, then, we can view it as measurement error that we would expect to downward bias our results. We also confirm our results with another dataset, the NLSY-CYA, in which all sibling gender data is available (see Section 8).

5 Results

Table 2 presents basic OLS regressions for females in which the dependent variable is log earnings in Wave IV, and the key independent variable is the presence of any brother in the household. Column (1) includes only controls for age and race, Column (2) adds family size controls, and Columns (3) and (4) add family background controls. The coefficient on any brother declines slightly from Columns (1) to (2). This is an expected result given that those with larger families are more likely to have a brother, and larger families may be more conservative (and mothers may be less likely to work). However, after controlling for family size, the results are largely consistent across specifications. They show that an increase from no brothers to at least one brother results in an earnings decrease of about 10 percent in a woman's late 20s and early 30s.

One potential threat to identification is due to parents' decision to have an additional child. Parents who choose to have another child after the birth of a girl may be different from parents who choose to have another child after the birth of a boy. To address this selection issue, we next regress wages on an indicator for whether the next-youngest sibling is male (rather than an indicator for the presence of any brother). This is in line with an emerging literature that views the gender of the next child as random conditional on the decision to have another child [see Peter et al. (2015); Brenøe (2017)]. To avoid oversampling large families, we restrict our sample in Table 3 to females who are the oldest in their families (and thus are highly likely to have a younger sibling).[12] Table

[12]This is in line with Brenøe (2017). Results for the full sample are qualitatively unchanged and are available upon request.

3 presents the results. Column (1) includes only controls for age and race, Column (2) adds family size controls, and Column (3) adds family background controls. The results reveal a similar pattern, though they produce a slightly larger coefficient: the presence of a brother decreases female wages by 13-14 percent. Given this result, we are confident that our results are not driven by selection issues (in the decision of parents to have another child). Thus, we use the OLS results for the remainder of the paper.

Because our dependent variable is log personal earnings, those women with zero earnings are excluded from the regressions in Tables 2 and 3. To test whether labor force selection is an issue, in Table 4, Column (1) we show that the probability of labor force participation (having more than zero earnings) is unrelated to the percent brothers. Table 4, Column (2) reports on the intensive margin. We do see that women with more brothers work fewer hours, but this result is not significant.[13]

To test whether our results are robust to the inclusion of those not participating in the labor force, we run linear probability models in which the dependent variable is 1 if the female has income above various thresholds, in increments from $10,000 (the 25th percentile of the female wage distribution) to $70,000 (just above the 95th percentile of the female wage distribution). The results are shown in Appendix Table 2. They show that those greater fraction of brothers are less likely to earn more than $20,000 per year (and also less likely to earn larger amounts, although this is not quite significant). This evidence suggests that the results are not sensitive to the inclusion of those with zero wages.

Differences in income may be a result of differences in educational and occupational categories, or differences within these categories. In Table 5, we examine the effect of brothers on educational and occupational outcomes. In Column (1), the dependent variable is 1 if the individual has graduated from college. In Column (2), the dependent variable is the Nakao-Treas Prestige Score for the individual's reported occupation (attained

[13]Appendix Table 1 displays an estimate for log earnings per hour. This is an approximation, given that hours are calculated from the question "How many hours a week (do/did) you usually work at this job?", answered for the current or most recent job. Earnings are based on total personal earnings in the prior year, and thus the two may not be consistent if the individual changed jobs or changed hours over the past year. However, the general results hold.

from Ruggles et al. (2016).[14] In Column (3), the dependent variable is the occupational earnings score from Ruggles et al. (2016).[15] Although the estimated coefficients are not statistically significant, the negatives signs in all columns point to a trend of those with brothers choosing lower-prestige and lower-paying occupations.

In Table 6, we examine the extent to which differences in education and occupation explain the coefficient on brothers. We begin with the regression in Table 1, Column (4), and add controls for education [Table 6, Column (1)] and education and occupation [Table 6, Column (2)]. Table 6 indicates that less than one percent of the impact of brothers can be accounted for by differences in education and 2-digit occupation. In column 3, we exclude women in STEM occupations to explore whether all results are driven by STEM fields. The effect of having brothers still remains at about 10 percent.

Overall, the effects of education and occupation are small. In addition, we view education and occupation decisions as part of the larger set of work-related outcomes. These factors jointly determine earnings and are likely influenced by the same mechanisms. As a result, in our examination of mechanisms below, we use regressions without education and occupation controls. This allows us to examine the impact of these mechanisms on earnings in totality (rather than focusing on whether these differences come through education, occupation, or earnings within group).

6 Mechanisms

As discussed above, the literature highlights two primary mechanisms through which sibling gender may influence women's earnings: parental investment decisions and gender role development. We examine each in turn below. At the end of this section, we also check for the presence of three alternative mechanisms (which have less support in the literature, and were not discussed in the theory section): cognitive ability, parental

[14] In 1989, the General Social Survey asked respondents to rank 110 occupations by "social standing" on a scale of 1 (low) to 9 (high). The Nakao-Treas Prestige Score converts these average responses into a ranking for each occupation of the 1980 Census from 0 to 100. See Nakao and Treas (1994) for details on the methodology.

[15] The occupational earnings score takes the median earnings in a given occupation in the 1990 Census, standardizes it, and then converts it to a percentile. See https://usa.ipums.org/usa-action/variables for more details.

expectations, and personality traits.

We first consider the mechanism of parental investment. The Add Health parent survey provides details on environment in infancy and parents' interactions with the student's teachers over the school year. The in-home (student) survey asks students to report whether they engaged in a variety of activities with their parents over the past four weeks. It also asks about the number of days each week a parent is at home when the student eats the evening meal. We code answers to questions on breastfeding, whether the parent has met with teachers, and whether the parent and student have performed the following activities as a binary variable (which equals 1 if the activity was performed and 0 otherwise). The number of days per week when the parent is home while the student is eating a meal are coded as 0-7. We then develop an index of parental investment using a traditional principal component analysis (PCA).[16] Table 7 displays the mean of each variable and the contribution to the index. As shown in Table 7, the strongest loadings are for factors that may be likely to be most associated with academic success and (potentially) higher earnings, such as talking with parents about school and grades. Figure 1, Panel (a) displays the scree plot, demonstrating that the first principal component accounts for substantially more variance that the remaining factors. In Figure 1, Panel (b), we display the distribution of the index. As shown, there are three "humps" in the distribution. The greatest density is at relatively low levels of parental investment, but a substantial portion of the sample displays medium and high levels of investment as well.

We next examine whether our index of parental investment differs significantly by the presence of brothers. Table 8 shows the results of these OLS regressions where the dependent variable is the investment index. The results indicate no significant difference in parental investment (for the activities in our index) by the presence of brothers.

Next, we consider the channel of gender role development. As highlighted in the theoretical overview, we may expect those with brothers to have more traditional gender

[16]PCA is an orthogonal transformation that converts a set of correlated variables into a fewer number of orthogonal variables (each called a principal component). The first principal component, our index, accounts for the most variance in the data.

roles, and may think that more traditional gender roles (including a focus on marriage and children) leads to lower wages. This may be due to productivity losses from greater intensity of household tasks (especially childrearing); it may also due to the fact that those with more traditional identities may value earning less money than their husbands (see Bertrand et al. 2016).

We use a number of questions from Wave III and Wave IV to compile an index of traditional gender roles. Binary variables are created based on the following questions: " How important is it to you to be married someday (again)?" (Wave III, 1=very important); "How important would it be for you to work full time for a year or two before you got married?" (Wave III, 1=very important); in a committed relationship (Wave IV, 1=yes); married (Wave IV, 1=yes); any child (Wave IV, 1=yes); "Family responsibilities have interfered with my ability to work" (Wave IV, 1=agree or strongly agree)[17]; and "(In the past 12 months/Since you started your current job/In the last year of your most recent job), how often on your primary job (have you had/have you had/did you have) to cut back your hours or turn down overtime because of your family responsibilities?" (Wave IV, 1=frequently or sometimes)[18]. Count variables are for total number of children intended (Wave IV) and total number of children currently (Wave IV). Table 9 displays the mean and contribution to the index for each variable. The strongest loadings are for the presence of children, family interruptions to work, and family interference with work.

The scree plot and kernel density of the index are displayed in Figure 2. The density plot shows that women are largely clustered into two groups, those with low values of the gender role index, and those with medium-high values. These can be thought of as less-traditional and more-traditional groupings. Table 10 examines whether gender role attitudes differ by the presence of brothers. The results show that those with brothers demonstrate more traditional attitudes and behaviors.[19]

[17]Coded as "Family interference with work"

[18]Coded as "Significant family interruptions to work"

[19]In Wave III, the Add Health questionnaire also asked a more direct gender role question: "How much do you agree or disagree with the following statement? It is much better for everyone if the man earns the money and the woman takes care of the home and family." Unfortunately, the number of students answering this question is very small, thus preventing us from using this information in our baseline specification. Qualitatively, the results indicate that females with brothers display more traditional gender roles, though the variance is too large to attain statistical significance. In the subsample of

Gendered attitudes may also manifest through whether an individual reports closeness with the same-gender versus opposite-gender parent. In Wave I and Wave IV, individuals are asked how close they feel to their father and mother figures. We run regressions in which the dependent variable is 1 if a woman reports feeling "quite close" or "very close" to her parental figure. The results are shown in Appendix Table 3. We find no significant effect of brothers on closeness to mother figure in Wave I or father figure in either period. We find that women with brothers report greater closeness to their mother figures in Wave IV.[20] Closeness with mothers may be related to traditionally feminine tastes and attitudes (Suitor & Pillemer, 2006), which supports the mechanism of gender role development. This result also indicates that gender role development may continue to take place even after high school.

In Table 11, we examine to what extent our proposed mechanisms can account for lower wages among females with brothers.[21] The inclusion of the investment index does not meaningfully change the effect of brothers, while the inclusion of the gender role index pushes the coefficient toward zero. When adding the different indexes jointly in a horse race (column 4), the gender role mechanism appears most potent.

Next, we consider three other potential mechanisms: cognitive abilities, parental expectations, and personality traits. Although there is some evidence of differences in academic achievement by sibling gender (Brenøe, 2017), few papers to our knowledge have been able to examine cognitive ability directly. We consider two measures of cognitive ability provided by the Add Health data: the age-standardized score on the picture vocabulary test issued by Add Health[22], and mathematics grades. We run two sets of regressions. In the first [Table 12, Column (1)], the dependent variables is the score on the PVT. In the second [Table 12, Column (2)], the dependent variable is equal to 1 if

those with highly educated mothers (who are most affected by brothers, see Section 9), the probability of strongly disagreeing with this stated traditional gender role is significantly lower among those with brothers (at the 10 percent level). Results are available upon request.

[20]This result remains even if we control for marital status and presence of own children.

[21]Our sample size is reduced in these regressions became we only include individuals who answered the necessary questions (to get the gender role and investment indexes) in all three waves. As a result, the baseline coefficient on brothers is slightly different from that reported in Table 2.

[22]The Add Health PVT is a condensed version of the Peabody Picture Vocabulary Test–Revised, a standard assessment of verbal ability used in the United States. For more information, see http://www.cpc.unc.edu/projects/addhealth/design/wave1.

the student received an "A" in her mathematics class (and 0 otherwise). These tables do not show strong evidence of differences in cognitive ability or academic achievement by sibling gender.

Second, we test for differences in parental expectations (Table 13). For this, we make use of questions asked to parents in Wave I, another unique feature of the Add Health data. Parents are asked a few sets of questions about their children. They are also asked about the most important quality they would like the student to have. If they would most like for her to be a "brilliant student", the dependent variable is equal to 1 in Column (1). If the would most like for her to be a "leader in school activities," the dependent variable is 1 in Column (2).[23] Next, they are asked how disappointed they would be if the child did not graduate from college [dependent variable = 1 if they would be "very disappointed" or "somewhat disappointed" and 0 otherwise, results displayed in Column (3)]. These results indicate no consistent difference in parental expectations by sibling gender.

Finally, we consider the mechanism of personality traits. The literature has suggested that traditionally "male" qualities (such as assertiveness or risk-taking) may be associated with higher wages [see, e.g., Booth (2009); Croson and Gneezy (2009); Charness and Gneezy (2012)]. In Table 14, we examine whether the presence of a brothers impact womens' reported personality traits. In each column of Table 14, the dependent variable equals 1 if the individual agrees or strongly agrees that she has the given personality trait and 0 otherwise. To examine whether personality differences are present, we use self-reported personality in Wave II. We construct binary outcome variables which equal 1 if the individual agrees that she has the personality trait and zero otherwise. There are some significant differences by sibling gender: females with brothers are less likely to claim that they are emotional, but more likely to claim that they are assertive. These results are consistent with some psychology theories that suggest that brothers may lead women to develop more masculine characteristics in early childhood, see Rust et al. (2000).

[23]The exact question is: " If [NAME] could be one of the following in high school, which would be most important to you?" The available answers are: "a brilliant student", "a leader in school activities", "an athletic star", or "the most popular".

To test whether these three mechanisms can explain the effect of brothers on female earnings, we add them to our horse race. As shown in Table 15, none of the three alternative mechanisms (cognitive ability, parental expectations, or personality) can explain a substantial portion of the effect of brothers. When all variables are placed into the regression [Column (5)], the gender role mechanism has the strongest effect.

7 Heterogeneity

In this section, we examine heterogeneity in our results by individual and family characteristics. This provides further insight into the mechanisms through which brothers affect female wages.[24]

First, we examine heterogeneity by mother's education (which is related to socioeconomic status) and family structure. We expect that lower-income and single-parent families face the strongest investment constraints. Therefore, if the effect of brothers works through the investment mechanism, we would expect females from lower income and single-parent families to see the strongest negative outcomes from brothers. As shown in Table 16, we in fact see the opposite: the largest effect comes from females who have mothers with a college education and who grow up in two-parent families.

We next examine effects across cultural groups. In the United States, individuals who are more religious may have exposure to more traditional gender roles [see, e.g., (Harris & Firestone, 1998)], and may adopt more traditional views in certain circumstances. In Wave I, individuals are asked how often they attend religious services. From this information, we classify individuals as "religious" if they attend services at least once a month (and non-religious otherwise). Results for the religious and non-religious subgroups are shown in the last two columns of Table 16. Consistent with our expectations, religious individuals are strongly negatively affected by brothers. For those who are not religious, there is no significant impact of brothers.

[24]Although it would be interesting to examine the differences in the effect of older versus younger brothers, our data does not allow for a full examination of this mechanism. Given the fact that our survey is a household survey for students in middle school and high school, we are more likely to observe younger siblings than older siblings in the data. As a result, we cannot differentiate effects of older versus younger siblings.

The results by subgroup in our sample show brothers are most likely to affect women's wages in families that have higher socioeconomic status, contain two parents, and are religious. These findings support the gender role mechanism.

8 Robustness and Extensions

In this section, we present a battery of robustness checks, and extend our results to look at men. First, we examine the sensitivity of our our results to the specification of the dependent variable. Second, we repeat our analysis for twins to rule out any residual concerns about selection issues. Third, we use an additional dataset to address concerns related to measurement errors and external validity of our results. Finally, we examine the results for men in our data.

We first examine alternative specifications of the dependent variable. In Table 17, we replicate Table 2, but use an alternate specification of the dependent variable. We set the dependent variable equal to the percent of siblings in the household who are brothers. Our results reveal coefficients that are similar to the coefficients on any brother, though they are weaker. If the parental investment mechanism were important, we would expect the total percent of brothers to matter more than the presence of any one brother. The fact that one brother is as important (or more important) as the fraction of brothers suggests that the parental investment mechanism is not at work.

In Table 18, we further address selection by considering just the subsample of twins. Add Health provides unique information on twins, including details on whether they are dizygotic (DZ) or monozygotic (MZ). As noted in Peter et al. (2015), DZ twins provide a means of testing the effect of sibling gender that rules out selection from the decision to have an additional child. Because twins already increase family size substantially, the gender of a DZ twin may also have less of an effect on overall family size than the gender of a non-twin. As such, it allows us to see whether our results hold under a situation we believe should present very few selection issues. Because the sample size is very small, however, we do not use it in our main results but as a robustness check. As shown in the

table, we find qualitatively similar but insignificant results.

We next use another dataset to examine potential measurement error and the external validity of our results. The NLSY-CYA survey follows the children of women in the NLSY. The NLSY-CYA cohort thus includes women mostly born in the 1980s and 1990s, making them (on average) slightly younger than the Add Health cohort. We examine log earnings in 2013 (as reported in 2014), and restrict our sample to those born in or before 1988 (turning 25 in the year of the reported earnings). The NLSY-CYA results, displayed in Table 19, indicate that the presence of a brother decreases wages by about 12 percent, roughly equivalent to the estimate from the Add Health data. (The standard errors are larger, likely due to a much smaller sample size.)[25]

Finally, we examine the impact of brothers on men. Although the literature (especially that focusing on earlier cohorts) finds that brothers positively impact each other (Peter et al., 2015; Rao & Chatterjee, 2016; Brenøe, 2017), our results indicate no effect of sibling gender for men (see Table 20). This result provides further evidence against the parental investment mechanism, because if brothers attract more parental investment, we would expect the impact of brothers on men to be negative. Though it does not directly support our gender role story, it does not contradict it given that single-sex environments may be more influential in developing gender roles for women than for men [e.g., Favara (2012)], or gender roles may have a stronger impact on female than male wages.

9 Conclusion

This paper provides the first estimates of the impact of sibling gender composition on women's wages for recent U.S. cohorts. In particular, we find that the presence of a brother lowers earnings by approximately 10 percent for a woman in her late 20s or early 30s. Our estimate suggests that, if no women had brothers, the earnings gap

[25]We also examine the earlier cohort represented in the NLSY79. Consistent with earlier work, we find no impact of sibling gender composition on log earnings for women. However, we do find that women with any brothers are significantly less likely to be in the labor force (by about 3-5 percent) in most survey years between 1986 and 2012. Results are available upon request. Interestingly, this impact of sibling gender composition on labor force participation is also consistent with the findings of Butcher and Case (1994) for their youngest cohort (born 1940s-1960s). We suspect that the gender mechanism may be operating along the extensive margin for these earlier cohorts (born before 1970).

between men and women would be 5 percent smaller.[26] Using unique data from Add Health, we test for a variety of mechanisms that may explain this result. We find no evidence that differences in parental investment, cognitive abilities, parental expectations, or personality traits drive the results. We instead find that women with brothers have a greater focus on family-centered behavior (including importance of marriage, being in a committed relationship, and presence of and intention to have children); our index of gender role attitudes and behaviors accounts for approximately 20 percent of the effect of brothers on earnings.

This paper helps advance the literature on gender role identity and gendered behavior. Traditional gender role attitudes continue to contribute to the gender wage gap in the United States (Bertrand et al., 2015), but the development of these attitudes is not well understood. By examining the role of sibling gender composition on women's wages, we show that exogenous changes in family environments can lead women to adopt less sex-typed attitudes and behaviors, potentially reducing earnings gaps between men and women later in life.

[26]In our data, 64 percent of working women have brothers. We can view the average female earnings ratio ($\frac{w_f}{w_m}$) as a weighted sum of the earnings gaps of those with brothers and those without brothers: $\frac{w_f}{w_m} = \frac{0.64w_{f,wb}+0.36w_{f,nb}}{w_m}$, where w_f is the average female earnings, w_m is the average male earnings, $w_{f,wb}$ is the average female earnings for those with brothers, and $w_{f,nb}$ is the average female earnings for those without brothers. Assuming that earnings for women without brothers are 10 percent higher, that is $w_{f,nb} = 1.1w_{f,wb}$, and that the average female wage ratio ($\frac{w_f}{w_m}$) is 79 percent (Blau & Kahn, 2016), we can see that the wage ratio for those without brothers is about 84 percent. This accounts for a reduction of about 5 percent in the wage ratio.

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11 Tables and Figures

Table 1: Summary Statistics for Females with Siblings

	(1) All Females in Sample	(2) Females without Brothers	(3) Females with Brothers	(4) *T-Stat*	(5) *P-Value*
White	0.66	0.65	0.66	*0.2*	*0.84*
Asian	0.04	0.04	0.04	*0.52*	*0.6*
Black	0.16	0.17	0.16	*-0.49*	*0.62*
Latino	0.12	0.12	0.13	*0.72*	*0.47*
Total Siblings in HH in Wave I	1.68	1.32	1.88	*16.96*	*0.00*
Total Children of Bio Parents	2.77	2.56	2.89	*6.15*	*0.00*
Total Siblings in Wave IV	3.13	2.84	3.29	*5.06*	*0.00*
Two Parent HH	0.75	0.74	0.75	*0.42*	*0.67*
Log Family Income	10.44	10.45	10.44	*-0.07*	*0.95*
Family Income Missing	0.22	0.22	0.21	*-0.14*	*0.89*
Father's Occ Farm	0.02	0.01	0.02	*0.84*	*0.4*
Father's Occ Manual	0.3	0.29	0.31	*1.4*	*0.16*
Father's Occ Military	0.03	0.03	0.03	*0.42*	*0.67*
Father's Occ Missing	0.29	0.3	0.28	*-0.92*	*0.36*
Father's Occ Sales	0.05	0.06	0.05	*-1.85*	*0.07*
Father's Occ Other	0.1	0.11	0.1	*-0.63*	*0.53*
Father's Occ Prof, Tech	0.13	0.14	0.13	*-0.68*	*0.49*
Father Completed College	0.22	0.22	0.22	*0.07*	*0.95*
Mother's Occ Farm	0.01	0	0.01	*1.91*	*0.06*
Mother's Occ Manual	0.18	0.16	0.18	*1.37*	*0.17*
Mother's Occ Military	0	0	0	*1.55*	*0.12*
Mother's Occ Missing	0.15	0.14	0.16	*1.38*	*0.17*
Mother's Occ Sales	0.23	0.24	0.22	*-1.2*	*0.23*
Mother's Occ Other	0.17	0.17	0.17	*0.01*	*0.99*
Mother's Occ Prof, Tech	0.22	0.23	0.21	*-1.44*	*0.15*
Mother Completed College	0.23	0.25	0.22	*-1.62*	*0.11*
Oldest Child	0.45	0.43	0.46	*1.69*	*0.09*
Religion Practice	1.92	1.9	1.93	*0.56*	*0.58*
Age	15.05	15.15	14.99	*-2.25*	*0.02*
Student Grade	9.15	9.26	9.09	*-2.51*	*0.01*
Observations	5405	1992	3413		

Note: The T-Statistics and P-Values are from tests of differences in means between columns (2) and (3). Wave I sampling weights are used in all calculations.

Table 2: Basic Results: Log Personal Earnings in Wave IV, Females

	(1) Log Personal Earnings	(2) Log Personal Earnings	(3) Log Personal Earnings	(4) Log Personal Earnings
Any Brother	-0.139***	-0.0975**	-0.106**	-0.108**
	(0.0444)	(0.0458)	(0.0440)	(0.0438)
Is Oldest Child				0.0111
				(0.0515)
Age controls	Yes	Yes	Yes	Yes
Race Controls	Yes	Yes	Yes	Yes
Family Size Controls	No	Yes	Yes	Yes
Family Background Controls	No	No	Yes	Yes
Observations	3985	3985	3985	3985
R^2	0.031	0.059	0.118	0.120

Note: Parameter estimates and standard errors (in parentheses) are reported. Standard Errors clustered at the school level. Unless otherwise specified, all variables are for Wave I, and Wave I sampling weights are used in all calculations. Family size controls include dummies for total number of siblings in household, total number of children born to biological parents, and total siblings in Wave IV. Family background controls include: two-parent household, log family income, religion practice, mother's education, father's education, whether the mother works outside the home, mother's occupation, and father's occupation.

* p<0.1, ** p<0.05, *** p<0.01

Table 3: Log Personal Earnings in Wave IV, Female Oldest Children

	(1) Log Personal Earnings	(2) Log Personal Earnings	(3) Log Personal Earnings
Next Youngest is Brother	-0.132**	-0.142***	-0.137***
	(0.0518)	(0.0518)	(0.0483)
Age controls	Yes	Yes	Yes
Race Controls	Yes	Yes	Yes
Family Size Controls	No	Yes	Yes
Family Background Controls	No	No	Yes
Observations	1674	1674	1674
R^2	0.040	0.081	0.166

Note: See notes to Table 2.

Table 4: Labor Force Participation and Hours, Females

	(1) LFP	(2) Hours Worked
Any Brother	0.0104	-0.760
	(0.0131)	(0.484)
Is Oldest Child	-0.0122	0.222
	(0.0157)	(0.586)
Age controls	Yes	Yes
Race Controls	Yes	Yes
Family Size Controls	Yes	Yes
Family Background Controls	Yes	Yes
Observations	4474	4427
R^2	0.055	0.045

Note: See notes to Table 2.

Table 5: Education and Occupation, Females

	(1) College Graduate	(2) Occupational Prestige Score	(3) Occupational Earnings Score
Any	-0.00661	-0.366	-0.239
Brother	(0.0178)	(0.537)	(1.241)
Is Oldest	0.0387**	0.881	2.587**
Child	(0.0192)	(0.608)	(1.281)
Age controls	Yes	Yes	Yes
Race Controls	Yes	Yes	Yes
Family Size Controls	Yes	Yes	Yes
Family Background Controls	Yes	Yes	Yes
Observations	5042	4930	4925
R^2	0.272	0.144	0.098

Note: See notes to Table 2.

Table 6: Log Personal Earnings with Controls for Education and Occupation, Females

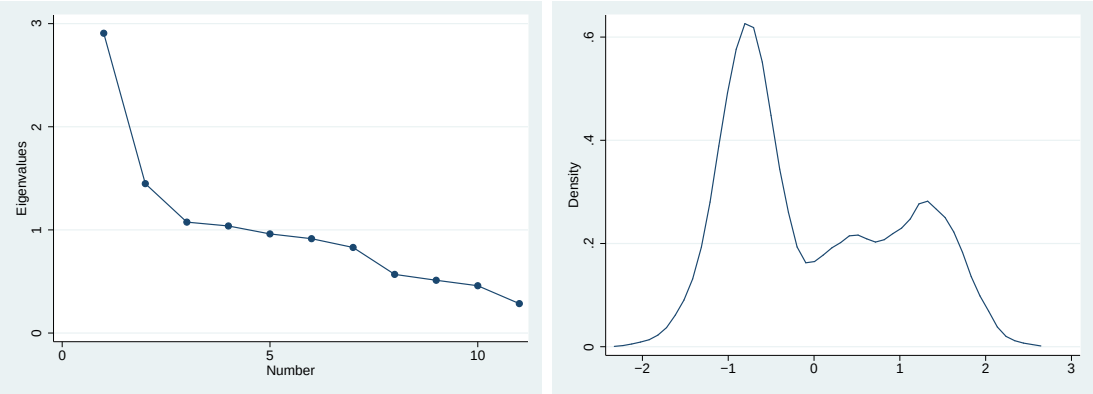
	(1) Log Personal Earnings	(2) Log Personal Earnings	(3) Log Personal Earnings
Any Brother	-0.103**	-0.102**	-0.105**
	(0.0443)	(0.0429)	(0.0412)
Is Oldest Child	-0.0226	-0.0390	-0.0310
	(0.0492)	(0.0466)	(0.0460)
High School	0.427**	0.367**	0.357**
	(0.170)	(0.171)	(0.171)
Some College	0.0813	0.0635	0.0621
	(0.0782)	(0.0783)	(0.0784)
College	0.501***	0.408***	0.400***
	(0.0439)	(0.0453)	(0.0453)
Age controls	Yes	Yes	Yes
Race Controls	Yes	Yes	Yes
Family Size Controls	Yes	Yes	Yes
Family Background Controls	Yes	Yes	Yes
Occupation controls	No	Yes	Yes
Observations	3985	3985	3927
R^2	0.182	0.241	0.248
STEM Occupations Included	Yes	Yes	No

Note: See notes to Table 2.

Table 7: Parental Investment Index

	Mean	Contribution to Index
Breastfed	0.49	0.14
Mom talked with teacher about schoolwork	0.35	0.31
Talked about grades with mom	0.61	0.63
Did school project with mom	0.15	0.53
Talked about school (generally) with mom	0.54	0.69
Attended event with mom	0.29	0.32
Talked about grades with dad	0.41	0.70
Did school project with dad	0.09	0.54
Talked about school (generally) with dad	0.35	0.74
Attended event with dad	0.18	0.36
Days parent is at home when eating meal	4.89	0.29

Figure 1: Parental Investment Index, Females



(a) Scree Plot (b) First Principal Component

Note: Principal component analysis of parental investment. In (a) 26% of the total inertia is explained by the first component, 23% is explained by the second and third components, and 50% is explained by the fourth through eleventh components. In (b) an epanechnikov kernel is used for density estimation.

Table 8: Parental Investment by Gender of Siblings, Females

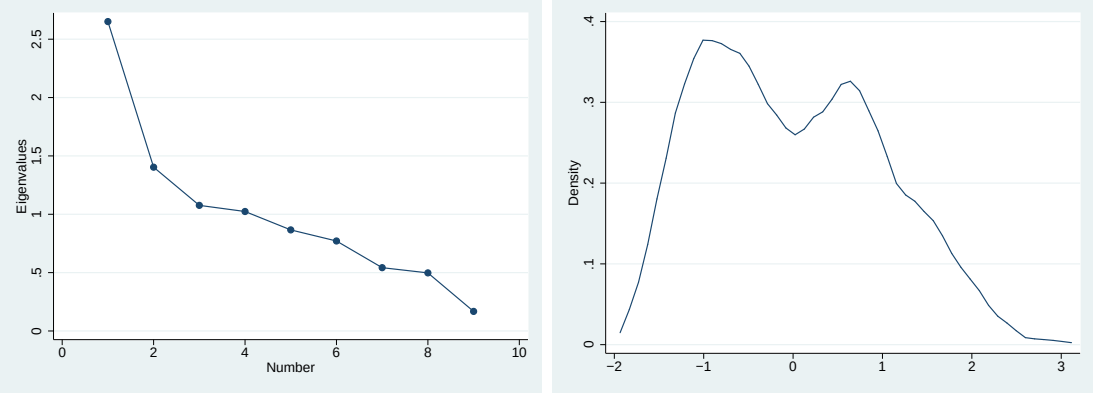
	(1) Investment Index	(2) Investment Index	(3) Investment Index	(4) Investment Index
Any Brother	0.0114	-0.0259	-0.0334	-0.0345
	(0.0465)	(0.0465)	(0.0409)	(0.0408)
Is Oldest Child				0.0530
				(0.0435)
Age controls	Yes	Yes	Yes	Yes
Race Controls	Yes	Yes	Yes	Yes
Family Size Controls	No	Yes	Yes	Yes
Family Background Controls	No	No	Yes	Yes
Observations	4289	4289	4289	4289
R^2	0.046	0.089	0.286	0.287

Note: See notes to Table 2.

Table 9: Gender Role Index

	Mean	Contribution to Index
Important to be married (Wave III)	0.63	0.32
Not important to work before marraige (Wave III)	0.68	0.26
In a committed relationship (Wave IV)	0.73	0.32
Married (Wave IV)	0.47	0.54
Total number of children intended (Wave IV)	2.37	0.36
Total number of children (Wave IV)	1.02	0.82
Has any child (Wave IV)	0.55	0.80
Significant family interruptions to work (Wave IV)	0.20	0.58
Family interference with work (Wave IV)	0.20	0.56

Figure 2: Gender Role Index, Females



(a) Scree Plot (b) First Principal Component

Note: Principal component analysis of gender role attitudes and behavior. In (a) 29% of the total inertia is explained by the first component, 28% is explained by the second and third components, and 43% is explained by the fourth through ninth components. In (b) an epanechnikov kernel is used for density estimation.

Table 10: Gender Role Index by Sex of Sibling, Females

	(1) Gender Role Index	(2) Gender Role Index	(3) Gender Role Index	(4) Gender Role Index
Any Brother	0.116***	0.0593	0.0759*	0.0761**
	(0.0407)	(0.0409)	(0.0386)	(0.0380)
Is Oldest Child				-0.0220
				(0.0490)
Age controls	Yes	Yes	Yes	Yes
Race Controls	Yes	Yes	Yes	Yes
Family Size Controls	No	Yes	Yes	Yes
Family Background Controls	No	No	Yes	Yes
Observations	4204	4204	4204	4204
R^2	0.044	0.083	0.140	0.142

Note: See notes to Table 2.

Table 11: Add Health Data: Log Personal Earnings with Controls, Females

	(1) Log Personal Earnings	(2) Log Personal Earnings	(3) Log Personal Earnings	(4) Log Personal Earnings
Any Brother	-0.148***	-0.146***	-0.120**	-0.119**
	(0.0496)	(0.0486)	(0.0495)	(0.0486)
Is Oldest Child	0.0589	0.0561	0.0411	0.0388
	(0.0590)	(0.0581)	(0.0578)	(0.0571)
Investment Index		0.0661**		0.0591**
		(0.0258)		(0.0252)
Gender Role Index			-0.227***	-0.226***
			(0.0301)	(0.0297)
Age controls	Yes	Yes	Yes	Yes
Race Controls	Yes	Yes	Yes	Yes
Family Size Controls	Yes	Yes	Yes	Yes
Family Background Controls	Yes	Yes	Yes	Yes
Observations	2947	2947	2947	2947
R^2	0.121	0.125	0.161	0.164

Note: See notes to Table 2.

Table 12: Cognitive Ability, Females

	(1) PVT Score	(2) Grade of A in Math
Any Brother	-0.0909	-0.0251
	(0.572)	(0.0197)
Is Oldest Child	3.195***	0.0387
	(0.606)	(0.0263)
Age controls	Yes	Yes
Race Controls	Yes	Yes
Family Size Controls	Yes	Yes
Family Background Controls	Yes	Yes
Observations	4825	4667
R^2	0.315	0.074

Note: See notes to Table 2.

Table 13: Parental Expectations and Percent Brothers, Females

	(1) Prefer Brilliant Student	(2) Prefer Leader	(3) Disapp if Child not Grad Coll
Any Brother	0.0168	-0.0172	0.0194
	(0.0278)	(0.0244)	(0.0186)
Is Oldest Child	0.0247	-0.0296	0.0300*
	(0.0219)	(0.0197)	(0.0161)
Age controls	Yes	Yes	Yes
Race Controls	Yes	Yes	Yes
Family Size Controls	Yes	Yes	Yes
Family Background Controls	Yes	Yes	Yes
Observations	4095	4095	4095
R^2	0.079	0.103	0.074

Note: See notes to Table 2.

Table 14: Personality Characteristics and Percent Brothers, Females

	(1) Likes Taking Risks (Wave II)	(2) Is Assertive (Wave II)	(3) Is Independent (Wave II)	(4) Is Emotional (Wave II)
Any Brother	-0.0111	0.0471**	0.00103	-0.0431**
	(0.0232)	(0.0215)	(0.0189)	(0.0211)
Is Oldest Child	-0.0198	-0.00705	-0.0114	0.0443**
	(0.0262)	(0.0275)	(0.0181)	(0.0221)
Age controls	Yes	Yes	Yes	Yes
Race Controls	Yes	Yes	Yes	Yes
Family Size Controls	Yes	Yes	Yes	Yes
Family Background Controls	Yes	Yes	Yes	Yes
Observations	3944	3944	3944	3944
R^2	0.053	0.059	0.075	0.052

Note: See notes to Table 2.

Table 15: Add Health Data: Log Personal Earnings with Controls, Females

	(1) Log Personal Earnings	(2) Log Personal Earnings	(3) Log Personal Earnings	(4) Log Personal Earnings	(5) Log Personal Earnings
Any Brother	-0.152**	-0.147**	-0.156**	-0.151**	-0.123**
	(0.0601)	(0.0574)	(0.0600)	(0.0586)	(0.0555)
Is Oldest Child	0.0446	0.0162	0.0434	0.0504	0.00704
	(0.0749)	(0.0722)	(0.0740)	(0.0757)	(0.0698)
PVT Score		0.00407*			0.00214
		(0.00221)			(0.00220)
Grade of A in Math		0.268***			0.236***
		(0.0619)			(0.0607)
Prefer Brilliant Student			-0.000441		-0.0281
			(0.136)		(0.138)
Prefer Leader			-0.0827		-0.123
			(0.149)		(0.145)
Disapp if Child not Grad Coll			0.207**		0.179**
			(0.0960)		(0.0850)
Likes Taking Risks (Wave II)				0.0236	0.0650
				(0.0719)	(0.0710)
Is Assertive (Wave II)				-0.0306	-0.0330
				(0.0695)	(0.0668)
Is Independent (Wave II)				0.181	0.143
				(0.119)	(0.113)
Is Emotional (Wave II)				-0.0142	-0.00787
				(0.0624)	(0.0589)
Gender Role Index					-0.220***
					(0.0374)
Investment Index					0.0571*
					(0.0322)
Age controls	Yes	Yes	Yes	Yes	Yes
Race Controls	Yes	Yes	Yes	Yes	Yes
Family Size Controls	Yes	Yes	Yes	Yes	Yes
Family Background Controls	Yes	Yes	Yes	Yes	Yes
Observations	2111	2111	2111	2111	2111
R^2	0.135	0.152	0.139	0.139	0.197

Note: See notes to Table 2.

Table 16: Log Personal Earnings for Females: Heterogeneity by Mother's Education, Family Structure, and Religoius Practice

	(1) Moth No Coll	(2) Moth Coll	(3) Not Two Parent	(4) Two Parent	(5) Religious	(6) Not Religious
Any Brother	-0.0639	-0.336***	-0.0111	-0.151***	-0.159***	-0.0649
	(0.0526)	(0.0751)	(0.110)	(0.0514)	(0.0513)	(0.0876)
Is Oldest Child	-0.0213	-0.0143	-0.152	0.0252	0.00235	-0.0345
	(0.0657)	(0.0784)	(0.130)	(0.0563)	(0.0630)	(0.0967)
Age controls	Yes	Yes	Yes	Yes	Yes	Yes
Race Controls	Yes	Yes	Yes	Yes	Yes	Yes
Family Size Controls	Yes	Yes	Yes	Yes	Yes	Yes
Family Background Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2490	917	827	2580	2401	1006
R^2	0.122	0.179	0.213	0.110	0.120	0.228

Note: See notes to Table 2.

Table 17: Log Personal Earnings in Wave IV by Percent Brothers, Females

	(1) Log Personal Earnings	(2) Log Personal Earnings	(3) Log Personal Earnings	(4) Log Personal Earnings
Percent Brothers	-0.0767	-0.0803*	-0.0868*	-0.0873*
	(0.0478)	(0.0483)	(0.0466)	(0.0467)
Is Oldest Child				0.00947
				(0.0516)
Age controls	Yes	Yes	Yes	Yes
Race Controls	Yes	Yes	Yes	Yes
Family Size Controls	No	Yes	Yes	Yes
Family Background Controls	No	No	Yes	Yes
Observations	3985	3985	3985	3985
R^2	0.027	0.058	0.117	0.119

Note: See notes to Table 2.

Table 18: Log Personal Earnings in Wave IV for DZ Twins, Females

	(1) Log Personal Earnings	(2) Log Personal Earnings	(3) Log Personal Earnings
Twin Brother	-0.232	-0.442	-0.234
	(0.288)	(0.266)	(0.170)
Age controls	Yes	Yes	Yes
Race Controls	Yes	Yes	Yes
Family Size Controls	No	Yes	Yes
Family Background Controls	No	No	Yes
Observations	233	233	233
R^2	0.176	0.418	0.751

Note: See notes to Table 2.

Table 19: Evidence from Other Datasets: Log Personal Earnings, NLSY-CYA, Females

	(1) Log Personal Earnings	(2) Log Personal Earnings	(3) Log Personal Earnings	(4) Log Personal Earnings
Any Brother	-0.125*	-0.0970	-0.127*	-0.128*
	(0.0708)	(0.0776)	(0.0754)	(0.0751)
Oldest Child				0.0316
				(0.0678)
Age Controls	Yes	Yes	Yes	Yes
Race Controls	Yes	Yes	Yes	Yes
Total Number Sibs Controls	No	Yes	Yes	Yes
Family Background Controls	No	No	Yes	Yes
Observations	950	950	950	950
R^2	0.027	0.060	0.099	0.099

Note: Parameter estimates and standard errors (in parentheses) are reported. Standard errors clustered at the mother level, and 2014 sampling weights are used. Family size controls include dummies for total number of siblings. Family background controls include: mother's education, father's education, mother's marital status when individual is 14, mother's labor force participation when individual is 14, and mother's age.
* p<0.1, ** p<0.05, *** p<0.01

Table 20: Log Personal Earnings in Wave IV, Males

	(1) Log Personal Earnings	(2) Log Personal Earnings	(3) Log Personal Earnings	(4) Log Personal Earnings
Any Brother	0.0367	0.0327	0.0312	0.0310
	(0.0464)	(0.0545)	(0.0532)	(0.0530)
Is Oldest Child				-0.0161
				(0.0504)
Age controls	Yes	Yes	Yes	Yes
Race Controls	Yes	Yes	Yes	Yes
Family Size Controls	No	Yes	Yes	Yes
Family Background Controls	No	No	Yes	Yes
Observations	3773	3773	3773	3773
R^2	0.046	0.068	0.099	0.099

Note: See notes to Table 2.

12 Appendix

Appendix Table 1: Log Personal Earnings per Hour, Females

	(1) Log Earnings per Hour	(2) Log Earnings per Hour	(3) Log Earnings per Hour	(4) Log Earnings per Hour
Any Brother	-0.120***	-0.0815**	-0.0868**	-0.0877**
	(0.0412)	(0.0410)	(0.0396)	(0.0396)
Is Oldest Child				0.0161
				(0.0500)
Age controls	Yes	Yes	Yes	Yes
Race Controls	Yes	Yes	Yes	Yes
Family Size Controls	No	Yes	Yes	Yes
Family Background Controls	No	No	Yes	Yes
Observations	3948	3948	3948	3948
R^2	0.039	0.070	0.122	0.123

Note: See notes to Table 2.

Appendix Table 2: Linear Probability Models of Earning over Threshold

	(1) Over 10,000	(2) Over 20,000	(3) Over 30,000	(4) Over 40,000	(5) Over 50,000	(6) Over 60,000	(7) Over 70,000
Any Brother	-0.0189	-0.0451**	-0.0211	-0.0136	-0.0146	-0.0182	-0.0126
	(0.0166)	(0.0200)	(0.0196)	(0.0186)	(0.0163)	(0.0129)	(0.00858)
Is Oldest Child	-0.0169	-0.0218	-0.00804	0.0171	0.0162	0.0152	0.00974
	(0.0228)	(0.0249)	(0.0254)	(0.0195)	(0.0156)	(0.0139)	(0.0112)
Age controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Race Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Family Size Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Family Background Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	4474	4474	4474	4474	4474	4474	4474
R^2	0.070	0.119	0.141	0.124	0.098	0.084	0.055

Note: See notes to Table 2.

Appendix Table 3: Closeness to Parents in Wave I and Wave IV, Females

	(1) Close with Fath Wave I	(2) Close with Moth Wave I	(3) Close with Fath Wave IV	(4) Close with Moth Wave IV
Any Brother	-0.000683	0.00771	0.0224	0.0528***
	(0.0211)	(0.0183)	(0.0230)	(0.0153)
Is Oldest Child	-0.0191	-0.00141	0.0326	0.00709
	(0.0253)	(0.0207)	(0.0242)	(0.0192)
Age controls	Yes	Yes	Yes	Yes
Race Controls	Yes	Yes	Yes	Yes
Family Size Controls	Yes	Yes	Yes	Yes
Family Background Controls	Yes	Yes	Yes	Yes
Observations	3120	3120	3120	3120

Note: See notes to Table 2.