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# Sibling structure and gender inequality: assessing gender variation in the effects of sibling structure on housework performance, education, and occupation

Yan Wang  
*University of Iowa*

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SIBLING STRUCTURE AND GENDER INEQUALITY: ASSESSING GENDER  
VARIATION IN THE EFFECTS OF SIBLING STRUCTURE ON HOUSEWORK  
PERFORMANCE, EDUCATION, AND OCCUPATION

by  
Yan Wang

An Abstract

Of a thesis submitted in partial fulfillment  
of the requirements for the Doctor of  
Philosophy degree in Sociology  
in the Graduate College of  
The University of Iowa

May 2013

Thesis Supervisors: Professor Jae-On Kim  
Associate Professor Mary C. Noonan

## ABSTRACT

The objective of this dissertation is to investigate the effect of sibling structure on women's and men's socialization and achievement outcomes in three areas: housework performance, education, and occupation. Data from China and the United States are used for analyses. The findings indicate that the effect of sibling structure largely depends on the cultural and structural contexts in each society. More specifically, although women and men on average have the same sibling structure, the meaning of sibling configuration is different for women and men because of macro-level factors, such as cultural expectations, gender stereotypes, historical legacy, and political propaganda, and micro-level factors, such as parental preferences, parent-child communication and sibling competition.

To examine the effect of sibling structure on each outcome, I conduct three empirical studies. In the first study, using data from the 2006 wave of the China Health and Nutrition Survey, I investigate the effect of sibling structure on children's housework performance. The results show that sibship size, sex composition, and birth order are important predictors of children's housework performance in China. On average, children's probability of doing housework increases as number of siblings increases and singletons are least likely to do housework. In two-child families, for girls, a brother increases the likelihood of doing housework, whereas a sister has no impact. For boys, the presence of a younger brother increases the likelihood of performing housework, whereas a sister and an older brother have no impact. In the second study, I focus on the effect of sibling structure on educational attainment and the role of siblings' education in this relationship. Data from the National Longitudinal Survey of Youth 1979 (NLSY79) are used for analyses. I find that the effects of sibship size and sibling sex composition on educational attainment are mediated through siblings' educational achievements. These effects are divergent for men and women. For women, sibship size and sex composition

do not impact their educational attainment after accounting for siblings' educations. For men, only the number of brothers (but not sisters) has a negative effect on their educational attainment after controlling for siblings' educational achievements. In the third study, I investigate the influence of birth order on the prestige and sex type of adolescents' occupational aspirations using the first wave of the NLSY79. The results indicate that for both females and males, firstborn and lastborn adolescents on average expect higher prestige occupations compared to middleborns, and lastborns are more likely to have nontraditional occupational aspirations than firstborns and middleborns. Taken together, the results suggest that the gender gap in important child and adult behavioral outcomes is smaller among individuals with fewer siblings, fewer brothers, and among lastborn young adults.

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Graduate College  
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CERTIFICATE OF APPROVAL

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PH.D. THESIS

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has been approved by the Examining Committee  
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To My Parents

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The objective of this dissertation is to investigate the effect of sibling structure on women's and men's socialization and achievement outcomes in three areas: housework performance, education, and occupation. Data from China and the United States are used for analyses. The findings indicate that the effect of sibling structure largely depends on the cultural and structural contexts in each society. More specifically, although women and men on average have the same sibling structure, the meaning of sibling configuration is different for women and men because of macro-level factors, such as cultural expectations, gender stereotypes, historical legacy, and political propaganda, and micro-level factors, such as parental preferences, parent-child communication and sibling competition.

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## CHAPTER I. SIBLING STRUCTURE AND THE GENDERED OUTCOMES

### Introduction

As the basic unit of society and one of the most significant institutions for individuals, family plays a critical role in connecting individuals with the society and shaping the development of human ideology and behaviors. An individual's experience with (or without) siblings in the family contributes not only to unforgettable memories but also important outcomes that endure during one's life time, and the aggregate of these experiences constructs a principal component of the social system.

Sibling structure (also known as sibling configuration and sibling constellation) consists of four factors of a sibling group: (1) sibship size (number of siblings), (2) birth order, (3) sibship density (the spacing between siblings), and (4) sex composition (Brody and Steelman 1985; Powell and Steelman 1990; Spitze and Logan 1991; Steelman et al. 2002). The study of sibling structure not only provides an important insight into the dynamics of family life, but also corresponds to important research questions in sociology, such as the influence of structure on individuals, and how resources and status transfer across and within generations.

As a result, sibling structure has captured the interest of researchers since sociology became an independent discipline. Galton (1874) claimed the significance of birth order in intellectual development and career achievement through an empirical study of 180 men in Great Britain, in which he found that the eldest sons in the family are more likely to become eminent scientists than their later born brothers. Since then, social scientists have explored many possible outcomes influenced by sibling structure in various areas, such as intelligence and cognitive ability (Breland 1974; Galbraith 1982; Guo and VanWey 1999; Nisbet and Entwistle 1967), substance use (Duncan, Duncan, and Hops 1996; Rowe and Gulley 1992), juvenile delinquency (Sletto 1934; Slomkowski



et al. 2001), educational attainment (Blake 1989; Booth and Kee 2008; Duncan 1968; Hauser and Kuo 1998; Lu and Treiman 2008; Powell and Steelman 1993), and occupational achievement (Parr 2006; Polit, Nuttall, and Nuttall 1980).

Although there is a vast literature examining the effect of sibling structure on various outcomes, few studies have systematically explored the process through which gender inequality (or equality) are initiated and enhanced through sibling structure, beginning in childhood and extending to the adult years. Although men and women on average have the same sibling structure, I expect that sibling structure influences gender inequality because the meaning of sibling configuration is different for men and women because of (1) macro-level factors, such as cultural expectations, historical legacy, and political propaganda and (2) micro-level factors, such as parental preferences (such as the son preference culture in China) and sibling competition. In addition, most sociological research on gender inequality concentrates on housework, educational attainment, and employment, without further asking how childhood experiences within the family contributes to these adult outcomes. In my dissertation, I expect to fill these gaps in the literature by bridging the scholarship of sibling structure and gender inequality. On the one hand, this study contributes to the study of gender inequality by examining the issue from a new perspective, i.e., do women's and men's position in their sibling structure lead to gendered outcomes in adulthood?; on the other hand, it enriches the scholarship on sibling structure by differentiating the effects of sibling structure on girls and boys respectively.

In this study, I focus on the gendered outcomes in three areas: housework performance, education, and occupation. My overarching research questions are: (1) How is gender inequality in three areas (housework, educational attainment, and occupational attainment) influenced by various types of sibling structure? And (2) Is the effect of sibling structure on these outcomes different for men and women? I will answer these questions through three studies, each examining one aspect of gender inequality:

children's performance of housework (Chapter 2), young adults' educational attainment (Chapter 3), and young adults' occupational aspirations (Chapter 4).

I use two datasets for the analyses, the 2006 wave of China Health and Nutrition Survey (Chapter 2) and the National Longitudinal Survey of Youth 1979 (NLSY79) (Chapters 3 and 4). Although many studies has shown consistent effects of sibling structure in different countries (Bernhardt, Noack, and Lyngstad 2008; Booth and Kee 2008; Emerson and Souza 2008; Evertsson 2006; Lee 2012; Ono 2004), the China's case is especially interesting because of the implementation of the one-child policy in a transitional society with a cultural model of male preferences. The NLSY79 data is employed because it includes detailed information of siblings, such as sex, years younger or older than the respondent, and educational attainment, which is often lacking in many datasets.

Although the purpose of this study is not to conduct a cross-national comparison, it is important for readers to keep in mind that the findings from these two countries should not be automatically generalized to other societies. That is, the effect of sibling structure on gender inequality likely varies according to the specific socio-historical contexts within a country. For instance, historically, one's birth order and gender was closely related to his/her legal rights in China and Europe. Differences in legal rights such as inheritance status, the patrilineal system, and primogeniture substantially influenced each child's future outcomes. In England, only the eldest male descendant of the aristocracy and landed classes received a title and a land inheritance (Bertocchi 2006). Younger sons could inherit a small portion of land only if the father had gained additional lands that exceeded his original inheritance (Painter 1960). In most cases younger sons were left no more than a modest life annuity that expired at their death, and thus they and their offspring often experienced downward social mobility (Stone 1966). Daughters were usually married off to maximize the interests of families (Erickson 1995, 5) and the eldest daughter was qualified as heiress only when there were no direct male heirs

(Brodrick 1881; Holmes 1957). In England, primogeniture (i.e., the exclusive right of inheritance of the eldest son) remained effective until 1925 and a gender-equal succession rule (the “Royal Equality Act”) was not proposed until 2011 (Watt 2011). In the United States, however, primogeniture had never been established. As Parsons (1943, 28) observed, “The American law of intestacy...in specific contrast to the older English Common Law tradition, gives all children, regardless of birth order or sex, equal shares. But even more important, the actual practice of wills overwhelmingly conforms to this pattern.” It is likely that historical and structural legacy still plays a subtle but important role in shaping individual attitudes and behavior in contemporary society. Considering the results are based on data from China and the United States, researchers should be cautious that the findings in this study are inevitably culturally bound.

The rest of this chapter will provide the historical, cultural, and structural backgrounds of the two countries in which the three studies are situated, review literature on the intertwining of sibling structure and gendered outcomes, explain the research significance of sibling structure, and illustrate contributions of current studies.

### Gender Inequality and the One-Child Policy in China

#### The Agency-Structure Debate

It could take a book-length discussion to have a thorough understanding on the agency-structure debate. Since it is not the primary focus of my dissertation, in this section, I will briefly review related theories and examine how parents (or individual families) respond to the top-down one-child policy by changing their expectations and their interactions with their children, which then contribute to macro-level cultural change in the Chinese context.

### The Reciprocal Relationship between Agency and Structure

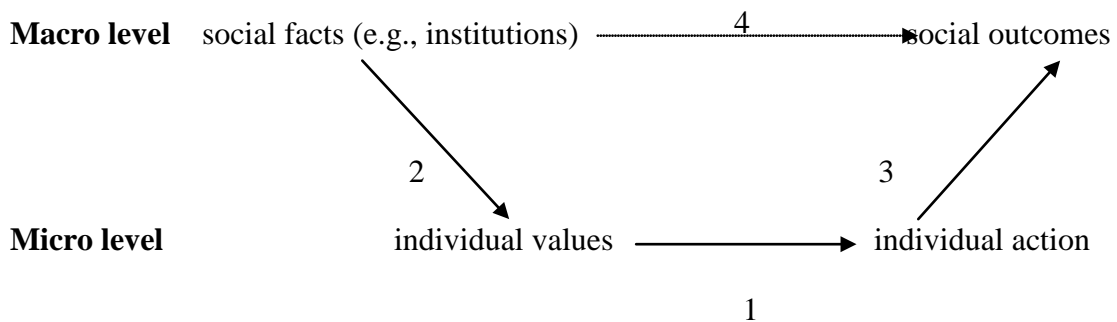
The structure-agency, or the macro-micro, question is one of the fundamental questions in sociology. Researchers often find it is difficult to assign precise definitions to the concepts of “structure” and “agency” (Sewell 1992). Social structure is the general paradigm shared by the majority of social members living in a particular physical space (which could be either large or small). The unique characteristics and behavioral patterns of each individual are also important, and add variety to the social life and also make social change possible (Fuchs 2001).

Marx constructs his theoretical system on the basis of historical materialism and insists that social structure is determined objectively by the economic base, which is independent of individuals as it comes into being. Durkheim also highlights the importance of structure, but unlike Marx, his functionalism emphasizes the role of “soft” structure in the social system, such as customs and norms. His theories focus on and aim for social solidarity as the ultimate goal of theoretical development. On the other hand, Weber values the meaning conveyed through subjective human action and argues that “all social collectivities and human phenomena have to be reducible to their individual constitutes, and explained in these terms” (Crompton 2008, 34).

Though still having different emphases on agency and/or structure, in general contemporary theorists tend to bridge the gap between the micro and macro sociological systems by examining the subtle linkage between agency and structure and connecting individual action with broader structure. For example, following Weber, Parsons (1937, 1960; Parsons and Shils 2001) first starts with the paradigm of voluntaristic action by acknowledging the motivational dimension of human action, but then he rejects reductionism (i.e., explain social action mainly through individual preferences and motivation) and moves on to pursue macrosociological explanations for the functioning of the society.

In their book *The Social Construction of Reality*, Berger and Luckmann (1967) suggest a dialectical relationship between agency and structure. The micro and macro worlds do not contradict with each other in that (1) people are born in the society that has already been constructed through the “externalization” of human activity, and (2) an individual identifies and empowers oneself as a social member by accepting and performing roles according to particular cultural schema, or through the process of “internalization”, and then participates in the ongoing construction of social system. Social structure is objective and in existence only when individuals within it are “institutionalized”, share the same meaning, and agree on certain behavioral patterns.

The famous “Coleman boat” (see Figure 1) explicitly illustrates that the micro (individual values and individual action) and macro levels (social facts and social outcomes) are not isolated or mutually exclusive (Coleman 1986). Rather, besides the causal chains within the same level (arrows 1 and 4), Coleman points out the possibility of cross-level effects (arrows 2 and 3), especially the often missing link or “the main intellectual obstacle” of connecting individual action with their social consequence (arrow 3).



**Figure 1. The Coleman Boat**

### Repetitive Action and Social Change

Both Berger and Luckmann (1967) and Collins (1981) propose that “repetitive action” serves as a bridge between agency and structure. Berger and Luckmann stress the importance of repetition of coordinated behaviors in shaping social roles according to “predefined patterns of conduct”. Social roles then channel the smooth transfer from public norms into personal beliefs and habits (Rousseau 2002, 231–232). Collins goes a step further and explicitly argues that from a “micro viewpoint”, repetitive actions, including both objective objects and resources and subjective symbols and emotions, constitute social structure through the mechanism of “interaction ritual chains”, a concept that functions for Collins in a way similar to social roles for Berger and Luckmann. The seemingly random and temporary micro encounters produce fluid and continuous social reality in the long run, where individuals construct their social world.

Three conditions are essential in this process of translating repeated individual behaviors to macrostructure, i.e., the type-3 micro-to-macro relation in the Coleman boat. First, since structure simultaneously consists of virtual cultural schemas and actual resources (Sewell 1992), individual behavior should touch upon at least one of them in order to exert influence at the higher level. If personal conduct corresponds to particular set(s) of cultural conventions, the value inherent in it is likely to be socially acceptable and open to widespread diffusion. If the individual action includes display or exchange of resources, then the repetition may contribute to the development of power, authority, and interdependence, which are important in the effective functioning of the society. Second, the micro-macro transfer requires participation of a group of people, so that more social members can be influenced. Third, the action should be “repeated” and endure for a certain amount of time. As a result, people could be immersed into the “interaction ritual” and adapt to the newly developed behavioral modes.

Fuchs (2001) describes agency and structure as variations along a continuum in which agency is often applied as the unit of analysis where the numbers are small and

researchers are able to *understand* and *interpret* the nuances of interactions and micro events, whereas structure flourishes where the numbers are big and researchers take an objective standpoint and *explain* relationships among variables or system-level social facts.

## The Transfer of Agency and Structure in the Chinese

### Context

The reciprocal relationship between agency and structure results in the possibility of cross-level influences (both macro on micro and micro on macro), which in turn contribute to the flowing nature of social structure. In other words, structure is not static and social change can occur directly at the macro level as well as indirectly from the individual level (Sewell 1992).

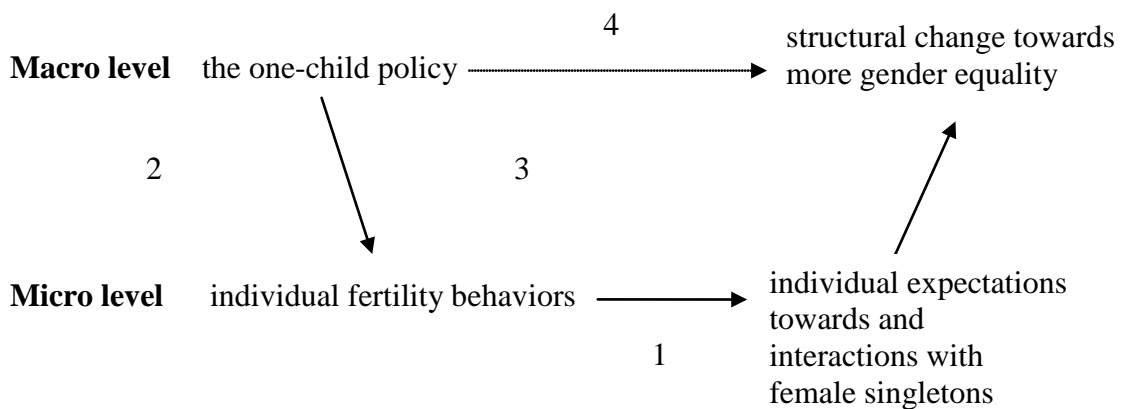
Although the government advocates that “daughters are as good as sons” and “having one child is good”, the deep-rooted traditional fertility culture which favors more children (sons in particular) does not change overnight. Therefore, the policy focuses more on behavioral outcomes rather than individual preferences. Since 1979, the policy has been rigidly enforced and, in general, each family is allowed to have one child. For families with singleton girls, parents have similar expectations for these girls as they would for boys, such as good performance at school and a successful career when they grow up (Tang and Parish 2000, 213).

The aforementioned three conditions which facilitate the transfer of individual action to structural transformation are all met (though to different degrees) in the Chinese context, partly because the policy is initiated by the state. First, the change in individual fertility behavior and corresponding attitudes towards only girls are in accord with the socialist gender egalitarian ideology. This egalitarian ideology is more popular than the traditional male dominance culture both because of the promotion of women’s rights since the 1911 revolution (also known as the *xinhai* revolution) when the last imperial

dynasty was overthrown (Li 1989; Wang 1999) and the massive and enthusiastic support of the communist regime and policies in general (Meisner 1977). These girls are not subject to competition from male siblings and thus the resource distribution within families inevitably is tilted towards girls.

Second, the determination of political leaders on population control and the rigorous implementation of the policy within a communist state ensure that the change takes place in the families of the whole nation. In this sense, the individual behavior is repeated by hundreds of families at the same time.

Third, the policy has been carried out over thirty years and is still in effect today, which provides relatively sufficient time for individual families to shift to and act upon gender egalitarian ideology, especially those with girl singletons (Tang and Parish 2000, 51–78). The long-term performing of systematic repetitive behaviors also promotes structural transformation of gender inequality in the society. This hypothetical process is demonstrated with the model of Coleman boat, though with slight differences (Figure 2).



**Figure 2. The Hypothetical Process of Agency-Structure Interaction in the Chinese Context through the One-Child Policy**



In the next two sections, I situate the transfer of agency and structure under the influence of the one-child policy in China and examine how this social policy impacts the long-standing male-privilege system and motivates the progress toward achieving gender equality.

### Lineage Preservation, Family and Gender Inequality in China

Under the influence of Confucian ideology, families in China undertake the responsibility of “lineage preservation”, a characteristic that distinguishes Chinese families from those in Western societies. To traditional Chinese, the individual’s life is continued through the family. When individuals pass away, their spirit and blood are carried on by their offspring, and thus remain in the secular world. In ancient China, ancestral worship and filial piety show respect to ancestors and current household heads who have developed the lineage; the desirability of large families and the emphasis on male dominance highlight the importance of keeping the lineage prosperous in the future. Therefore, it is not surprising to see the prevalence of these phenomena in Chinese families (Chu and R.-R. Yu 2010, 1–2).

Gender inequality is rooted in this traditional Chinese culture because the “lineage” in fact refers to the cultural model of patrilineality, according to which males are expected to fulfill the filial duty, inherit their parents’ property, and perform ancestral worship ceremonies. Besides the patriarchal tradition, people also celebrated the birth of sons for their potential socio-economic value. Like in many other societies, because women were constrained at home, men provided the primary source of income through agricultural production, business, or other activities. Another special institution that enhanced men’s social position in China is the imperial examination system (*keju*), which was the major way administrative officials were selected to join the state bureaucracy. Those who successfully passed the exams not only got access to official ranks but also

brought great honor to the whole lineage. Under the patrilineal descent system, only males could participate in the examination and thus they were viewed as potential candidates who were able to earn power, wealth, and glory for the family, which in turn reinforced male dominance in the society.

The importance of family and lineage preservation over individuals combined with male dominance often makes women the *de facto* victims. For example, marriage was often regarded as means towards a populous family. Personal feelings were not as important as procreation in a marriage, and therefore there was wide acceptance of arranged marriage, polygamy and concubinage. Daughters were not considered as descendants, rather they were seen as others' future wives and did not enjoy the same opportunities for education, inheritance, or other privileges as boys did. Women were tools of reproduction and those who were barren or did not give birth to sons could be forced to be divorced by their husbands. The sacrifice of individuals for the benefits of family is also encouraged and highly praised. In rural society, it is common for elder girls to drop out of school and being working at a very young age in order to support their younger brothers and their schooling (Lee 2012; Wang 2005).

Family is also important in value inheritance and cultural transmission. Chinese believe that the way people treat their families predicts the way they treat others in the society. The social relationships inside the family set the norms for relationships in the society and the society is regarded as an amplified version of the family (Freedman 1961). As in Mencius's suggestions to King Hui of Liang, "Treat your aged kin as the elderly should be treated, and then extend that to the treatment of the aged kinsmen of others; treat your young kin as the young should be treated, and then extend it to the young children of others. If you do this, you will be able to govern the world as though you turned it in your palm." In the same vein, as parents raise their only daughter in the manner that fosters gender egalitarianism, they are likely to treat other women in a

similar way. Therefore, smaller family structure contributes to structural changes in norms and behavioral patterns, especially in the Chinese context.

### The Influence of the One-Child Family Structure

Whyte (2003) suggests that change in family structure largely depends on three factors, economic development, cultural diffusion, and state social engineering. Before the implementation of the one-child policy, in terms of the cultural factor, people desired to have more children due to the impact of traditional Confucian ideology. In terms of the economic and political factors, the founding of the new regime in 1949 ended the civil war, created a stable social environment and improved basic medical conditions, which paved the way to baby boomers of the 1950s and 1960s. All of these led to the prevalence of multi-children families in China. If we have to set a causal order between individual fertility patterns and the macrostructure, individual behavior was driven by the traditional culture and objective social conditions to a large extent at that time.

Due to severe population pressure, the one-child policy was introduced in China in 1979, at the same time as the beginning of market reform. As an important state action, this policy has dramatically influenced many important aspects of social life. According to this policy, late marriage and late childbirth are encouraged, and in general each couple is allowed to have one child. Couples are permitted to have more than one child if they are minorities<sup>1</sup>, if they live in rural areas and their only child is a girl child, if their only child has a disability, or if both husband and wives are themselves only children (National Population and Family Planning Commission of China 2001). Since 1979 China's total fertility rate has dropped from 2.74 to 1.61 children per woman in 2009, a dramatic drop within only three decades (World Bank 2012b).

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<sup>1</sup> According to the Law on Population and Family Planning, it usually refers to the ethnic groups whose total population in the country is fewer than 10 million, such as the Mongolians, Tibetans, Daghur, Evenks, and Derung.

Researchers argue that the implementation of the one-child policy in a country with a traditional male-preference culture (like China) leads to an unbalanced sex-ratio at birth (Hull 1990; Zeng et al. 1993), an unbalanced marriage market, problematic old-age security (Hesketh, Li, and Zhu 2005) and the plight of “black” population (*heihu*, meaning the unplanned birth of children who have no household registration status) (Greenhalgh 2003). However, other researchers suggest that the one-child policy also benefits girls in a number of ways. Before the one-child policy was implemented, most Chinese families had more than one child. The slogan that “women hold up half the sky” in Mao’s time did not substantially change girls’ and women’s situations at home; rather they started to work a “double shift” of unpaid and paid labor (Hershatter 2011). Girls were viewed as less valuable and subject to more discipline from parents and grandparents, and girls’ situation worsened when living with a brother (Ge 1996).

The one-child policy may help to break the vicious circle of patrilineality by eliminating potential gender competition for girls and empowering them as capable candidates to fulfill responsibilities that used to be undertaken only by boys. As the number of families with only one child increased, female singletons received more educational resources and parental attention that used to be shared by multiple children and/or mostly by boys. For instance, an empirical study of eighth graders during 1998-99 in Wuhan, the provincial capital city of Hubei, China, finds that female and male only-children who were born around 1984-85 do not differ from each other with respect to parental investment, educational aspirations, mathematical performance, and other educational outcomes (Tsui and L. Rich 2002). Based on nationally representative data, Lee (2012) has similar findings, and shows that singletons receive significantly more education than children from multiple-child households, and the improvement for girls is larger than that for boys.

The benefit to girls continues into their adult years. Since the implementation of the one-child policy, research has found that young adult women are more empowered

and more likely to participate in the labor market, which also enables them to provide financial support to their parents and reduce the significance of patrilineal lineage, resulting in greater gender equality in Chinese society (Fong 2002; Hong 1987; Tang and Parish 2000, 68).

It should be noted that if the modernization theory of Goode (1963) is correct, then with massive socioeconomic development, similar changes towards gender equality are likely to happen in China as well as in other East Asian societies regardless of the implementation of the one-child policy (Hesketh, Li, and Zhu 2005). For example, the modernization and democratization in Taiwan have substantially changed gender-role attitudes and behaviors accordingly (Chia, Allred, and Jerzak 1997). There are undoubtedly multiple paths towards the progress of gender equality. The implementation of the one-child policy is just one way for a lower-middle income country with a long history of male dominance to move toward gender equity, especially when other approaches are not immediately available.

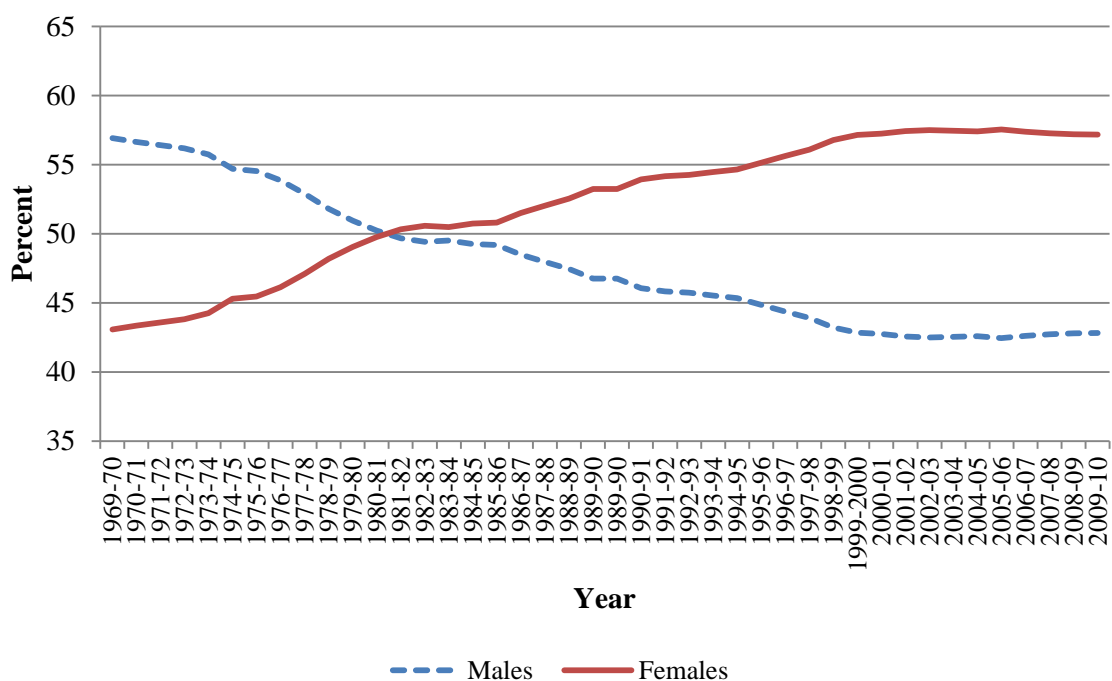
### Gender Inequality in the United States

#### Gender Inequality in Education

In the United States, there is a growing female advantage in academic performance since the early 1980s. Females on average obtain higher grades than males in all major subjects, including math and science, from kindergarten through college (Robert Perkins et al. 2004). Girls also perform better at school and have positive attitudes towards academic engagement. Adolescent girls in general are less disruptive than boys, more organized with class materials, and willing to seek help from peers, teachers, and parents. They devote more efforts in classroom and spend more time on academic activities outside of school (Downey and Vogt Yuan 2005; Jacob 2002). Boys, on the other hand, on average underperform at school, though their ratings of cognitive ability are roughly the same as girls. They have more disciplinary problems, show less

interest in school, and tend to associate academic performance with femininity (Duckworth and Seligman 2006; Legewie and DiPrete 2012; Silverman 2003).

Females also have generally higher educational attainment than males. Figure 3 illustrates the changes in the sex composition of college graduates over the past 40 years based on data from the U.S. Department of Education. In 1970, the majority (57 percent) of bachelor degrees were awarded to men. Women slowly caught up with men in the early 1970s. Since 1976, the percentage of female college graduates significantly has increased and has exceeded 50 percent since 1982. From 1982 onward, more than 50 percent of bachelor's degree recipients were women. The female advantage continued to increase and reached a plateau around 2000. By 2010, women received 57 percent of bachelor degrees and men received 43 percent.



**Figure 3. Bachelor's Degrees Awarded to Men and Women in the United States, 1969-2010**

Source: U.S. Department of Education. 2011. Digest of Education Statistics, Table 283.

Prior research on sibling structure and educational outcomes suggests that sibship size is negatively related to educational attainment because additional siblings dilute limited family resources (Booth and Kee 2008; Conley and Glauber 2005; Knodel and Wongsith 1991; Kuo and Hauser 1997; Sieben and De Graaf 2001). But not many empirical studies explore whether this relationship has asymmetric effects on males and females.

### Gender Inequality at Work

Surprisingly, although women have made dramatic progress towards gender equality in education, women and men remain segregated to a large extent in the labor market. Historically, most women did not work outside of the household and when they were employed, they were typically segregated in lower-status positions and/or lower-paid occupations. Charles and Grusky (2004) conceptualize gender inequality in the labor market along two dimensions, horizontal and vertical sex segregation. The horizontal dimension refers to segregation across occupations and the vertical dimension refers to segregation within the hierarchy of occupations. Two deeply rooted ideological tenets are responsible for the widespread horizontal and vertical sex segregation: gender essentialism and male primacy. Gender essentialism associates gender with job characteristics. Women are expected to be good at care-giving and personal service and men are assumed to excel in science, management and manual labor. Male primacy considers men as more status worthy and thus men deserve more power and authority at work.

These particular cultural stereotypes about sex roles and occupational types and status are widespread and continually reinforced in the society (Grusky and Levanon 2008; Ridgeway and Correll 2004). They influence career aspirations not only through shaping gender role attitudes and the expected commitment to the labor force but also by creating a social environment in which people receive sex-typical training, develop

relevant skills and are provided sex segregated job opportunities (Tomaskovic-Devey and Skaggs 2002). Based on experiments, Correll (2001, 2004) find that cultural beliefs about gender could also evoke gender differentiated performance and later bias the assessments women and men make of their own competence and career-relevant tasks. Both the “self-fulfilling prophecies” at the personal level and opportunity structure at the societal level contribute to traditional occupational aspirations and concentration in sex typical occupations.

The occupational sex segregation index, which measures segregation at the horizontal dimension, declined only slightly from 1910 (69.0) to 1970 (67.6) in the U.S. In the 1960s, more and more men participated in traditionally female jobs. In the 1970s, women increasingly entered several “male occupations”. The integration slowed down during the 1980s because women’s participation in the labor market concentrated on sex-typical jobs (Reskin 1993). The progress towards integration has stalled since 1996. In 2009, 40 percent of women and 4.5 percent of men worked in traditionally female-dominated jobs and 43.6 percent of men and 5.5 percent of women worked in traditionally male occupations (Hegewisch et al. 2010).

The major consequence of the vertical occupational sex segregation is that men are overrepresented in best-paid and prestigious jobs. In both female and male dominated occupations, the chances on movement to a managerial position for women are significantly lower than men (Kanter 1977; Maume 1999; Powell 1993). Based on data between 1970 and 1988, Jacobs (1992) find that the sex gap in authority remained constant and men are much more likely to be located at higher levels of management than women, although the gender wage gap among managers has narrowed during this period.

A few early studies have examined the relationship between birth order and occupational aspirations. For instance, Edwards and Klemmack (1973) report that firstborn female college students have a higher probability of aspiring to culturally non-feminine occupations. Marjoribanks (1995) also observes that birth order rank is



negatively associated with the prestige of expected occupations for both men and women. Therefore, it is possible that individuals of different birth order might develop different levels and preference of occupational aspirations, and thus gender inequality in occupational aspirations might be smaller among individuals of certain birth order.

### Literature on Sibling Structure: Resource Allocation and Socialization Practices

Sibling structure influences individual outcomes through two major mechanisms: (1) resource allocation within families and (2) socialization and interaction between parents and children as well as among siblings. On one hand, additional siblings indicate increasing housework and divided family resources and parental attention in the family, which often have an objective detrimental influence on children's development (Blake 1989; Lu and Treiman 2008). On the other hand, as active agents, siblings interact with each other and influence the family dynamics in multiple ways. Since childhood, children are sensitive to parental treatment and responsiveness, and siblings may compete with each other for parental favor. This sibling rivalry often causes pressure and motivates children to adopt distinct strategies to maximize their well-being in the family (Sullo way 1996, 2002). Meanwhile, it is also possible that siblings lend mutual support, develop close relationships and align with each other. The bonding among siblings could have positive impacts for their development in cognitive ability, personal skills (Downey and Condr on 2004), and academic performance. Therefore, I suggest that the examination of the sibling effects on individual outcomes should consider these two aspects simultaneously in order to achieve a better understanding of the function of sibling structure.

Two theoretical frameworks explain the effect of sibling structure on housework performance, the demand perspective and the socialization perspective. The demand perspective follows the resource argument, suggesting that additional children in the

family creates more household labor and children have to participate in the housework as there is not enough help in the household (Blair 1992a). The socialization perspective argues that housework is an important area of gender display, and because caretaking is core to women's sense of gender identity and not men's, girls are more likely to do housework than boys. In addition, elder children are often assumed to take care of the family than younger children, so they undertake more responsibility in household labor compared to same-gender younger siblings (Cogle and Tasker 1982; Robson 2004; Thrall 1978). Applying these two perspectives, I explain how sibship size, sex composition and birth order of siblings influence children's housework in the Chinese context in Chapter 2.

The study of sibling structure on educational outcomes could also be understood through these two mechanisms. The major theory in this area is the resource dilution theory (Anastasi 1956; Blake 1989). It argues that for a given level of family resources, sibship size is negatively related the average share of resources for each child. In Chapter 3, I propose another factor that impacts the learning environment and interactions among siblings in the family – siblings' education, and its mediation effects on the relationship between sibling structure (in particular sibship size and sibling sex composition) and educational attainment.

The need of maximizing one's share of resources in the family and the relevant adaptive strategies in this process also shape the development of personality, which further impacts personal tastes and preferences in occupational aspirations. The Darwinian evolutionary approach on birth order illustrates how sibling competition generates unshared microenvironment and the associated personality and social behavior for each child (Sulloway 1996). These microenvironments could be attributed to disparities in parental investment, niche partitioning, hierarchies among siblings, and sibling de-identification (Sulloway 2002). In Chapter 4, I discuss how these processes contribute to disparate personalities for individuals of different birth order ranks and

influence their career choices. Considering that a number of factors at both the contextual and individual levels might prevent people from attaining the “ideal” jobs in mind, I examine occupational aspirations rather than the actual occupations, because the aspirations are more directly related to personal tastes.

### Current Study

My dissertation will contribute to current scholarship in three major ways. First, sibling structure is identified as one of the key mechanisms in explaining gender inequality. Researchers explain gender inequality from numerous factors and deeply promote our understanding of the differential gendered outcomes from a variety of perspectives. As mentioned earlier, sibling structure is important in explaining many other behaviors and outcomes. Oddly enough, the literature on sibling structure is rarely discussed with the body of work on gender inequality. On one hand, most studies of gender inequality pay attention to adulthood experiences, such as interaction between males and females, stereotyped treatment in the labor market, and unequal division of household labor among couples. Few sociological studies address how childhood experience within the family shapes individual performance in adulthood<sup>2</sup>. In fact, although individuals mainly live with their siblings during childhood and adolescence, the influence of siblings does not fade as people grow up, but rather extends throughout the lifespan (Cicirelli 1982, 1995; Kahn and Lewis 1988; White 2001). The socialization and interaction perspectives suggest that childhood experiences with siblings are likely to impact individual’s gender identity, intellectual development, and personality characteristics, and these will affect other outcomes, such as devotion to family or career. Therefore, it is important to explore the role of sibling structure in gender inequality in

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<sup>2</sup> A number of psychological studies (such as Chodorow 1978; Irene Hanson Frieze et al. 1978) in Freudian tradition explore how infancy and childhood interaction with parents influences individual sex-role development, though with limited empirical support.

order to provide a comprehensive explanation of individuals' gender patterns in adulthood.

On the other hand, research on sibling structure does not often focus on sex differences in their studies, although the effect of sibling structure is different among males and females according to the limited literature that addresses gender variations. The inclusion of sibling configuration in the study of gender inequality provides a new perspective to examine the construction, maintenance, and perhaps weakening of the gender system, and bridges the gap between the two research fields. In my dissertation, I will examine the impact of sibling constellation on three major aspects of gender inequality, housework performance, education, and work, and therefore offer an explanation of the gendered outcomes from the lens of sibling configuration.

Second, both resource allocation and the socialization practices are examined in this dissertation. As Schulenberg and colleagues (1984) suggest in a review article, family context should be viewed as "a functioning whole" and it is necessary to consider both the structural features of the family and the family processes. In the past thirty years, although researchers have discussed massively on different theoretical frameworks in the operating of sibling structure in a variety of outcomes, the key issues in the study of sibling structure, as Steelman and colleagues (2002) point out in a review article, still centers on the flow of resources in the family. They call for more efforts to be directed towards understanding the means by which sibling structure exerts its effect. This study is conducted partly as a response to these suggestions.

I propose that for each child in the family, resources and opportunities are embedded to different extent in the sibling structure, which accompanies socialization practices among siblings. Siblings not only share (sometimes compete for) resources and opportunities in the family, but also interact with each other and exchange values and opinions. These two processes take place simultaneously and the neglect of either one may lead to misinterpretations of the effect of sibling structure. As mentioned earlier, the

influences of sibling structure upon different individual outcomes often operate through both mechanisms. Although some researchers have noticed the importance of resource and interaction among siblings (Blake 1989; Downey 1995; Lindert 1977), only a few have systematically examine these two processes together in various outcomes. The three studies in my dissertation provide a comprehensive understanding on how interaction and socialization practices among siblings mediate the relationship between the structural features of sibships and resources allocation in the family.

Finally, I provide a systematic examination of sibling structure in the three empirical studies. A major critique towards early studies on sibling structure is that the four factors of sibling structure (i.e., sibship size, sex composition, birth order and sibship density) are often correlated with each other and thus it is difficult to disentangle the effects of different factors (for example, Ernst and Angst 1983). For instance, higher birth order is sometimes found to be negatively associated with educational and occupational attainments (Black, Devereux, and Salvanes 2005). But at the same time, higher birth order is also closely related to large sibship size, and sibship size is also negatively related to those outcomes (Hauser and Sewell 1985). In this dissertation, I include relevant factors of sibling structure that might influence the other sibship variables and the outcome variables, so that the main effect could be determined. For example, in the second chapter, I examine sibship size, sex composition and birth order at the same time. In the third chapter, I examine all four factors, sibship size, sex composition, sibship density, and birth order (results not shown) in preliminary analyses. In the fourth chapter, I incorporate both birth order and sibship size in the models to predict the influence of birth order on occupational aspirations after accounting for sibship size. In this way, I could investigate the main effect of each sibling structure factor after controlling for other relevant factors.

## CHAPTER II. SIBLING STRUCTURE AND HOUSEWORK PERFORMANCE

### Introduction

In 1979, China enacted its one-child policy to curb population growth. Researchers have examined the effect of the policy on a wide variety of demographic, economic, and ideological issues. Fewer studies have explored the policy's potential impact on gender equality among children. The possibility for such impacts is real, however, since prior to the one-child policy most Chinese families had more than one child and, within multi-child mixed-sex families, sons are typically favored over daughters. Thus, by creating more only-child families, the policy may have inadvertently led to more equal treatment of sons and daughters within Chinese families (Fong 2002; Lee 2012).

A small set of recent sociological studies has explored the consequences of China's one-child policy on gender equality in one area of children's lives: education (Lee 2012; Tsui and Rich 2002; Veeck, Flurry, and Jiang 2003). As a whole, these studies indicate a significantly smaller gender gap in education among only-children compared to children in multi-child families, suggesting that the one-child policy has had gender equalizing effects on children's educational attainment. Time spent in unpaid housework is another important dimension of children's lives, one which is both highly stratified by gender and affected by, among other things, sibling structure. Has the one-child policy in China also led to more gender equality in children's housework time? This question motivates the current study.

Prior research suggests that sibling structure (measured by sibling size, birth order, and gender composition of siblings) is one important determinant of children's housework time. In general, studies find that children with more siblings spend more time on chores (Bianchi and Robinson 1997), older children do more than younger

children (Dammert 2009; Punch 2001), and the presence of sisters is negatively associated with housework and the presence of brothers is positively associated with housework (Emerson and Souza 2007; Lin and Adserà Forthcoming; McHale, Crouter, and Tucker 1999). Researchers theorize that these patterns are due to both demand processes (i.e., in one-child families there is less demand for child household labor than in multi-child families) and socialization processes (i.e., according to traditional gender roles, girls, not boys, are socialized to perform household chores and thus presence of a sister will be associated with less housework especially for boys ). Together, these studies suggest that in multi-child families of mixed-sex, older girls will do the most housework and younger boys will do the least (Edmonds 2006). Furthermore, the sex-gap in children's housework time should be smaller among singletons (i.e., only-boys compared to only-girls) than among children with siblings.

In this paper, I explore whether the one-child policy in China may have unintentionally created a family environment that fosters greater gender egalitarianism among children with respect to housework performance. More specifically, our study uses data from the 2006 wave of the China Health and Nutrition Survey to address two related research questions: (1) Does sibling structure influence children's housework performance in China? And (2) is the effect of sibling structure on housework performance different for girls and boys?

This study contributes to current scholarship in three important ways. First, I focus on sibling structure as a key mechanism in explaining children's housework performance. Sibling structure influences early childhood experience and shapes the family environment in which children are socialized. Sibling structure has been used to explain many important child and adult behaviors and outcomes (Heer 1985; Steelman et al. 2002). But in the study of children's housework, only a few studies have focused on sibling structure as a key explanatory variable. Our study will provide researchers in this

field with new findings on the relative importance of sibling structure in explaining children's housework participation.

Second, studies examining the division of housework among married couples often point to gender socialization throughout the life-course as an important explanation for why wives do more housework than husbands (Ferree 1991; Greenstein 1996). But little sociological research goes one step further and asks where the "appropriate" gender roles come from and how childhood experiences play a role in this process. In this way, the study of gender differences in children's housework performance is especially important in enriching researchers' understanding of gender differences in adult housework performance.

Third, our study is important because it indirectly explores how a national social policy directed at one area of family life - fertility - may affect another area of family life - gender equality among children, operationalized by boys and girls housework performance. China is an ideal locale to examine such a relationship because of the implementation of the one-child policy.

Our paper is organized as follows. First, I provide some historical background on gender inequality in China and the one-child policy. In the second section, I review two dominant theoretical perspectives, the socialization perspective and the demand perspective, used to explain children's involvement in housework. I discuss how sibling structure fits within these theoretical frameworks. Next, I discuss the data and method used in our analysis, followed by the presentation of our results. Finally, I provide several broad implications of our findings.

## Background

### Gender Inequality and the One-Child Policy in China

Gender inequality is rooted in traditional Chinese culture because of the cultural model of patrilineality (Chu and Yu 2010, 1–2). According to this model, sons are



expected to fulfill their filial duty, inherit their parents' property, and care for their parents in their old age. Daughters are not considered to be true descendants of their parents; rather they are seen as others' future wives. These differences in sons and daughters adult roles lead to differences in the way boys and girls are raised as children. Boys are provided with more educational opportunities than girls so that they will be able to eventually financially support their elderly parents. Girls are taught to cook and clean so that they will be able to take care of their own families after marriage.

The Communist Revolution of 1949 promoted a new cultural model of gender egalitarianism in China. Women were encouraged to receive education and participate in the labor force. But the deep-rooted patriarchal culture did not change overnight. Boys still had higher status, as reflected in the strong son preference permeating throughout Chinese society, especially in rural or underdeveloped areas (Gu and Li 1995).

In 1979, the one-child policy was introduced to promote modernization by controlling China's burgeoning population and reducing strain on scarce resources. Officially known as the "family planning policy" (*Jihua shengyu zhengce*), it dictates that a couple is allowed to have one child. There are a number of exceptions to this general ruling. For instance, couples are permitted to have a second child if (1) they are minorities, (2) they live in a rural area and have one daughter, (3) they have one child with a disability, or (4) if both husband and wife are only children (National Population and Family Planning Commission of China 2001). Since 1979, China's total fertility rate dropped from 2.74 to 1.61 children per woman in 2009, one of the fastest fertility reductions in human history (World Bank 2012b). China's per capita GDP also grew dramatically over this period, and at a significantly higher rate than in the United States or Europe (World Bank, 2012).

The implementation of the one-child policy in a country with a traditional male-preference culture has exacerbated gender inequality in some ways. Perhaps most dramatically, it has resulted in millions of "missing girls" as a result of parents' use of

sex-selective abortion (Hull 1990). Conversely, some researchers offer that the one-child policy has improved gender equality in Chinese society by freeing women to enter the labor force and take advantage of high-paying employment opportunities (Fong 2002). That is, with fewer children to care for, Chinese women are more able to invest in their careers and increase their earnings, and, by doing so, improve their status and power within the family.

China's one-child policy has also had led to more gender equality among children, specifically in the area of education (Lee 2012; Tsui and Rich 2002; Veeck, Flurry, and Jiang 2003). The policy increased the number of singleton girls raised in Chinese society, and these singleton girls benefit more than girls raised in multi-child families because they receive *all* their parents' attention and resources, which would otherwise be shared by multiple children and/or mostly be directed at sons. For instance, in a study of eighth graders, Tsui and Rich (2002) find that female and male only-children who were born in 1984-85 do not differ from each other with respect to parental investment, educational aspirations, mathematical performance, and other educational outcomes. In another study, Lee (2012) analyzes nationally representative Chinese data and finds that the one-child policy has inadvertently improved the educational opportunities of female singletons, and thus contributing to gender equality in education.

Because of the increasingly equal emphasis on education for both singleton girls and boys (Lee 2012), parents may be more likely to treat singleton girls and boys similarly in other areas, such as assignment to housework chores. Thus, it may be the case that girls and boys in single-child families are also more similar with respect to housework performance than girls and boys in multi-children families.

### Theories of Children's Housework Performance

In this section, I review two theoretical perspectives, socialization and demand, which are used to understand children's involvement in housework (Blair 1992a; Gill

1998). Many of the studies reviewed in this section are based on data from the U.S. and Western Europe, but the theories are applicable to Chinese society as well.

The socialization perspective views housework as an opportunity for children's exposure to and internalization of cultural norms, expectations, and habits necessary for their future development. Parents believe that doing chores improves children's character and the cultivation of responsibility, and thus contributes to their overall development (Thrall 1978). For example, in their study of 790 Nebraska parents, White and Brinkerhoff (1981b) report that "developmental" is the most frequently mentioned rationale for children's involvement in housework. Given the emphasis on children's development, parents are likely to assign household tasks to children even when they could do the chores themselves. Furthermore, this perspective suggests that, over time, children will do chores out of habit without explicitly being told to.

Parents socialize their children according to their gender and age, and thus gender and age of children are the two most important factors in determining the amount of chores that children perform (Cogle and Tasker 1982; Robson 2004). According to a meta-analysis of 172 studies, household chores, together with play activities, are the only socialization areas in which both parents treat girls differently from boys (Lytton and Romney 1991). Housework is traditionally associated with feminine qualities like patience and nurturing, and as a result, on average girls do more housework than boys (Antill et al. 1996; Crouter, Manke, and McHale 1995; Larson and Verma 1999). The sex-typing of chores is consistently found in countries with various cultural and economic backgrounds, such as in the U.S. (Cogle and Tasker 1982), Bolivia (Punch 2001), Nepal (Edmonds 2006), and China (Xu and Minca 2008). In addition to gender socialization, children are also socialized according to their age. Older children are more capable and thus expected to do more housework in both Western and non-Western settings (Bonke 2010; Dammert 2009; Evertsson 2006; Punch 2001). For example, using a national representative sample in the U.S., Blair (1992b) found that a one year increase in

children's age is associated with an additional 15 minutes per week spent on housework. And among Nigerian girls, time spent on housework increases from 1.9 hours per day at age 6-9 to 2.5 hours per day at age 10-15 (Robson 2004).

The second perspective, the demand perspective, emphasizes the "pragmatic" dimension of housework distribution (Blair 1992a). This perspective suggests that children's involvement in chores is mainly due to the mismatch between parents' limited time and the overwhelming demand of household labor. Today, most parents view their children not as unpaid labor, but as "priceless" love objects (Zelizer 1994). Parents typically assign children housework when they do not have enough time and energy to complete the housework on their own. Under this rationale, children participate in housework only when they are called upon, and hence their housework performance is likely to fluctuate depending on family circumstances compared to children who have been intentionally socialized to take the responsibility of household.

Family size is an important factor influencing demand. Additional young children typically increase the amount of housework to be done, and thus increase the demand for (older) children's housework time. Additional adults typically decrease demand, but the work status and health of these adults is also important (e.g., elderly adults may increase the need for children's assistance with housework). For example, dual-earner and single-parent families are more likely to assign chores to children because "parents need help" (White and Brinkerhoff 1981b).

The two theories are not necessarily contrary to one another, but instead may be viewed as complementary. The socialization perspective suggests that parents assign children housework to develop age and gender appropriate roles. The demand perspective is a structural framework and posits that parents' allocation of housework to children is due to need. Thus, parents may assign children housework because they want to socialize them into appropriate roles *and* they need children's help. For example, maternal employment often indicates an increased need for children's housework assistance

(demand perspective), but the assignment of these tasks is likely not to be gender neutral (socialization perspective) (Gager, Cooney, and Call 1999).

Additionally, I expect that both socialization and demand perspectives are important in determining housework time, but I think that the relative importance of each differs for girls and boys. I expect girls' housework performance to be more influenced by socialization than demand, because doing household tasks are traditionally seen as women's work and a necessary skill as a future wife and mother in China. Girls are supposed to perform housework even when they are not called upon or there are others in the household who *could* do the housework. In the same vein, I expect the demand perspective to be more suitable in predicting boys' housework time.

#### Sibling Structure and Children's Housework Performance

Sibling structure refers to four factors: number of siblings, sex composition, birth order, and the spacing of siblings (Steelman et al. 2002). Very few studies examine the effect of sibship spacing on children's housework time (for an exception, see Edmonds 2006), and so I do not focus on this characteristics in our study. In this section, I discuss how the first three sibling structure characteristics - number of siblings, sex composition, and birth order - are likely related to children's housework performance via the socialization and demand perspectives.

I begin with sibship size. From the demand perspective, more children in the household leads to more housework. A number of previous studies have found that sibship size is indeed positively associated with housework time among children. For instance, based on a random sample of Californian children, Bianchi and Robinson (1997) report that an additional child is associated with 14 additional minutes per day spent on housework, regardless of gender. Girls' housework time is often found to be more responsive to family size than boys' because of the extra time girls spend taking care of their younger siblings. Gager and colleagues (1999) show that girls in larger

families spend approximately 5 more hours per week than their male peers under the same circumstances. Using data from Nepal, Edmonds (2006) explores the relationship between sibship size, birth order, gender and housework, and finds that the workloads of older girls in the household increases with the number of younger siblings, but number of younger siblings has no influence on older boys' time spent on domestic work.

Sex composition of siblings is another important part of sibling structure.

According to the socialization perspective, children with opposite-sex siblings experience more sex stereotyping in housework compared to those with same-sex siblings, because parents assign chores according to traditional gender roles (Brody and Steelman 1985). This would suggest that girls will do more housework if they have brothers, and boys will do less housework if they have sisters. According to the demand perspective, having sisters will lead to less housework compared to having brothers since girls create a smaller amount of net housework compared to boys.

These hypothesized relationships are supported by empirical research. For instance, a longitudinal study of 144 young adolescents (ages 9-11) in the U.S. reveals that children are more likely to accept traditional gender role ideology and participate in gender-typical household chores in contexts with a younger, cross-sex sibling (Crouter, Manke, and McHale 1995). Webbink and colleagues (2012) find that in 16 developing countries, girls' time spent on domestic work increases in the presence of brothers, but not in the presence of sisters; boys' housework time increases more in the presence of brothers and less in the presence of sisters.

Birth order is another important factor predicting children's housework participation. As aforementioned, children are socialized into appropriate gender roles as they age. In multi-child families, parents expect older siblings to undertake more responsibility and become role models for their younger siblings. The demand perspective suggests younger children are less capable of performing housework, and

thus they produce more net housework relative to older children. Therefore, older children are more likely to do housework compared to younger children.

A number of empirical studies find that early-borns do more housework than the later-borns of the same gender, but this pattern only applies to girls (not boys) (Antill et al. 1996; Dammert 2009; Punch 2001). Dammert (2009) finds that older sisters engage more in domestic work than their younger sisters in Guatemalan and Nicaraguan households. Punch's ethnographic study (2001) shows that in rural Bolivia older children are assumed to acquire the competence, physical ability and responsibility to do different housework. They gradually abandon their "younger" and easier jobs (such as fetching water or firewood) and perform more physical demanding and skillful jobs (such as plowing and making dishes for the whole family). But Bianchi and Robinson (1997) find that being a first-born child is not associated with children's housework time after controlling for sibship size.

Taken together, I expect that singletons will do less housework compared to same-gender children with siblings (the sibling size hypothesis). Among those with siblings, I expect brothers to be positively associated with housework time and sisters to have a weak or non-significant association with housework time (the sex composition hypothesis). Finally, I expect earlyborns to do more housework than laterborns (the birth order hypothesis).

### Mother's Education and Children's Housework

#### Performance

In addition to sibling structure, parents' characteristics also likely play a role in determining children's housework performance. In this section, I examine one important parental characteristic, mother's education, and describe how it may influence children's housework.

In societies where fertility decision making is a more personal behavior, parental characteristics are often directly related to family size. Highly educated parents often prefer fewer children and have more egalitarian gender ideology (Bolzendahl and Myers 2004). This scenario is not completely applicable to China because the fertility decision is restrained by the policy. Parental socioeconomic status may not be the determinant of family size since a large number of families, regardless of parental characteristics, have only one child. Thus, the relative significance of the parents' characteristics on children's housework in China is likely to be different than that in other countries.

Mother's educational level is an important factor influencing children's housework performance in the Chinese context for three reasons. First, in developing societies, mothers' education is more important than fathers' education in affecting children's, especially daughters', outcomes (Kurosaki et al. 2006; Mukherjee and Das 2008; Warrington and Kiragu 2012). Highly educated mothers are more likely to have an egalitarian gender ideology, to value education, and to help children with their schoolwork. Empirical studies in developing countries show that children with a highly educated mother are less involved in child labor (both paid and unpaid) and more likely to achieve higher levels of education (Mukherjee and Das 2008; Warrington and Kiragu 2012).

The evidence on the effect of father's education, on the other hand, is quite mixed. Some research finds that fathers' educational level has a negative impact on daughters' educational attainment and is positively related to their participation in housework, because fathers with higher education provide families with more resources to funnel towards their sons (Kurosaki et al. 2006). But some studies find that father's education is equally important as mother's education in children's educational achievement (Huisman and Smits 2009; Smits and Hoşgör 2006). The contrary findings could be attributed to the specific cultural environment and overall educational level in each country.



Second, the importance of mother's role is amplified in the Chinese context where education is highly emphasized. Viewed as the primary way in Confucianism to achieve a better self and to improve social solidarity, education is highly valued in Chinese culture (Gu 2006). Highly educated mothers are more likely to undermine the developmental rationale of housework compared to education. The one-child policy justifies singleton girls as legitimate descendants. Thus, parents, mothers in particular, may encourage the education of daughters as much as the education of sons, while discourage their housework involvement. In multi-child households, mothers with higher education might veer away from assigning domestic work to the older girls and instead assign housework more equally among all children. In this way, each child's educational opportunities and benefits are maximized.

Third, due to the high female labor force participation rate in China (in 2006, 88% of women aged 25-64 were employed), mother's education is likely to be more sensitive than maternal employment in influencing children's housework time. During the process of market reform, the massive labor-intensive industries provided numerous employment opportunities for workers of all educational levels. Therefore, in China women's improvement in education serves a better signal of empowerment than employment and in this sense I suggest mother's education has a bigger effect than women's employment on children's housework performance.

### Method

#### Data

In this study, I use the 2006 wave of China Health and Nutrition Survey (CHNS, data available at <http://www.cpc.unc.edu/projects/china>) collected by the Carolina Population Center at the University of North Carolina at Chapel Hill and the National Institute of Nutrition and Food Safety at the Chinese Center for Disease Control and Prevention. The CHNS is an ongoing longitudinal survey of individuals, households and

communities in nine provinces in China. It follows a multistage, random cluster sampling design.

I use three parts of the CHNS in this study: the household survey, the adult survey and the child survey. The household survey is filled out by the head of the household, and collects basic information on the household and changes in the family members living in each household since the last survey (for our purposes, the 2004 survey). The loss of household members, due to death or an adult child moving away, and the gain of household members, through marriage and childbirth, are all recorded in the household survey. The adult survey is answered by all household members aged 19 and older, and contains demographic information, work activities, housework time, etc. The child survey is filled out by all children aged 10-18 currently living in the household. If the child is under age 10, a parent answers the questionnaire for her/him.

### Sample

I merge all three surveys using the household identifier. Our unit of analysis is the child and the base sample includes 1,954 children. A number of families have more than one child. The inclusion of all children from each household would over-represent households with multiple children. Thus, for multi-child households, I select the oldest child (18 years old or younger) to be in the sample. Because the CHNS only asked children aged 6 and older questions about household chores, I exclude any child younger than 6 from our sample. Additionally, since children from single-parent families are likely to do substantively more chores than children from two-parent families (Gager, Cooney, and Call 1999), I exclude approximately 300 children who live with only one parent.

As a result of these sample restrictions, nearly all of the children from multi-children households are either (1) the oldest child whose younger sibling(s) lives in the household or (2) the youngest child whose older sibling(s) do not live in the household. A

small number ( $n = 36$ ) of children in the sample do not fall into either category. In these cases, the child has (1) an elder sibling(s) living in the household, (2) a younger sibling(s) not living in the household, or (3) both an older sibling(s) not living in the household and a younger sibling(s) living in the household at the same time. Because the number of children living in these more complicated sibling structures is so small, I exclude them from the sample in order to simplify the analysis. Finally, I excluded cases with missing data on the variables used in our analysis. The final analytic sample consists of 733 children aged 6 to 18 (see Table A1 of Appendix for details on sample creation).

## Variables

### Dependent Variable and Main Independent Variable

In the survey, children are asked whether or not they did the following chores during the previous week: (1) preparing and cooking food for the household, (2) washing and ironing clothes, (3) cleaning the house, and (4) buying food for the household. I decided to focus on the first three tasks as they are typically the most time consuming and need to be performed more frequently. For each task, if a respondent indicated that he/she did the chore, he/she was then asked to provide the average time spent on each task per day in minutes. Because about 71 percent of the children in our sample report no time on any of the three chores, I decided to measure our dependent variable – *child's participation in housework* – as a dichotomous variable (1= yes, 0 =no) instead of a continuous one. To be clear, I code this variable as “1” if the child spends time performing *any* of the three tasks (i.e., cooking, laundry, or cleaning).

Our key predictor variable is sibling structure. First, I create a measure of sibship size by categorizing siblings into two groups: *singletons* and *children with siblings*. Next, I identify birth order for children with siblings, distinguishing between two types: the *youngest* child (whose older sibling(s) is not living in the household) and (2) the *oldest*

child (whose younger sibling(s) is living in the household). Third, I classify the gender of each sibling for children with siblings, identifying each as a *brother* or *sister*.

Following Short and colleagues (2001), I then specify three dummy variables based on the number and sex of siblings for children with siblings. The three dummies are: *one brother*, *one sister*, and *two or more siblings*. The group of children with two or more siblings is too small to further identify the sex composition of the siblings. As a result of these various classifications, I have a final set of seven dichotomous variables: (1) *singleton*, (2) *one older brother*, (3) *one older sister*, (4) *two or more older siblings*, (5) *one younger brother*, (6) *one younger sister*, and (7) *two or more younger siblings*.

For singletons, I expect low levels of socialization and demand. For children with an older sibling(s), I expect high levels of socialization due to their experience of living with sibling(s), and low levels of demand since they are currently the only child in the household. For children with a younger sibling(s) in the household, I expect high levels of socialization and high levels of demand due to the presence of sibling(s). It is important to note that for boys, a high level of “socialization” means less housework, whereas for girls it means more housework.

### Control Variables

*Child's age* is a continuous variable measured in years. I expect age to be positively associated with the likelihood of doing housework. Because child's educational level is strongly related to child's age, I measure education with a dummy variable, *schooling*, which simply indicates whether the child is currently attending school. Because attending school occupies a large amount of children's time, I expect school attendance to be negatively associated with the likelihood of doing chores.

I capture parental influence through several variables, measuring mothers' and fathers' *age*, *time spent on housework* (minutes/day), *hours worked per day*, and *years of completed education*. Parents' time spent on housework is measured in the same way as

children's time on housework. I expect parents' housework time to be negatively associated with child's housework participation. Hours worked per day is a continuous measure and is set equal to 0 for those who are not currently working at the time of the survey. I expect parents' (especially mothers') paid work hours to be positively associated with child's (especially girl's) involvement in housework. Years of completed education is calculated from the question, "How many years of formal education have you completed in a regular school?" I expect that parents with higher education will focus more on children's education and discourage children's housework participation. Also, when household labor demand increases, highly educated parents are expected to have less gendered division of labor among children.

Finally, I control for three variables at the household level: *rural/urban status*, *number of other adult family members in the household*, and *household income*.

Rural/urban status is measured by a dichotomous variable (1=urban, 0 = rural). There are systematic differences between urban and rural life that are associated with housework time. Many of these differences are already controlled for in our models, such as number of siblings, school attendance and parental socioeconomic status. But there are other potentially important differences for which I do not have direct measures in our data. For example, rural parents are more likely to embrace traditional gender role attitudes compared to urban parents (Shu 2004), and thus rural girls may be more likely to do housework than urban girls. It is important to note, however, that our dependent variable is the likelihood of doing *any* housework, not the time spent in housework. Thus, it may be the case that children in urban families are more likely to do at least some housework compared to children in rural settings, because they are more likely to have modern appliances which make doing housework easier and less complicated.

Our control variable measuring "number of other adult family members" refers to all adult members living in the household in 2006 except the parents. Because many Chinese families are extended families, including not only parents and children but also

grandparents and other relatives, controlling for this variable enables us to account for additional sources of housework demand and housework supply. Depending on the age and gender of these other household members, this variable could be positively associated with child's housework time (i.e., these member create additional housework to be done by the children), or it could be negatively associated (i.e., they are responsible for part of the housework).

Household income is included to control for class differences. The relationship between household income and children's housework is not clear *a priori*. On one hand, the relationship may be positive if higher income raises the standards of cleanliness and cooking and increases the amount of household tasks needed to be done. On the other hand, income may be negatively related to children's housework if families with high income are more likely to hire outside help and use modern appliances. High-income families may also place a higher priority on their children's education and thus want them to use their non-school time on schoolwork, not housework. I take the natural logarithm of household income to correct for the right skewness.

### Methods

To begin, I present descriptive statistics for all variables in our analyses, separately for girls and boys. Next, I predict a child's likelihood of doing housework as a function of sibling structure and our control variables. Because our dependent variable is binary, the models are estimated using logistic regression techniques. I estimate four models in total.

To answer our two research questions (i.e., Does sibling structure influence children's housework performance? Is the effect different for girls and boys?), I estimate four models separately for boys and girls. Models 1 and 2 include a dummy variable indicating whether or not the child is a singleton; these models will tell us whether singletons are less likely to do chores compared to children with siblings. Model 1

includes all of the control variables except mother's education, and Model 2 contains the complete set of controls. I estimate the models with and without mother's education because I expect it to be strongly associated with sibling structure (i.e., only-child versus child with siblings) and children's housework performance. Models 3 and 4 replace the dichotomous indicator "singleton (yes/no)", with the six dummy variables characterizing the sibling structure for children with siblings. These dummy variables indicate the number of siblings (1 versus 2+), the sex composition of siblings (brother versus sister), and the birth order (oldest versus youngest).

## Results

### Descriptive Statistics

Table 1 shows the descriptive statistics for our analytic sample. I show statistics for the sample as a whole and also separately by gender. I also perform a t-test to determine if there are significant gender differences on the key variables in our analysis. Results show that girls are significantly more likely to do housework than boys; 37 percent of girls report doing any housework whereas only 21 percent of boys do. Among those who report *any* housework, girls spend about 10 more minutes on housework per day than boys.

Next, I discuss the sibling structure of the children in our sample. Approximately 50 percent of the children in the sample are singletons. Among children with siblings, the majority (85 percent) has one sibling and the minority (15 percent) has more than one sibling. There are some interesting gender differences in sibling structure. Boys are significantly more likely to be singletons compared to girls (56 percent versus 45 percent). Additionally, boys are significantly more likely to have older sisters, and girls are significantly more likely to have younger brothers. These gender differences in sibling structure are likely due to the strong "son preference" in China. Families want a son, and will be more likely to have additional children if their first child is a girl.

**Table 1. Descriptive Statistics for All Variables, by Gender, CHNS 2006**

	All		Girls		Boys		T-test
	Mean	S.D.	Mean	S.D.	Mean	S.D.	
<b>Child's Participation in Housework</b>							
Perform any housework (1=yes, 0=no)	0.29	0.45	0.37	0.48	0.21	0.41	23.55***
Time spent on housework (min/day), among those who report any housework	34.15	29.78	38.09	32.65	27.94	23.45	2.44*
<b>Sibling Structure</b>							
Singleton (1=yes, 0=no)	0.50	0.50	0.45	0.50	0.56	0.50	8.89***
Older sibling(s) (not currently living in household)							
1 brother	0.09	0.29	0.10	0.30	0.08	0.28	0.58
1 sister	0.13	0.33	0.10	0.30	0.15	0.36	4.32*
2+ siblings	0.05	0.21	0.04	0.20	0.05	0.21	0.04
Younger sibling(s) (living in household)							
1 brother	0.13	0.33	0.20	0.40	0.06	0.24	32.50***
1 sister	0.08	0.27	0.07	0.26	0.08	0.28	0.26
2+ siblings	0.03	0.17	0.04	0.19	0.02	0.14	1.91
<b>Child's Characteristics</b>							
Age	12.25	3.35	12.14	3.34	12.34	3.36	-0.81
Currently in school	0.91	0.29	0.93	0.25	0.89	0.31	1.94+
<b>Mother's Characteristics</b>							
Time spent on housework (min/day)	132.68	68.78	133.59	69.81	131.88	67.94	0.34
Age	37.91	5.43	38.00	5.77	37.84	5.11	0.39
Hours worked per day in labor market	5.14	3.73	5.14	3.73	5.14	3.73	-0.01
Years of education	8.41	3.28	8.57	3.41	8.28	3.17	1.19



**Table 1. Continued**

	All		Girls		Boys		T-test
	Mean	S.D.	Mean	S.D.	Mean	S.D.	
<b>Father's Characteristics</b>							
Time spent on housework (min/day)	21.34	38.66	20.40	36.35	22.16	40.63	-0.62
Age	39.51	6.06	39.66	6.35	39.38	5.80	0.62
Hours worked per day in labor market	6.57	3.22	6.57	3.16	6.57	3.27	0.00
Years of education	9.34	3.02	9.39	3.09	9.29	2.96	0.45
<b>Household Characteristics</b>							
Household registration status (1=urban, 0=rural)	0.41	0.49	0.42	0.49	0.39	0.49	0.51
Number of other adult family members living in household	0.52	0.82	0.52	0.82	0.51	0.82	0.19
Household income (in 1,000 <i>yuan</i> )	28.59	39.15	28.74	28.24	28.46	46.81	0.10
<b>N</b>	733		345		388		

Notes: p-value \*\*\* p<0.001, \*\* p<0.01, \* p<0.05, + p<0.1. For dummy variables, I calculated a chi-square test in place of a t-test.

The values for the control variables for the boys and girls in our sample are very similar. Children in our sample are, on average, 12 years old and approximately 90 percent of them are currently enrolled in school. Mothers are 38 years old, on average, and have approximately 8 years of education. On average, mothers spend nearly 2.5 hours per day on housework and about 5 hours per day in paid work. Fathers are about 2 years older than mothers (40 years old) and have slightly more education than mothers (a little over 9 years). Fathers spend significantly less time in housework than mothers

(about 20 minutes), but slightly more time in paid work (about 6.5 hours per day). Finally, about 40 percent of the sample lives in an urban area, about half of the children live with other adult family members, and the average household income is 28,000 *yuan* (about \$4,400).

### Regression Results

Table 2 shows the results of the first part of the regression analysis. The results are logistic regression coefficients, and thus are not easily interpretable. To make the results more meaningful I translate the coefficients into predicted probabilities, after I discuss the statistical significance of the coefficients.

Model 1 shows that singletons are significantly less likely to do housework compared to children with siblings (see Table 2). This is true for girls and boys. Although not shown in the table, a number of our control variables are statistically significant. For instance, I find that as a child ages, he/she is more likely to do housework. Furthermore, our results suggest that urban children do less housework than their rural counterparts. For boys, our results suggest that the more time a mother spends on housework, the lower the likelihood is that her son will do housework. The same is not true for girls, as I find no relationship between mothers' paid work hours and daughters' housework performance. This finding contradicts some research on children's housework in Western societies, which suggests a negative association between mother's work hours and girls' housework performance (reviewed in Bonke 2010).

I used the sex-specific coefficients from Model 1 for the predicted probabilities shown in Figure 4. The predicted probabilities are calculated for an "ideal type": the child attends school, lives in a rural area, and lives without other adults in the household; his/her mother does 2 hours of housework per day and works 5 hours per day in the labor market; his/her father spends a quarter of an hour (16 minutes) per day on housework and

**Table 2. Logistic Regression Results Predicting Children's Participation in Housework (Singletons vs. Others), CHNS 2006**

Variables	Girls				Boys			
	Model 1	Model 2	Model 3	Model 4	Model 1	Model 2	Model 3	Model 4
<b>Sibling Structure</b>								
<b>Singletons</b>	-0.682*** (0.263)	-0.543** (0.269)	Reference Category		-0.510* (0.279)	-0.390 (0.287)	Reference Category	
<b>Children with siblings</b>	Reference Category				Reference Category			
Older sibling(s)								
1 brother			0.707* (0.417)	0.561 (0.423)			0.203 (0.499)	0.073 (0.513)
1 sister			-0.189 (0.452)	-0.379 (0.466)			0.211 (0.393)	0.052 (0.412)
2+ siblings			1.640*** (0.614)	1.324** (0.638)			0.608 (0.568)	0.448 (0.603)
Younger sibling(s)								
1 brother			0.933*** (0.338)	0.827** (0.342)			1.354*** (0.495)	1.481*** (0.506)
1 sister			0.473 (0.489)	0.418 (0.490)			0.365 (0.492)	0.200 (0.500)
2+ siblings			1.128* (0.655)	1.068 (0.667)			1.424* (0.812)	0.976 (0.858)

**Table 2. Continued**

<b>Variables</b>	<b>Girls</b>				<b>Boys</b>			
	Model 1	Model 2	Model 3	Model 4	Model 1	Model 2	Model 3	Model 4
<b>Mother's Education</b>		-0.110*** (0.042)		-0.110** (0.044)		-0.197*** (0.046)		-0.208*** (0.048)
<b>Constant</b>	-1.559 (1.272)	-1.406 (1.292)	-2.905** (1.388)	-2.668* (1.412)	-2.804** (1.278)	-1.800 (1.386)	-3.347** (1.315)	-2.300 (1.437)
<b>N</b>	345	345	345	345	388	388	388	388

Notes: p-value \*\*\* p<0.001, \*\* p<0.01, \* p<0.05, + p<0.1. Standard errors in parentheses. Controls included in all models. Father's education is omitted due to multicollinearity.

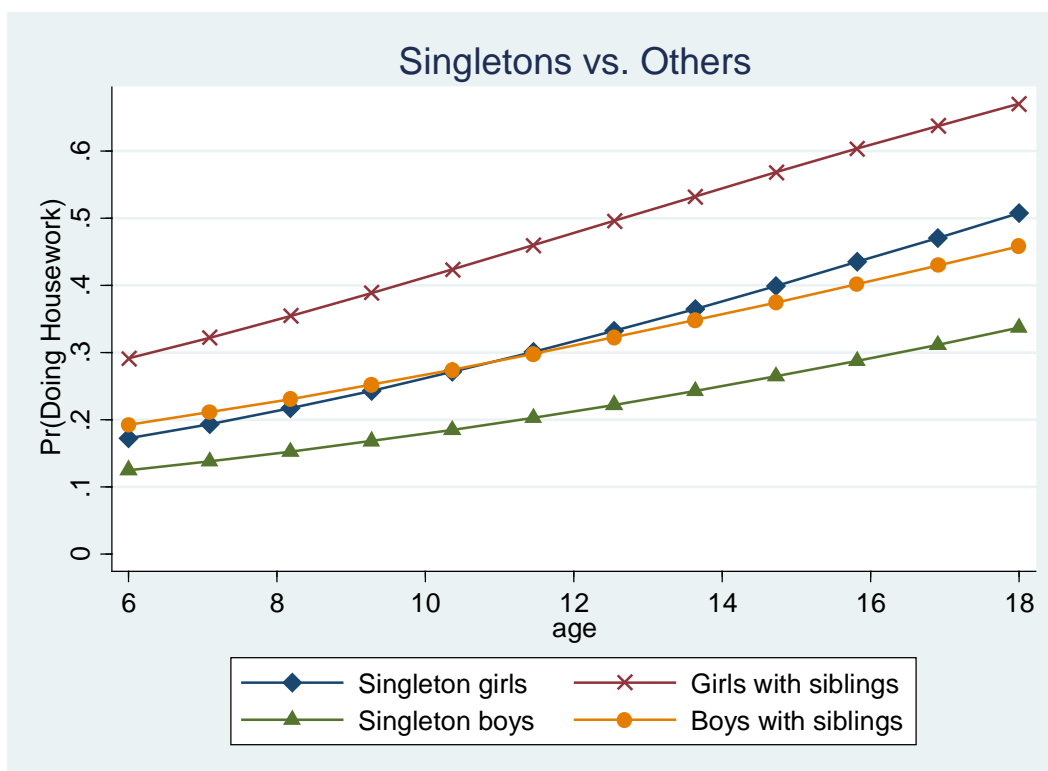
6 hours per day in the labor market. The rest of the variables (including household income and mother's and father's age) are held at their mean. I then calculate the predicted probabilities for four groups of children as age varies from 6 to 18: singleton girls, girls with siblings, singleton boys, and boys with siblings. Results are shown in Figure 4.

Figure 4 shows a clear gender gap in children's housework performance: girls, on average, are more likely to do chores compared to boys, net of the control variables. The gender gap in housework varies from 5 to 20 percentage points, and becomes larger as children get older. For both boys and girls, having a sibling leads to more housework. The "sibling gap" is wider for girls (blue versus red) than for boys (green versus yellow), indicating that girls' housework performance is more influenced by the presence of siblings.

In Model 2, I include a control for mother's education. As expected, mother's education is negatively associated with children's housework involvement, and this relationship is stronger for boys compared to girls. The coefficient for "singleton" weakens in magnitude in both the girls' and boys' models, and becomes insignificant in the boys' models. The rural-urban coefficient also loses significance after controlling for mother's education (results not shown). To explore this dynamic further, I calculated correlation statistics between mother's education, residence (rural/urban), and sibling structure. Mother's education is positively correlated with living in an urban area, is positively correlated with having only one child (i.e., child is a singleton), and is negatively correlated with children's housework time. Thus, when mother's education is included in the model, the influence of both of these variables – rural/urban residence and sibling structure - weakens.

Models 3 and 4 (see Table 2) further illustrate the effect of sibling structure on children's housework, by specifying the child's birth order and sex composition of siblings, among those children with siblings.

Model 3 shows that girls with one sister (either younger or older) are not significantly more likely to do housework compared to singleton girls. Having a brother (either younger or older), on the other hand, significantly increases girls' probability of doing housework. Boys with siblings are more likely to do housework compared to singleton boys only when they live with a younger brother or have more than one younger sibling. In these cases, boys might be prompted to do housework because there is substantial additional housework created by the younger siblings and there are no sisters (or not enough sisters) to do it. Unlike girls, as boys become the *de facto* only children in the household, their housework performance is no different from singleton boys.

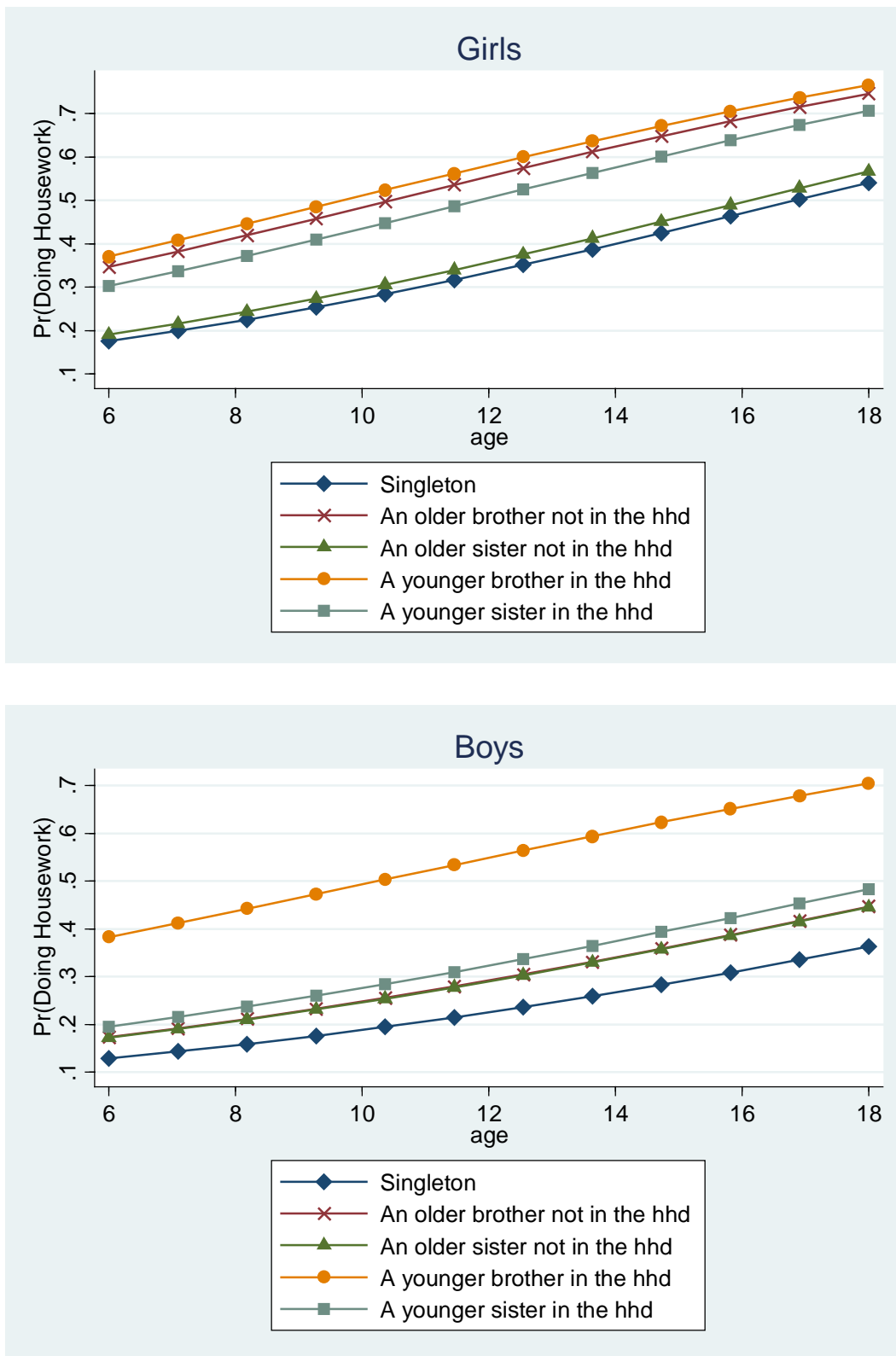


**Figure 4. Predicted Probabilities of Children's Participation on Housework (Singletons vs. Others, by Gender)**

Figure 5 presents the predicted probability of housework performance based on the results in Model 3. For simplicity purposes, children with two or more siblings are not shown. Panel 1 shows the results for girls and panel 2 shows the results for boys. For girls, panel 1 show that having a brother (regardless of birth order) substantially increases girls' probability of doing housework. The presence of a younger sister at home also increases the likelihood of doing chores compared to having no siblings. Having an older sister is not substantively different than being an only child.

Panel 2 shows that, among boys, having a younger brother in the household (and no sisters) significantly increases the likelihood of performing housework. At age 18, boys living with a younger brother have a 70 percent chance of doing housework, much higher than boys in the other four groups.

The inclusion of mother's education in model 4 results in two major changes. First, the presence of an older brother has a weaker influence on children's housework performance. For girls, the coefficient becomes smaller (from 0.71 to 0.56) and loses significance, indicating that girls with an older brother are not significantly different from singleton girls when it comes to housework performance, after mother's education is controlled. Second, the effect of living with multiple siblings also weakens after mother's education is controlled. The coefficients decrease and lose significance for both girls and boys, meaning that are not significantly different from their singleton peers in terms of housework performance when mothers' education is constant. It is possible that highly educated mothers may be inclined to divide housework equally among boys and girls in multi-child households, rather than reinforce traditional gendered division as early study (for example, White and Brinkerhoff 1981a) suggests.



**Figure 5. Predicted Probabilities of Children's Participation on Housework**



### Discussion

In this paper, I explore the relationship between sibling structure and children's housework performance in China. Our results show that on average, singletons are significantly less likely to do housework than same-gender children with siblings. A larger sibship size creates additional chores, but does not necessarily introduce an equal division of household labor among children.

Our results suggest two different and often intertwining rationales, socialization and demand, underlying housework division among children with different sibling structures. Singletons on average have a lower chance of doing housework because (1) parents cannot divide housework between sons and daughters, and singletons do not interact with opposite-sex siblings, which often strengthens traditional gender roles (socialization); and (2) one child often creates less housework and parents are able to manage the additional chores on their own (demand). Gender socialization is also evident when I compare singleton girls versus singleton boys. Singleton girls, though lower than girls with siblings, still have a higher probability of doing housework than singleton boys. I suspect this is due to the fact that housework is a crucial location for displaying gender and socializing children according to gender-appropriate norms. Despite the lower need of household labor in one-child families, girls are often assumed to be mother's helpers while boys are likely to be exempt from such responsibilities. Although I could not directly measure the attitudes of parents and other adults in the households, our results show that the likelihood of boys' (but not girls') housework participation decreases as mothers' time spent on housework increases. Considering that there is no evidence showing that girls create more housework than boys, it is very possible that for girls, the symbolic meaning of housework performance matters more than the actual labor girls put in it.

Children tend to be raised in a less gendered way in terms of housework in families with same-sex children. On average, in two-child families, girls with a sister are

less likely to do housework than those living with a brother. This suggests that two girls may both do chores and help out each other, but this may not strengthen the traditional gender roles. For girls with an older sister moving out, their likelihood of doing housework is the lowest compared to girls in other types of multi-child families. Boys' probability of doing chores is higher when they have a brother. For boys with a younger brother, their probability is the highest among boys with sibling. This is consistent with previous studies that find when in two-boy families, parents cannot assign housework according to the traditional gendered division and thus the older boy has to undertake more responsibility.

Among same-sex siblings where the effect of gender is undermined, birth order plays a more important role in determining housework performance. For both girls and boys, earlyborns do more housework than laterborns. The probability of doing chores at age 18 is very similar between elder boys with a younger brother (67 percent) and elder girls with a younger sister (68 percent), holding all else constant. This is consistent with previous research on the personalities of firstborns, who are often socialized to be more nurturing and caregiving than their younger siblings (Brody 1998). Compared to their younger same-sex siblings, these big brothers/sisters are expected to be more capable in handling household tasks when gender differences are blurred.

Cross-sex siblings often strengthen the sex-typing of housework. Boys benefit from having a sister and are least likely to do chores in such households. The presence of a sister, even at a younger age, enables parents to continue to assign chores in a sex-specific way. For girls, being the younger sister and baby of the family may receive special attention from parents and get away from cooking and doing laundry. But this is only true when their older sibling is a girl. Having an older brother reinforces the traditional gendered division to the extent that over two thirds of younger sisters in our sample get used to the behavioral pattern and continue doing chores as their older brother moves out. Sex triumphs birth order in these scenarios. The combination of older sisters

and younger brothers exerts double pressures for the girls in doing housework because of simultaneously being “older” and “girls”. The combination of older brothers and younger sisters, however, does not put older brothers in the same position because their sisters participate in housework at a young age and thus do not “create” additional chores.

This paper has a few limitations. First, due to a large number of children who do not report doing any housework, I could not predict the specific amount of time that children spend on chores. For example, although boys and girls are in general equally likely to do housework when living with a same-sex younger sibling, they may not devote equal time to housework.

Second, the way that the dataset is set up could not separate the effect of birth order from living arrangement. One consequence is that I cannot differentiate the demand from socialization rationale in terms of the housework performance of the *de facto* children, since I could not examine their performance when living with their older sibling. Their general low housework participation could either because of being the younger children (and thus physically or socially not ready) or because of decreasing demand as their older sibling left the household.

Finally, no questions were asked on attitudes of both children and parents, so I cannot directly examine the dynamics underlying children's housework performance. When there are data available, researchers could examine the gender attitudes of singletons and children with sibling(s), and the changes of gender roles associated with living arrangement in the households.

Three broader implications can be drawn from the current research. First, the fact that singletons are the least likely to do housework not only influences housework distribution in each individual family but also influences gender equality at the national level. The prevalence of one-child families in China contribute to the “one-child culture”, which particularly benefits female singletons by eliminating potential competition for family resources and empowering them as capable candidates to fulfill responsibilities

that used to be undertaken only by boys. In terms of doing housework, around three quarters of singleton girls in our sample do not perform any housework, which is startling considering the traditional cultural image of women in China as obedient wives. Behaviors and values often reinforce each other, and thus the general low housework participation of singleton girls could be an important way in creating a more gender egalitarian environment in China. If these girls maintain this behavioral pattern into adulthood, it is possible that there would be more gender equality in the division of housework after they marry. Furthermore, gender (in)equality in the household is often shown to be closely associated with that outside the household (Hersch and Stratton 2002). A more equal share of housework among couples is related to more equal leisure and paid work time for men and women.

Second, this study highlights mother's education as one of the most important characteristics in determining children's housework performance. In a country with high female labor force participation rate, maternal employment does not substantially influence children's housework involvement in China as in some Western societies with moderate female labor force participation rates. The variation in women's education, on the other hand, leads to the significant difference in their children's housework participation. Though they cannot completely close the gender gap, highly educated mothers tend to have a better understanding of the importance of education in contemporary society. They are likely raise their daughters in a more gender-neutral way and thus decrease the influence of gendered socialization.

Our findings also shed light on adult men's lack of time in housework. Beginning in their childhood, men are more likely to do housework when there is work that cannot be done by women or other family members. This pattern is likely to be replicated when they are adults. For example, since they can rely on their wives to do chores, married men spend less time on housework compared to those who are never married or divorced (Gupta 1999; South and Spitze 1994). Research also finds that husbands are more likely

to do chores in families where women are doing paid work and are unavailable during times when husbands are at home (Presser 1994).

## CHAPTER III. SIBLING STRUCTURE AND EDUCATIONAL ATTAINMENT

### Introduction

Currently, there is a growing theoretical and empirical literature on the effects of sibling structure on educational outcomes. Researchers have consistently found an inverse relationship between sibship size and educational outcomes (Blake 1989; Booth and Kee 2008; Duncan 1968; Hauser and Kuo 1998; Lu and Treiman 2008; Powell and Steelman 1993). In fact, as Powell and Steelman (1990) stated, “[this] negative relationship ... has received such consistent support that this pattern now is almost taken for granted.” Sibship size is also more important in explaining educational attainment compared to other predictor variables, such as family income, parental occupational prestige, and race (Blake 1989; Blau and O. D. Duncan 1967).

According to the resource dilution theory, sibship size has a negative effect on education because each additional sibling dilutes the limited family resources for children in the household. With additional siblings, each child’s average share of parents’ time, energy, and money (i.e., resources) will be lowered, leading to lower educational attainment. In addition, it seems likely that, in larger families, a child’s *siblings’* educational attainment will be lower (due to fewer parental resources), and this will impede a pro-learning environment in the family and further decrease the child’s interest in education. In fact, recent studies have suggested that the academic performance and achievement of a child’s peer groups are important in influencing children’s achievement-related beliefs, school performance, and academic attainment (Altermatt and Pomerantz 2003; Cook, Deng, and Morgano 2007; Crosnoe, Cavanagh, and Elder 2003; Kindermann 2007). Since a child’s siblings are his/her primary peer group, siblings’ educational attainments are likely to influence the child’s educational attainment as well. For instance, if a child’s siblings attain a low level of education, then it is likely that the

child will have low levels of educational expectations and complete fewer years of education as well.

Only a few studies have examined the mechanisms (e.g., parental resources per child, siblings' educational attainment) through which sibship size impacts children's educational attainment. Among the limited studies, most focus on the effect of parental resources, and argue that these resources are diluted as family size increases. For example, on average children with fewer siblings have more parental resources (both interpersonal and economic resources) than children with more siblings (Blake 1989; Downey 1995). In this chapter, I test another way through which sibling size may affect educational attainment: siblings' educational attainment. That is, I test whether siblings' educational attainment mediates the relationship between sibship size and children's educational attainment.

Prior research on the relationship between sibship size and educational attainment also suggests that brothers and sisters have a divergent effect on educational attainment. Considering that as a background identity, gender explicitly and implicitly influences our everyday life, including interactions among family members (Ridgeway and Smith-Lovin 1999; West and Zimmerman 1987), it is easy to imagine that a girl with a brother has a different educational experience compared to a girl with a sister. In general, number of brothers are found to be negatively related to educational attainment (Chu, Xie, and Yu 2007; Powell and Steelman 1989, 1990) and number of sisters are positively related to educational attainment (Kaestner 1996). This may be due to the fact that (1) the labor market returns to education are bigger for sons than daughters and thus parents may invest more in sons, and (2) males (especially adolescents) often stigmatize academic effort and construct masculinity partly through resistance to school (Ferguson 2012; Willis 1977). Unlike males, females are more likely to conform to school norms and on average willing to devote to schoolwork, which have a positive effect on the pro-learning atmosphere in the family (Morris 2008; Powell and Steelman 1989, 1990).

Most prior research which looks at the association between number of brothers and sisters and children's educational attainment assumes that the effect of brothers and sisters on educational attainment will be symmetric for girls and boys. But this might not be the case considering that the construction of gender identity among children is mainly influenced by same-sex peers (Cobb, Walsh, and Priest 2009a; Legewie and DiPrete 2012; Sutton-Smith and Rosenberg 1965a), and thus a same-sex sibling might magnify the association between sexuality (i.e., masculinity/femininity) and academic performance. For instance, imagine a boy with two brothers and two sisters. The two brothers may have a stronger impact than the two sisters on his conception of masculinity and thus negatively influence his academic engagement and expectation. While for a girl with two brothers and two sisters, the two sisters may have a stronger impact than the two brothers on her construction of femininity. Therefore, the negative effect of having brothers might be stronger for boys than for girls. Similarly, the positive effect of having sisters might be stronger for girls than for boys. In this chapter, I will test whether the sex composition of siblings has a different influence on a child's educational attainment depending on the gender of the respondent.

In summary, I expand previous research on the relationship between sibling structure (in particular sibship size and sex composition) and educational attainment by addressing the following research questions: (1) Does siblings' educational attainment mediate the relationship between sibship size and individual educational attainment? (2) Does the sex composition of siblings influence individual educational attainment after controlling for siblings' educational attainment? and (3) Are the processes above different for women and men?

This study contributes to current scholarships in three important ways. First, it provides researchers with a better understanding on how sibship size influences education by examining the mediating effect of siblings' educational attainment. Second, this study also adds to the sibling structure literature by stressing different impacts of sibling



structure on females and males. Females and males experience different peer cultures and socialization norms, and thus treating them as a monolithic group might lead to misleading results in the study of sibling structure. Third, this study also offers implications for gender and family researchers. By examining their potentially different influences on females' and males' educational attainment, it suggests that brothers and sisters serve as significant yet different agents during early socialization.

This chapter unfolds as follows. In the first section I describe the theoretical background on the effects of sibling structure on educational attainment and then propose related hypotheses drawing on current literature. The second section presents the data, measures, and analytical strategy. Next, I show the descriptive statistics and regression results in the third section. Finally, I discuss and conclude the findings.

## Background

### Sibship Size and Educational Attainment

In this section, I first discuss a classical theoretical framework developed by Simmel on group size and group dynamics and then several middle range theories that shed light on the relationship between sibship size and education.

#### The Number of Members and Group Dynamics in a Small

#### Group

Among early pioneers, Dr. George Simmel (1902a, 1902b) explicitly points out the effect of group size on group dynamics in a series of papers titled "The Number of Members as Determining the Sociological Form of the Group" published in *The American Journal of Sociology*. He suggests that the number of individuals in a group is significant in determining the structure of the group in that (1) a certain quantity (small or large) of persons is necessary to meet the conditions leading to certain consequences; and

(2) the change in numbers of group members promotes changes in the forms and contents of interactions.

At the micro level, group size plays a subtle but critical role in shaping the individuality of actors, the relationships among members, and the characteristics of the entire group. In a dyad, there is no majority rule in making decisions and face-to-face interaction or confrontation is frequent, which makes it possible for negotiation, cooperation, and exchange of opinions and resources, as well as the maintenance of the personality and uniqueness of the two persons to a large extent. As another person enters the dyad, the dynamics between the two original members and within the group can change dramatically. The newcomer could serve as a mediator and reduce conflicts between the two, developing the strengths of the triad by enabling everyone to perform their best. It is also possible that two parties unite against a third; or, if two parties are hostile to each other, both could try to win over the third.

Group dynamics vary according to different combinations and become increasingly complex as more individuals join the group. For small groups consisting of more than three members, Simmel argues that “specifically new aggregate phenomena appear, when quantity increases, which are not present *pro rata* in the case of smaller numbers” (1902a, 23). Therefore, I would not expect a linear relationship between each additional member and the development of group culture.

Applying this theory to sibling groups seems like a natural step. On the one hand, siblings are substantially different from other social groups in that they are connected by blood and in most cases they know each other from the time they are born. Such connections do not automatically disappear when members are not physically present in the circle. On the other hand, a group of siblings is similar to other groups because the interpersonal structure changes correspondingly with the number of individuals. Simmel (1902b, 159–160) stated that “a marriage union resulting in a single child has a quite different character from a childless union, while there is not an equally significant

difference between it and the union resulting in two or more children. To be sure, the difference in its essential nature which the second child produces is again much greater than that springing from the arrival of the third.” To the oldest child, the second child could either be his or her ally (children versus parents), or a completely new member to the whole family (three current family members versus the newcomer). If the second child is perceived by his or her sibling in the first way, the siblings may have a more harmonious relationship than in a situation in which the second child is viewed as an intruder.

According to Simmel, compared to a large community of individuals, personal characteristics matter more in small groups because of the importance attached to each member in the circle. Considering the fact that most sibling groups consist of limited numbers of individuals, both the *quantity and quality* of siblings should be examined to achieve a more comprehensive understanding of the effect of siblings as a small group on personal development.

### The Resource Dilution Theory

Following Simmel’s call on the studying of group size on group dynamics, Anastasi (1956) proposed the resource dilution theory specifically addressing the effect of sibship size on status attainment in a study of family size and IQ scores.<sup>3</sup> This theory postulates that the number of siblings is negatively associated with intelligence test scores because additional children “dilute” limited economic resources and parental attention. According to this theory, the share of parental resources among children is essential in determining children’s outcomes.

Consistent with the resource dilution hypothesis, sibship size is found to have a significant negative effect on the development of verbal skills (Alwin 1991; Blake 1989;

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<sup>3</sup> For a detailed review of the resource dilution theory, please refer to Heer (1985) and Steelman et al. (2002).

Breland 1974; Downey 1995; Jæger 2009; Nisbet and Entwistle 1967; M. S. Thompson, Alexander, and Entwistle 1988), and educational attainment (Booth and Kee 2008; Conley and Glauber 2005; Knodel and Wongsith 1991; Kuo and Hauser 1997; Sieben and De Graaf 2001). Based on a nationally representative sample, Downey's study (1995) lent more direct support to this theory by including measures of parental resources (such as frequency of parent-child communication, parental educational expectations, and educational fund saved for college) in his analytic models. He found that the availability of parental resources decreases with each additional sibling in the household.

The resource dilution hypothesis explains the influence of sibling size on educational attainment via its impact on parental resource distribution. Most empirical studies examine this by simply testing the effects of sibship size on educational attainment, without direct measure of resource distribution (for exceptions, see Downey 1995 and Powell and Steelman 1990). Additionally, although this theory is powerful in predicting intelligence and educational attainment in general, its focus on the distribution of resources from parents to children or among siblings leads to the view of siblings as gender-neutral. Therefore, this theory ignores to some extent the idea that the effect of sibling structure may diverge for males and females in the process of status attainment. As a salient and often stereotyped individual characteristic, gender shapes individuals' expectations and performance through social interaction and socialization (West and Zimmerman 1987). For example, according to Kanter's findings (1977), the gender structure of a group not only indicates the contrast in numbers, but is also associated with a series of psychological, behavioral, and interactional consequences.

### Sibship Size and Siblings' Educational Achievement

In this section, drawing from Simmel's theory on group size and group dynamics and the resource dilution theory, I propose a synthesized theoretical framework to understand the relationship between sibship size and educational attainment.

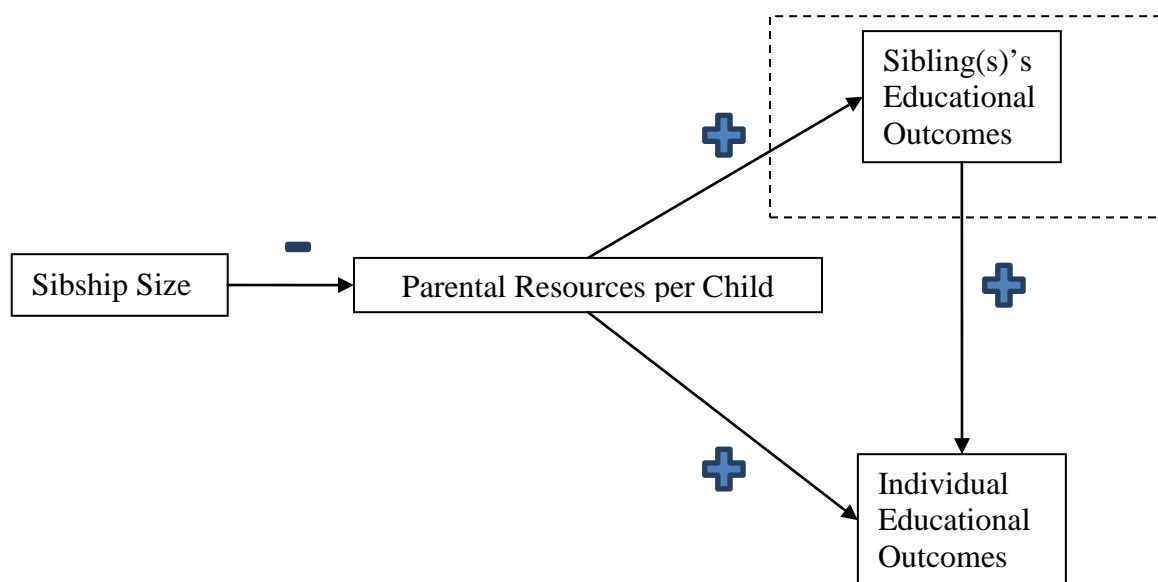
According to the resource dilution theory, educational attainment is influenced by sibling structure through resource distribution. More specifically, family resources are distributed from parents to children. The theory postulates that resources are positively associated with educational attainment. Since economic resources and parental attention are distributed to the children, the effect of sibling structure on educational attainment takes place through two pathways: resource distributed among siblings (which impact *siblings'* educational attainment), and resources directly received by the child from parents (which impact the *child's* educational attainment). As a result, within families both parents and siblings influence a child's educational outcomes.

Drawing on Simmel's theory, group dynamics are determined by the number of individuals in the group as well as interactions among group members. This theory points out an important factor that is missing in the resource dilution theory – the socialization and interaction process, or the mutual influence among siblings and its consequences on children's educational attainment.

Additionally, recent studies have identified peer groups as key agents in the socialization of adolescents' academic motivation and achievement (Altermatt and Pomerantz 2003; Cook, Deng, and Morgano 2007; Fredricks and Eccles 2005; Kindermann 2007; Nelson and DeBacker 2008; Ryan 2001). For example, adjusting for selection effect, Cook and colleagues' empirical study (2007) reveals that friends' grade point average (GPA) has the most powerful influence on individual school performance compared to other friends' attributes such as self-efficacy in school, math score, and social attitudes. High achieving friends are positively associated with students' school performance (Altermatt and Pomerantz 2003). Given the findings on the important role of peers on educational outcomes, it is possible that siblings play a similar role as close friends in motivating individual academic engagement and increasing educational attainment. In fact, an empirical study shows that older siblings' academic performance was positively related to younger siblings' academic performance (Bouchey et al. 2010).

In another study, Lee (2009) finds that children embrace the educational culture in the household and have similar academic expectations as their siblings. Therefore, it is likely that educational attainment of siblings will shape prospects for children's educational attainment.

Combining these theoretical arguments, I suggest that sibship size influences educational outcomes through both parental resource allocation and siblings' educational attainments. As shown in Figure 6, each child in the family shares parental resources, which influences each child's educational outcomes, such as learning attitudes, academic engagement, and educational attainment. At the same time, every child's educational outcomes would also shape the learning environment in the family and influence each other's educational outcomes. This pathway is often ignored in current literature on this topic. Thus each sibling contributes to the learning environment through their sharing of resources and interactions with one another, which in turn impacts each child's individual educational attainment (see Figure 6).



**Figure 6. The Role of Parents and Siblings in Educational Attainment**

In this study, I use siblings' average educational attainment as an indicator of the learning environment in the family. In other words, if the average years of education of siblings are high, it is probably that the siblings value education and encourage each other in terms of academic performance. In addition, research has found that the influence of siblings on educational outcomes is not necessarily from old to young, rather it is mutual among siblings (Hauser and Wong 1989). Based on the argument above, I hypothesize the following:

*Hypothesis 1:* The effect of sibship size on educational attainment is mediated by siblings' average educational attainment.

#### Gender Differences in Parental Involvement

As mentioned earlier, only a few studies explore gender differences in the effect of sibling structure on educational attainment. I propose that the effects of sibling structure on education are different for male children versus female children because of the gender variation in peer group culture (as I shall explain in the next section) as well as the diverging patterns of parental involvement in boys' and girls' education.

Parental involvement is crucial to children's academic success (E. B. Stewart 2008), and there is evidence that parents rear sons in a different way than daughters in terms of education (Raley and S. Bianchi 2006). For example, parents are more restrictive and more nurturing with daughters (Block 1983). They spend more time discussing school-related matters, provide greater educational supervision and invest more in social and cultural capital in daughters than sons (Deslandes and Cloutier 2002; Freese and B. Powell 1999).

Parents interact more with daughters in academic activities and show greater academic support for daughters than for sons because, first, they tend to assume that boys are more capable of studying, especially in the area of natural sciences, and thus daughters need more assistance (Herbert and Stipek 2005; Jacquelynne Eccles Parsons,

T. F. Adler, and Kaczala 1982). Second, sons and daughters respond to their parents' educational involvement differently. Compared to girls, boys tend not to want their parents to be involved in their school activities because they feel schoolwork is a personal matter and do not want parents to intrude on their lives (David et al. 2003).

As a result, parent-daughter communication might be less influenced by each additional sibling compared to parent-son communication. This leads me to formulate the second hypothesis:

*Hypothesis 2: Sibship size will have a smaller negative effect on women's educational attainment compared to men's educational attainment.*

### Sibling Sex Composition and Educational Outcomes

In this section, I will review studies on the effect of sibling sex composition on educational outcomes and propose three related hypotheses.

#### Being a Sex Majority/Minority among Siblings

The *normative climate perspective* is brought up by Powell and Steelman (1990) in the study of sibship sex composition on educational outcomes. They suggest that although parents sometimes treat sons and daughters differently based on sex-role expectations, "some socialization commonalities may emerge due to efficiency." Within a household with multiple children, the normative climate will be shaped by the sex majority group of children. If parents get used to socializing children in a particular style that is based on the representation of one sex, then both boys and girls in the household will be affected regardless of gender. For example, if the majority of children are girls, parents will be less likely to physically punish children, including the minority boy in the household (Elder and Bowerman 1963).

The *sex minority hypothesis* (Rosenberg 1965) is contrary to the prediction of the normative climate theory. This theory argues that the sex minority child enjoys special attention from parents and other opposite-sex siblings, which often benefits the sex



minority child in terms of character-building and educational achievement. The sex minority hypothesis especially applies to those who are the only male/female child with multiple opposite-sex siblings, for example, a girl with brothers and without sisters. According to the normative climate perspective and the sex minority hypothesis, I propose the following hypotheses:

*Hypothesis 3a:* A sex majority child in the family will have higher educational attainment compared to a non sex majority child.

*Hypothesis 3b:* A sex minority child in the family is positively related to the child's educational attainment compared to a non sex minority child.

### Boys' Underachievement and the Divergent Effects of Brothers and Sisters

Nowadays, the underperformance of boys in education has been well documented in recent literature (Francis 2000; Jha and Kelleher 2006; Younger and Warrington 1996). In the United States, there has been a growing female advantage in educational attainment since the early 1980s (U.S. Department of Education 2011). In 1970, the majority (57 percent) of bachelor degrees were awarded to men. Women slowly caught up with men in the early 1970s. Since 1976, the gender gap in education dramatically narrowed, and was closed by 1982. From 1982 onward, more than 50 percent of bachelor's degree recipients were women. The female advantage continued to increase and reached a plateau around 2000. By 2010, women received 57 percent of bachelor degrees and men received 43 percent.

Researchers find that one main reason for boys' underachievement is that students' conception of masculinity is sometimes in conflict with successful school performance (M. Cohen 1998; Willis 1977). The dominant form of masculinity, hegemonic masculinity, is defined as "a social ascendancy achieved in a play of social forces that extends beyond contests of brute power into the organization of private life and cultural

processes (Connell 1987, 184).” Masculinity embraces characteristics such as dominance, aggressiveness, heterosexuality, ambition (Connell and Messerschmidt 2005; Connell 2005; Kimmel 2000), or in general traits that are opposite to the cultural model of femininity (McGuffey and B. L. Rich 1999).

Beginning at early ages, children observe gendered interactions between males and females and gradually develop beliefs about gender difference. They also construct gender boundaries according to their own observations, understandings and experience in everyday interactions. These gender cultures substantially permeate boys’ and girls’ perceptions of educational success and their approach towards academic activities (Hodgetts 2008; Legewie and DiPrete 2012). In a studying environment where academic activities are portrayed as de-masculinized, active engagement with school means femininity, implying lack of talents, being “nerdy”, and fear of school authorities. Boys’ culture is less learning-oriented compared to girls’ (Houtte 2004; MacLeod 1987; Morris 2008). Male students celebrate and encourage each other for noncooperation and disruptive behaviors, whereas girls are more likely to comply with norms and support each other with schoolwork. Although this “problem with boys” has been found in many countries, researchers find that boys’ anti-academic attitudes could be alleviated by a pro-learning peer culture. In particular, boys benefit from peer culture that does not stigmatize academic involvement and achievement as feminine traits (Legewie and DiPrete 2012).

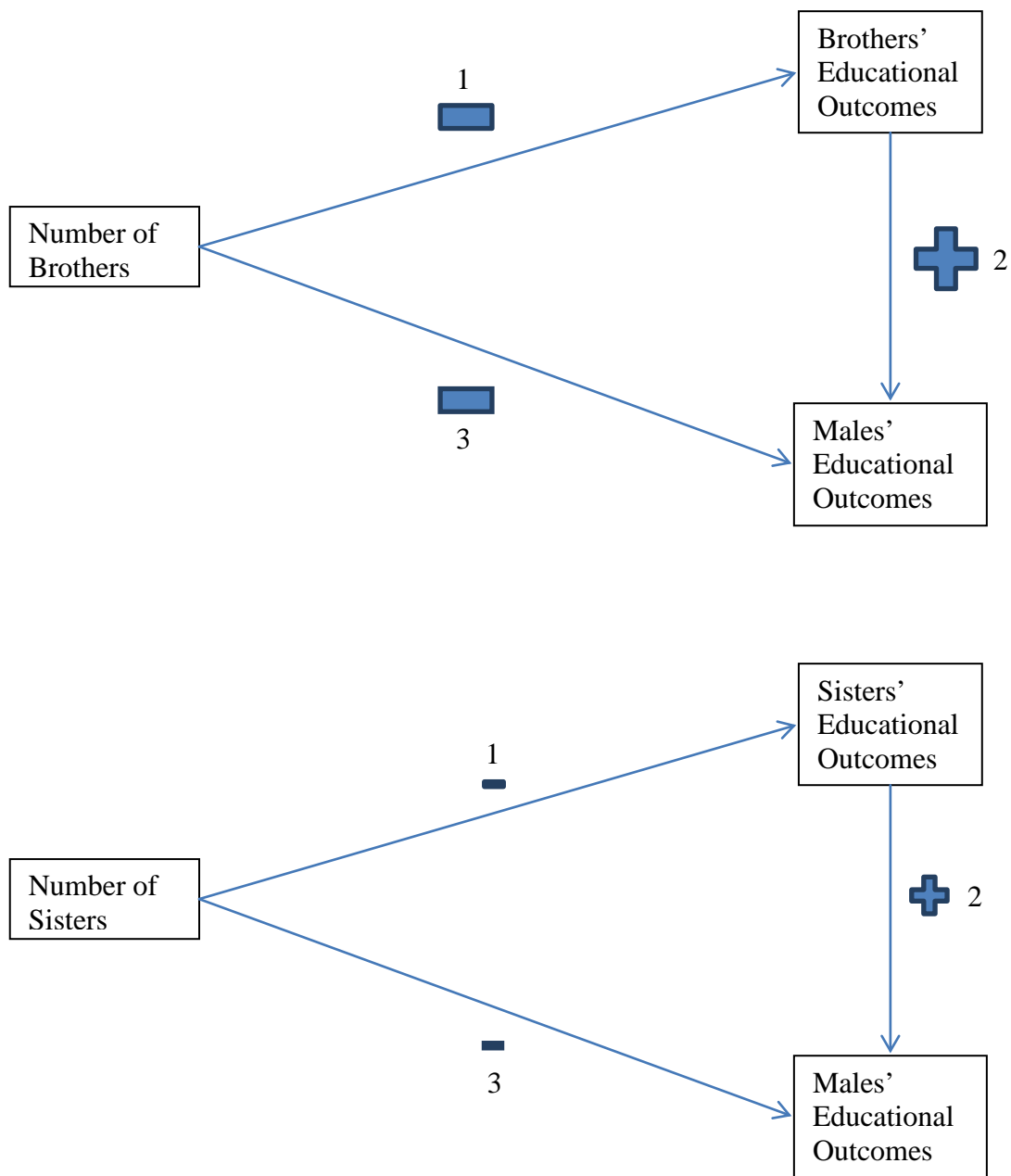
This theory of masculinity construction in peer groups could also be applied to sibling groups. Gender researchers find that same-sex siblings reinforce traditional sex traits. In two-child families, boys with a brother report higher masculinity scores, show more masculine traits, and engage in more masculine activities than boys with a sister, and girls with a sister report higher femininity scores, display more feminine traits, and engage in more feminine activities than girls with a brother (Bigner 1973; Cobb, Walsh, and Priest 2009; Rust et al. 2000; Sutton-Smith and Rosenberg 1965; Vroegh 1971).

Given that learning attitudes and behavior are closely associated with gender identity, I hypothesize that brothers will have a bigger influence on boys' academic engagement and educational outcomes than sisters, and sisters will have a bigger influence on girls' educational outcomes than brothers.

There is evidence that on average individual educational attainment is negatively associated with the number of brothers one has, and positively associated with the number of sisters (Kaestner 1996; Powell and Steelman 1990). Kaestner (1996) finds that, among Blacks, males benefit from having sisters and females benefit from having older sisters in terms of educational attainment. Similarly, Powell and Steelman (1990) find that for both girls and boys, the number of brothers (but not the number of sisters) decreases children's grade-point average.

Figure 7 presents the hypothesized effect of the number of brothers and sisters on *males'* educational outcomes. Arrow 1 shows the relationship between number of brothers/sisters and brothers'/sisters' educational attainment. Arrow 2 shows the relationship between brothers'/brothers' educational attainment and respondents' educational attainment. Arrow 3 indicates the relationship between number of brothers/siblings and respondents' educational attainment *after* controlling for siblings' educational attainment.

In Figure 7, due to the resource dilution process, I expect both number of brothers and sisters are negatively associated with brothers'/sisters' educational outcomes (arrow 1). In addition, number of brothers and sisters also has negative effects on male respondent's educational outcomes *before* controlling for siblings' educational attainment. Because of the magnifying effect of having brothers on males' construction of masculinity and anti-academic attitudes and behavior, when compared to number of sisters, number of brothers will have a stronger negative impact on brothers' educational outcomes. In the same vein, number of brothers will also be more negatively associated with male respondents' educational outcomes than number of sisters. The negative



**Figure 7. The Effect of Brothers and Sisters on Males' Educational Outcomes**

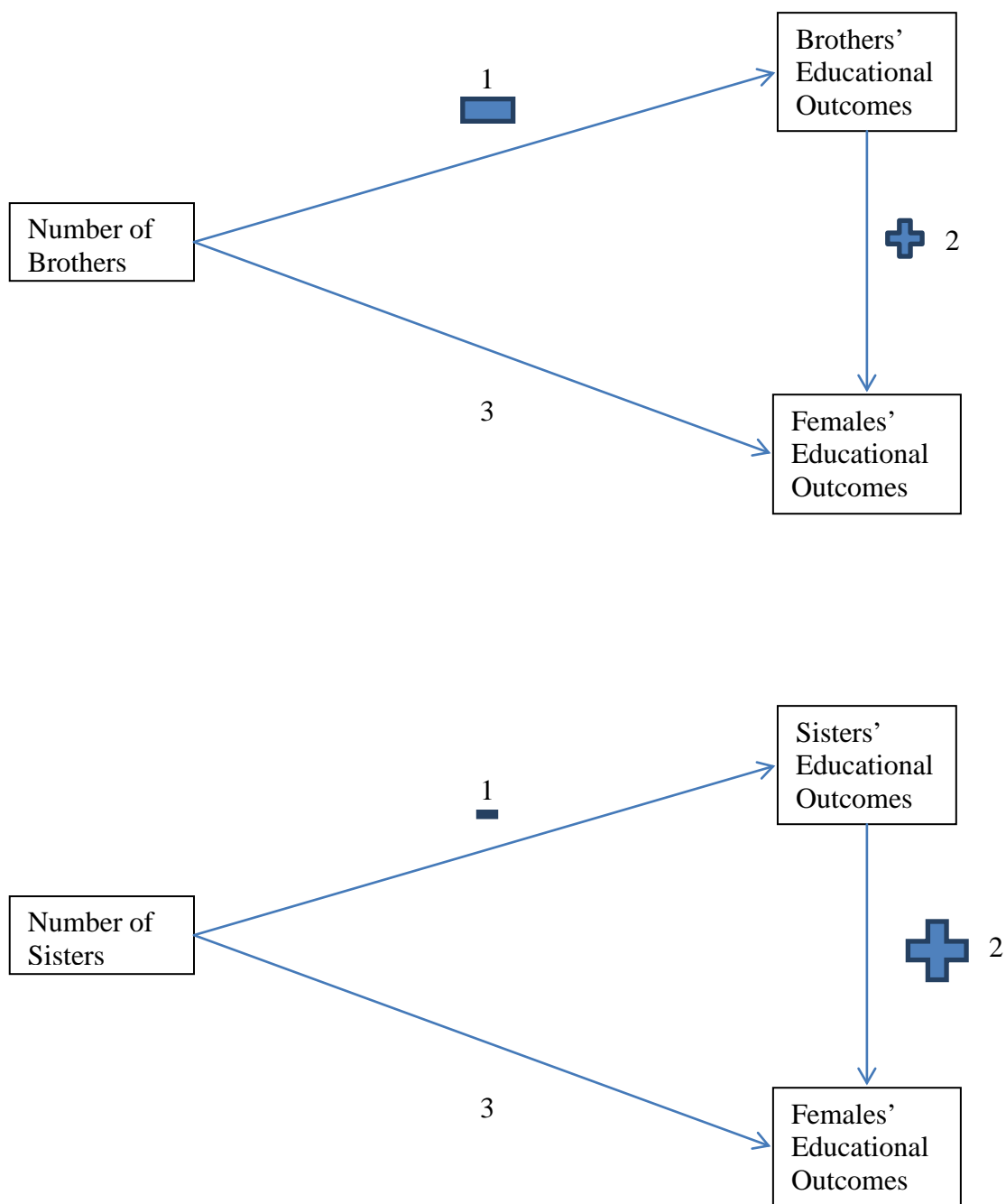
impact of number of sisters will be smaller compared to that of number of brothers, because sisters do not reinforce the conflict between masculinity and academic success.

The plus signs of arrow 2 in the two panels of Figure 7 suggest that both brothers' and sisters' educational outcomes will be positively associated with male respondents' educational outcomes. But brothers' educational outcomes will have a bigger influence compared to sisters' because of the stronger influence of same-sex peer culture. Additionally, although brothers' educational outcomes are positively related to male respondents' educational attainment, I suspect that this effect (i.e., indicators of the academic attitudes and performance among brothers) is not necessary to compensate the negative effect of number of brothers (arrow 3). This is because research finds that a pro-learning environment at home and at school alleviates but not entirely eliminates the stigmatization of school engagement among male peer group (Legewie and DiPrete 2012; Willis 1977).

Figure 8 shows the effect of brothers and sisters on *females'* educational outcomes. Again, as the resource dilution theory predicts, the number of brothers and sisters are both negatively associated with female respondents' educational outcomes. But the number of brothers is expected to have a smaller negative impact on females' education than on males', because unlike males, females are willing to devote to schoolwork and in general do not despise academic effort (Morris 2008). Furthermore, the negative effect of having siblings (both brothers and sisters) might disappear after accounting for siblings' educational attainment (arrow 3). Thus, based on the findings on gender identity, peer group culture, and boys' underperformance, in general, I expect to find the followings:

*Hypothesis 3c:* Number of brothers is negatively associated with males', but not females', educational attainment, after controlling for brothers' educational attainment.

*Hypothesis 3d:* Number of sisters does not influence males' or females' educational attainment after controlling for sisters' educational attainment.



**Figure 8. The Effect of Brothers and Sisters on Females' Educational Outcomes**

## Method

### Data

In this study, I use the National Longitudinal Survey of Youth 1979 (NLSY79, available at <http://www.bls.gov/nls/nlsy79.htm>) collected by the U.S. Bureau of the Census Demographic Surveys Division. It is a nationally representative sample of 12,686 young men and women who were born in the years of 1957-64 and were ages 14-22 when first interviewed in 1979. The respondents were interviewed annually through 1994 and are currently interviewed on a biennial basis.

This dataset is selected because it meets the following criteria: (1) it is longitudinal and nationally representative, which enables me to study the relationship between early family environment and adult outcomes; (2) completed sibling structure data is collected; (3) the measure of the key variable in this research, educational attainment, is included in the dataset; and (4) family background measures are available in the data, such as respondents' parents' socioeconomic status, which have been shown to be important in determining children's educational attainment.

I use variables from three waves of the NLSY79 to study the relationship between gender, sibling structure, and educational attainment: the 1979 (respondents age 14-22), 1993 (respondents age 28-36), and 1998 (respondents age 33-41) waves. The 1979 wave contains basic information on the household and parents' socioeconomic status. The 1993 wave collects sibling structure variables, including information on up to 12 siblings for each respondent. For each sibling, the survey gathers the number of years younger or older than respondent, sex, and highest grade completed. The 1998 wave contains respondents' demographic information and information on the respondent's educational attainment at midlife, which is the dependent variable in this study.

I merge all three waves using the respondent identifier. The unit of analysis is the respondent and the base sample includes 12,686 respondents. Since singletons are

dramatically different from those with siblings, I restrict my analytic sample to respondents with at least one sibling. After excluding cases with missing data on the variables used in the analysis, the final analytic sample consists of 5,976 respondents (see Table A2 of Appendix for details on sample creation).

## Variables

### Dependent Variable and Main Independent Variables

I obtain the dependent variable, *educational attainment*, from the 1998 wave of the NLSY79, when the respondents were asked about their highest grade completed. In 1998, respondents are middle aged (their age ranges from 33 to 41 years old). Most people would have finished their education at this time, so the variable shows completed years of education.

The key independent variables are sibling structure and siblings' education. Sibling structure variables include sibship size and sex composition of siblings.<sup>4</sup> In the 1993 wave, completed sibling information (including both full and half siblings of respondents by 1993) was collected when respondents were 28-36 years old. *Sibship size* is measured by the number of siblings respondents had. The sex composition of sibship is calculated from sibship size and sex of the sibling by specifying the *number of brothers* and the *number of sisters*. I also include three dummy variables – *opposite-sex siblings*, *same-sex siblings*, and *mixed-sex siblings* – to indicate situations where all siblings belong to the opposite sex or the same sex as the respondent.

Since the survey does not ask detailed educational performance of siblings, such as educational engagement, pro-learning attitudes, and grade-point average, siblings' education is measured by *the average years of education of siblings*. I use average years

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<sup>4</sup> I include the birth order variables in preliminary analyses, and these variables do not influence the main effects in the models. Since birth order is not the focus of this study, I did not include these variables in the final models.



of education because of the mutual influence among siblings (Hauser and Wong 1989). In order to specify the effects of brothers and sisters, I also differentiate brothers' and sisters' educational outcomes by measuring *average years of education of brothers* and *average years of education of sisters*. These two variables cannot be calculated when respondents do not have brothers or sisters or do not report educational attainments for each sibling (1,917 individuals in the sample), and thus the sample size is smaller in the models where these two variables are included (N = 4,059).

### Control Variables

Demographic information consists of respondent's *gender*, *age* and *race*. Gender is measured as a dichotomous variable (female=1). Age is a continuous variable measured in years. I use three dichotomous variables to measure respondent's racial status, including African Americans, Hispanics, and Whites and other racial groups. Whites and other racial groups serve as the reference groups in the analysis.

I also control for three family background variables, including *intact family*, *household income* (logged), and *mother's education*<sup>5</sup>. Intact family is measured by a dummy variable (1 = intact family). Research has found that individuals from intact families in general have more years of education compared to individuals from broken families (e.g., Astone and McLanahan 1991). Household income is included to control for class differences. Children from middle or upper class families on average receive greater social and economic support to finish higher levels of education than those from working class families (Blanden and Gregg 2004; Goldthorpe 1996; Taubman 1989). I take the natural logarithm of household income to correct for the right skewness.

Mother's education is measured by years of completed education. Previous studies

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<sup>5</sup> I also ran models which controlled for father's education. The inclusion of father's education does not change the main effects but substantially decreases the sample size by 695 respondents. In addition, it turns out that mother's education has a stronger impact on respondent's educational attainment compared to father's educational level. Therefore, I only include mother's education in the analysis.

reported that the level of mother's education has a positive influence on children's educational aspiration and later outcomes (Bowen 1977; Ermisch and Francesconi 2001; Sewell and Shah 1968). Therefore, I expect mother's education to be positively related to children's educational attainment. Table A3 of Appendix reports correlation matrix among these variables.

### Analytical Strategy

To begin with, I present the mean of the dependent variable by different sibling structures and gender. Then I use ordinary least-squares (OLS) models to predict educational attainment as a function of sibling structure. I estimate three sets of regression models. The first set of models explores the relationship between sibship size and educational attainment. I use Models 1 and 2 to examine Hypothesis 1 and Models 3 and 4 to examine Hypothesis 2. Model 1 includes a continuous variable measuring sibship size. In Model 2, I test whether siblings' education mediates the relationship between sibship size and educational attainment. Model 3 estimates whether the effect of sibship size is different for females and males by including variables which are interactions between the gender dummy variables and sibship size.<sup>6</sup> Finally, Model 4 estimates whether the effect in Model 2 is different for females and males by including the interaction terms.

The second set of models examines the effects of sibling sex composition on education. All models include the full set of controls. To test Hypotheses 3a and 3b, I estimate a model with two dummy variables indicating sex minority (girls without sisters or boys without brothers) and sex majority (girls with only sisters or boys with only

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<sup>6</sup> Following Chu and colleagues (2007), I interact both gender dummy variables (female and male) and sibship size in the models, which is equivalent to estimate the effect of sibship size separately for females and males.

brothers) in the family, with respondents with mixed-sex siblings as the reference group.<sup>7</sup> Model 1 estimates the effect of sex composition of siblings before controlling for sibship size. Model 2 adds sibship size to test whether the effect of sex composition could be explained by number of siblings. Model 3 examines whether the effects of sex composition and sibship size are still important in influencing educational attainment after accounting for siblings' education.

The final set of models is similar to the first set of models except that the effects of brothers and sisters are distinguished so that Hypotheses 3c and 3d can be tested. These models are restricted to individuals who have both brothers and sisters.

Finally, due to the sample design of the NLSY79, around half households include more than one respondent. Since the characteristics of respondents from the same households are likely to be correlated with each other, I correct the estimated stand error with the Huber-White adjustment.<sup>8</sup>

## Results

### Descriptive Statistics

In this section, I present descriptive statistics of all variables, followed by a graphical presentation of the relationship between sibship size and the educational attainment of the respondent and their siblings.

Table 3 summarizes the descriptive statistics of all variables. The respondents in the sample on average attain 13 years of education. Females (13.28 years) have slightly

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<sup>7</sup> To test hypotheses 3a and 3b, I run regression models separately for respondents with all opposite-sex and respondents with all same-sex siblings (in this way, the reference group is respondents who do not have all opposite-sex/same-sex siblings). The results are very similar with results presented here. To save space, I include both dummy variables in the same model and the reference group is respondents with mixed-sex siblings.

<sup>8</sup> For a discussion of the advantages and disadvantages of the fixed-effects models and variance-corrected techniques in the study of sibling structure, please see Chu, Xie and Yu (2007).

more years of education than males (13.10 years). The sibling structure is very similar for female and male respondents. Since I do not include singletons in the sample, the average sibship size is four siblings,<sup>9</sup> and in general the respondents have two brothers and two sisters. The majority of respondents (70 percent) have both brothers and sisters and the minority (16 percent and 15 percent respectively) have all siblings of opposite or the same sex. On average, siblings have 13 years of education and sisters have .3 more years of education than brothers.

The values for the control variables for the women and men in the sample are very similar. On average the respondents are 37 years old. Because the NLSY79 oversamples minorities, 51 percent of the respondents in the sample are Whites or other races, 20 percent are Hispanics and 29 percent are African Americans. Seventy percent of respondents live with both biological parents in the household. The average annual household income is around 17000 dollars. Mothers on average have 11 years of education.

Figure 9 is a graphical representation of the relationship between sibship size and educational attainment.<sup>10</sup> Consistent with previous studies, the number of siblings is negatively related to one's educational attainment. Children with one sibling in general attend college while children with more than five siblings on average attend high school. There is clearly a gendered pattern that females in general obtain more years of education than males, and males appear to be more strongly influenced by sibship size compared to females.

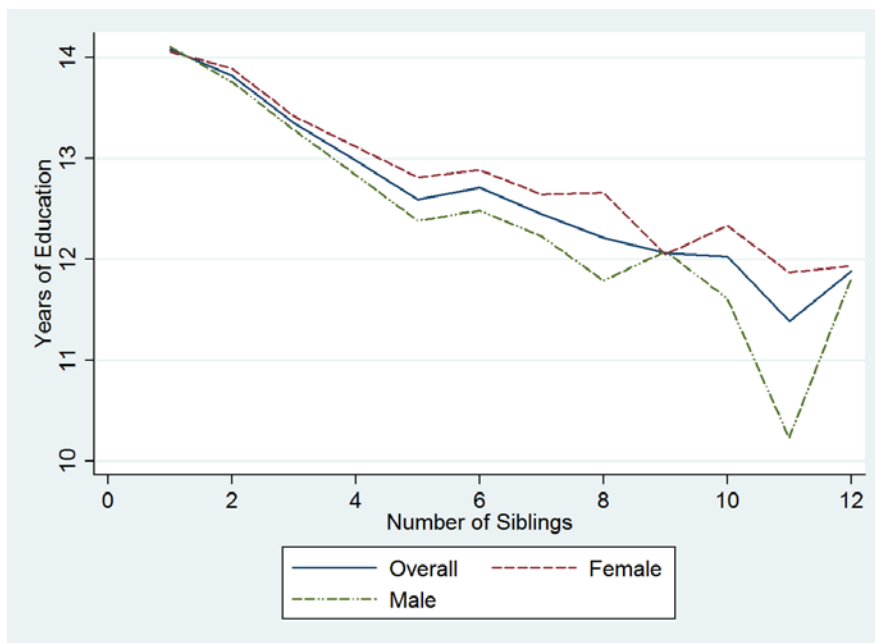
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<sup>9</sup> For reference, the total fertility rate in the US was 3.5 in 1960 (World Bank 2012a).

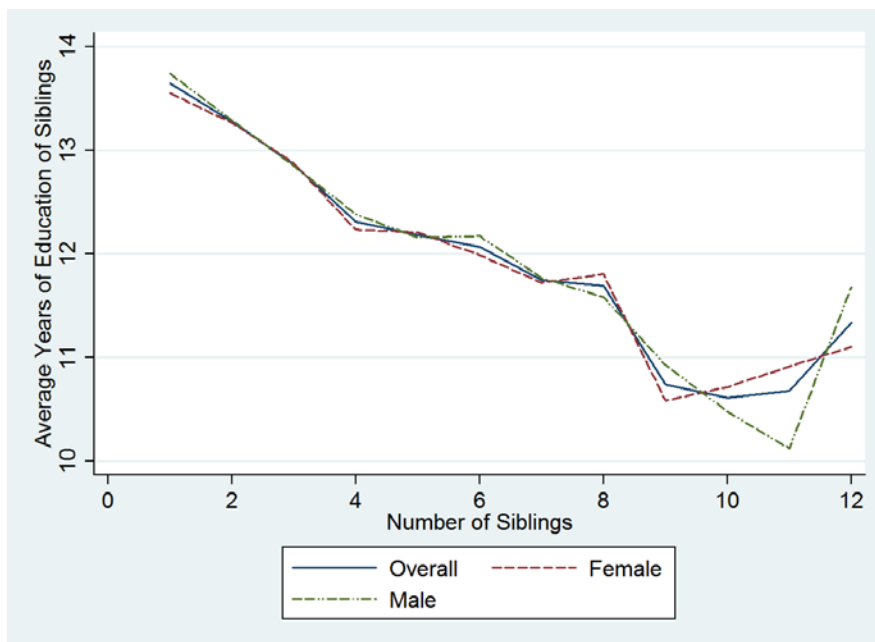
<sup>10</sup> Please note that the sample size becomes smaller as sibship size increases in both Figures 3-2 and 3-3. For both females and males, the sample size is smaller than 100 respondents when sibship size is bigger than seven.

**Table 3. Descriptive Statistics for All Variables, by Gender, NLSY79**

	<b>Overall</b>			<b>Females</b>			<b>Males</b>		
	Mean	S.D.	N	Mean	S.D.	N	Mean	S.D.	N
<b>Dependent Variable</b>									
Highest grade completed	13.19	2.42	5976	13.28	2.36	3048	13.10	2.47	2928
<b>Key Independent Variables</b>									
Sibship size	3.92	2.44	5976	4.02	2.51	3048	3.81	2.36	2928
Number of brothers	1.98	1.58	5976	2.02	1.61	3048	1.94	1.56	2928
Number of sisters	1.94	1.59	5976	2.00	1.63	3048	1.87	1.54	2928
Opposite-sex siblings	0.16	0.36	5976	0.16	0.36	3048	0.16	0.36	2928
Same-sex siblings	0.15	0.36	5976	0.14	0.35	3048	0.16	0.37	2928
Mixed-sex siblings	0.69	0.46	5976	0.70	0.46	3048	0.68	0.46	2928
Siblings' years of education	12.63	2.29	5976	12.57	2.28	3048	12.69	2.29	2928
Brothers' years of education	12.18	2.54	4059	12.10	2.60	2101	12.26	2.47	1958
Sisters' years of education	12.48	2.48	4059	12.41	2.52	2101	12.55	2.44	1958
<b>Control</b>									
Female	0.51	0.50	5976	-	-	-	-	-	-
Age	36.74	2.24	5976	36.77	2.24	3048	36.70	2.24	2928
Hispanic	0.20	0.40	5976	0.20	0.40	3048	0.19	0.39	2928
African American	0.29	0.45	5976	0.30	0.46	3048	0.29	0.45	2928
Whites and other races	0.51	0.50	5976	0.50	0.50	3048	0.52	0.50	2928
Intact family	0.70	0.46	5976	0.69	0.46	3048	0.70	0.46	2928
Household income 1979 (logged)	9.39	1.07	5976	9.35	1.15	3048	9.44	0.98	2928
Mother's education	10.79	3.24	5976	10.72	3.22	3048	10.86	3.26	2928



**Figure 9. Observed Years of Education by Sibship Size and Gender, NLSY79**



**Figure 10. Observed Average Years of Education of Siblings by Sibship Size and Gender, NLSY79**

Figure 10 presents years of education of siblings by sibship size and gender. It again confirms the negative relationship between sibship size and siblings' educational attainment. For siblings of both females and males, their average years of education decreases as sibship size increases.

### Regression Results

Table 4 presents the results testing Hypotheses 1 and 2. According to Model 1, as expected, there is a significant negative relationship between sibship size and educational attainment. Consistent with previous studies (for example, Behrman and Taubman 1986; Blake 1989), on average, each additional sibling decreases educational attainment by 0.1 years, net of other control variables. The effects of control variables are generally consistent with previous literature. On average, women obtain more years of education compared to men. Minority status is positively related to educational attainment accounting for family socioeconomic status (Kao and J. S. Thompson 2003; Warren 1996). Individuals from intact families in general attain higher levels of schooling than those from non-intact families. Mother's education has a positive effect on educational attainment.

Model 2 incorporates siblings' average educational attainment. Siblings' education is strongly positively related to individual's level of education. On average, as the average educational level of siblings increases by one year, individual's years of education increases 0.43 years. The inclusion of the educational attainment of siblings in the model substantially decreases the effect of sibship size. The coefficient for sibship size is reduced by half in magnitude compared to that in Model 1 (from -0.12 to -0.05,  $p < 0.001$ ). Hypothesis 1 is confirmed: the effect of sibship size on education is mediated by siblings' education. Both quality (i.e., siblings' educational attainment) and quantity of siblings influence individual educational attainment.

**Table 4. OLS Regression Results Predicting the Effects of Sibship Size on Years of Education, NLSY79**

	Model 1	Model 2	Model 3	Model 4
<b>Quantity and Quality of Siblings</b>				
Sibship size	-0.115*** (0.013)	-0.053*** (0.012)		
Average years of education of siblings		0.430*** (0.017)		
<b>Gender Variation</b>				
Sibship size * Female			-0.082*** (0.017)	-0.021 (0.016)
Sibship size * Male			-0.154*** (0.019)	-0.091*** (0.017)
Average years of education of siblings * Female				0.432*** (0.021)
Average years of education of siblings * Male				0.427*** (0.023)
<b>Control Variables</b>				
Gender (Female=1)	0.261*** (0.056)	0.277*** (0.052)	-0.023 (0.110)	-0.058 (0.416)
Age	0.042** (0.013)	0.011 (0.012)	0.042** (0.013)	0.011 (0.012)
Hispanics	0.361*** (0.086)	0.369*** (0.079)	0.362*** (0.086)	0.370*** (0.079)
African Americans	0.118+ (0.069)	0.103 (0.065)	0.122+ (0.069)	0.107+ (0.065)
Whites and other races (ref.)				
Intact family	0.382*** (0.066)	0.129* (0.061)	0.385*** (0.066)	0.132* (0.061)
Household income (logged)	0.239*** (0.035)	0.146*** (0.032)	0.240*** (0.034)	0.147*** (0.032)
Mother's education	0.259*** (0.011)	0.153*** (0.011)	0.259*** (0.011)	0.153*** (0.011)
<b>Constant</b>	6.551*** (0.588)	4.222*** (0.548)	6.694*** (0.590)	4.394*** (0.597)
<b>N</b>	5,976	5,976	5,976	5,976
<b>R-squared</b>	0.195	0.318	0.196	0.319

Note: \*\*\* p<0.001, \*\* p<0.01, \* p<0.05, + p<0.1. (two-tailed tests); robust standard errors adjusted for clustering in families in parentheses

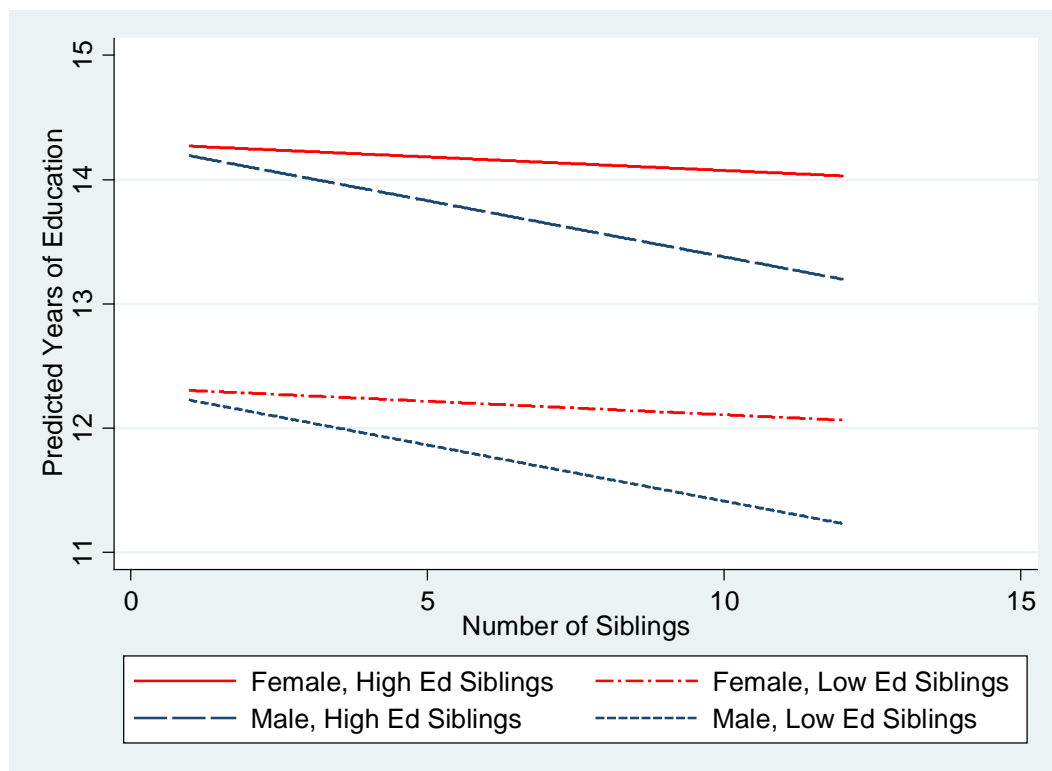


The effect of the three variables indicating family background, intact family, household income, and mother's educational level, also weaken with the inclusion of siblings' educational attainment, indicating that effects of familial socioeconomic status is also partially mediated through siblings' levels of education. Finally, the R square of the model increases by one third (from 20 percent to 32 percent), indicating the model explains more variance in educational attainment as siblings' educational level is added.

Models 3 and 4 test Hypothesis 2, referring to the gender variation in the effects of siblings. Similar to Model 1, Model 3 shows the sibsize effect. Consistent with Figure 9, on average, the effect of sibship size is stronger for males compared to females (-0.154 vs. -0.082,  $p < 0.001$ ). A t-test shows that these two coefficients are significantly different from each other ( $F = 8.56$ ,  $p < 0.01$ ). The results indicate that sibship size has asymmetric effects on females and males.

Model 4 includes the interaction terms between gender and siblings' education. Unlike the effect of sibship size, there is no gender variation in the effect of siblings' education on individual educational attainment. Meanwhile, the coefficient for sibship size weakens in magnitude (from -0.082 to -0.021) and becomes insignificant for women, but the effect remains significant for men, suggesting that the effect of sibship size educational attainment is fully mediated by siblings' education for women while is partially mediated for men. The results from Models 3 and 4 provide support for Hypothesis 2, showing that sibship size has a bigger effect on men's educational attainment than women's educational attainment.

Figure 11 presents predicted educational attainment by gender and siblings' levels of education based on the coefficient estimates from Model 4 in Table 4. The top two lines represent individuals with siblings with high levels of education (one standard deviation above the mean), and the bottom two lines represent individuals with siblings with low levels of education (one standard deviation below the mean).



**Figure 11. Predicted Years of Education by Gender and Siblings' Educational Attainment**

This figure elucidates three important results. First, the figure shows that the effect of siblings' education is similar for women and men. On average, for both females and males, individuals with highly educated siblings (the top two lines) obtain two more years of education compared to those with siblings of lower education (the bottom two lines). Second, on average, the effect of siblings' educational level is stronger than that of sibship size. This means that for individuals with academically high achieving siblings, their predicted educational attainment is always higher compared to those with underachieving siblings, regardless of sibship size. Third, the effect of sibship size is

stronger for men compared to women. For women, the line indicating the relationship between sibship size and education almost flattens after siblings' education is accounted for; whereas the negative consequences of sibship size remain pronounced for men.

Next I analyze the effects of being sex minority or majority in the family (Hypotheses 3a and 3b). Table 5 presents educational attainment and sibship size of individuals with different types of sibling sex composition. Individual educational attainment is very similar when all siblings are of same sex or opposite sex, and approximately one year higher than mixed sibling sex compositions. This might be attributed to the detrimental effect of sibship size, because the chance of having all opposite-sex or same-sex siblings decreases as the number of siblings increases (see Table A3 of Appendix). As shown in the last two columns of Table 5, sibship size is about two for individuals with all opposite-sex or same-sex siblings while individuals with mixed-sex sibling groups on average have around five siblings. According to earlier analyses, big families are in general negatively associated with educational attainment. Therefore, it is possible that smaller sibship size, rather than being sex majority/minority, influences educational attainment.

**Table 5. Educational Attainment and Sibship Size, by Sex Compositions of Siblings, NLSY79**

	N	Educational Attainment		Sibship size	
		Mean	S.D.	Mean	S.D.
All siblings are opposite sex	939	13.78	2.39	1.97	1.14
All siblings are same-sex	890	13.71	2.37	2.12	1.22
Mixed-sex sibling groups	4147	12.95	2.39	4.75	2.40

The regression results in Table 6 support the argument above. In Model 1, I only include the two dichotomous variables measuring whether the respondent has all opposite-sex or same-sex siblings. On average these individuals obtain more years of education compared to individuals with other types of sibling sex compositions, net of other control variables. In Models 2 and 3, I add sibship size and siblings' education to test whether the effects of being sex minority or majority are robust. The coefficients for having all opposite-sex and same-sex siblings lose significance and become substantially smaller in the last two models, indicating that the relationship between being sex minority or majority and academic achievement is influenced by sibship size and siblings' education. Therefore, Hypotheses 3a and 3b are not supported. Furthermore, the results do not vary by the gender of respondent (results not shown).

Table 7 presents results from OLS regression models testing Hypotheses 3c and 3d with a subsample consisting of individuals with both brothers and sisters in the family.<sup>11</sup> Model 1 shows that both sisters and brothers have negative effects on the respondents' educational attainment. The coefficient for brothers is slightly bigger in size compared to that for sisters, indicating that each additional brother might have more detrimental effects than each additional sister. In Model 2, I enter sisters' and brothers' education to examine whether the relationships shown in Model 1 remain effective. The coefficient for the number of sisters becomes insignificant, but the number of brothers still has negative effects on respondents' education even when brothers' education is controlled.

In Models 3 and 4, I add interactions between gender and sibling sex compositions to test gender variation in these effects. The results in Model 3 resemble those of Model 3 in Table 4. The number of sisters and brothers both has negative effects

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<sup>11</sup> In preliminary analyses, I also included respondents with only sisters or only brothers. The main effects are the same. To present the results in a more efficient way, I did not run the models separately.

**Table 6. OLS Regression Results Predicting the Effects of Being Sex Minority/Majority on Years of Education, NLSY79**

	Model 1	Model 2	Model 3
<b>Sex Composition of Siblings</b>			
Opposite-sex siblings	0.403*** (0.080)	0.165+ (0.086)	-0.005 (0.080)
Same-sex siblings	0.353*** (0.080)	0.130 (0.086)	-0.003 (0.079)
Sibship size		-0.101*** (0.015)	-0.053*** (0.013)
Average years of education of siblings			0.430*** (0.017)
<b>Control Variables</b>			
Gender (Female=1)	0.248*** (0.056)	0.260*** (0.056)	0.277*** (0.052)
Age	0.038** (0.013)	0.042** (0.013)	0.011 (0.012)
Hispanics	0.321*** (0.086)	0.362*** (0.086)	0.369*** (0.079)
African Americans	0.024 (0.068)	0.121+ (0.069)	0.103 (0.065)
Whites and other races (ref.)			
Intact family	0.369*** (0.066)	0.379*** (0.066)	0.129* (0.061)
Household income (logged)	0.252*** (0.035)	0.240*** (0.035)	0.146*** (0.032)
Mother's education	0.277*** (0.011)	0.259*** (0.011)	0.153*** (0.011)
<b>Constant</b>	5.878*** (0.590)	6.450*** (0.590)	4.224*** (0.549)
<b>N</b>	5,976	5,976	5,976
<b>R-squared</b>	0.189	0.195	0.318

Note: \*\*\* p<0.001, \*\* p<0.01, \* p<0.05, + p<0.1. (two-tailed tests); robust standard errors adjusted for clustering in families in parentheses

**Table 7. OLS Regression Results Predicting the Effects of Brothers and Sisters on Years of Education, NLSY79**

	Model 1	Model 2	Model 3	Model 4
<b>Sex Composition</b>				
Number of Sisters	-0.075** (0.025)	-0.033 (0.022)		
Number of Brothers	-0.119*** (0.023)	-0.071*** (0.021)		
Sisters' Education		0.228*** (0.021)		
Brothers' Education		0.216*** (0.017)		
<b>Gender Variation</b>				
Number of Sisters * Female			-0.069* (0.032)	-0.028 (0.030)
Number of Sisters * Male			-0.083* (0.038)	-0.037 (0.034)
Number of Brothers * Female			-0.075* (0.032)	-0.027 (0.029)
Number of Brothers * Male			-0.171*** (0.034)	-0.122*** (0.031)
Sisters' Education * Female				0.243*** (0.029)
Sisters' Education * Male				0.214*** (0.029)
Brothers' Education * Female				0.202*** (0.021)
Brothers' Education * Male				0.231*** (0.027)
<b>Control Variables</b>				
Gender (Female=1)	0.326*** (0.068)	0.363*** (0.063)	0.063 (0.157)	0.117 (0.526)
Age	0.045** (0.016)	0.019 (0.015)	0.045** (0.016)	0.019 (0.015)
Hispanics	0.288** (0.102)	0.317*** (0.095)	0.288** (0.102)	0.315*** (0.095)
African Americans	0.125 (0.083)	0.076 (0.078)	0.126 (0.082)	0.075 (0.077)
Whites and other races (ref.)				

**Table 7. Continued**

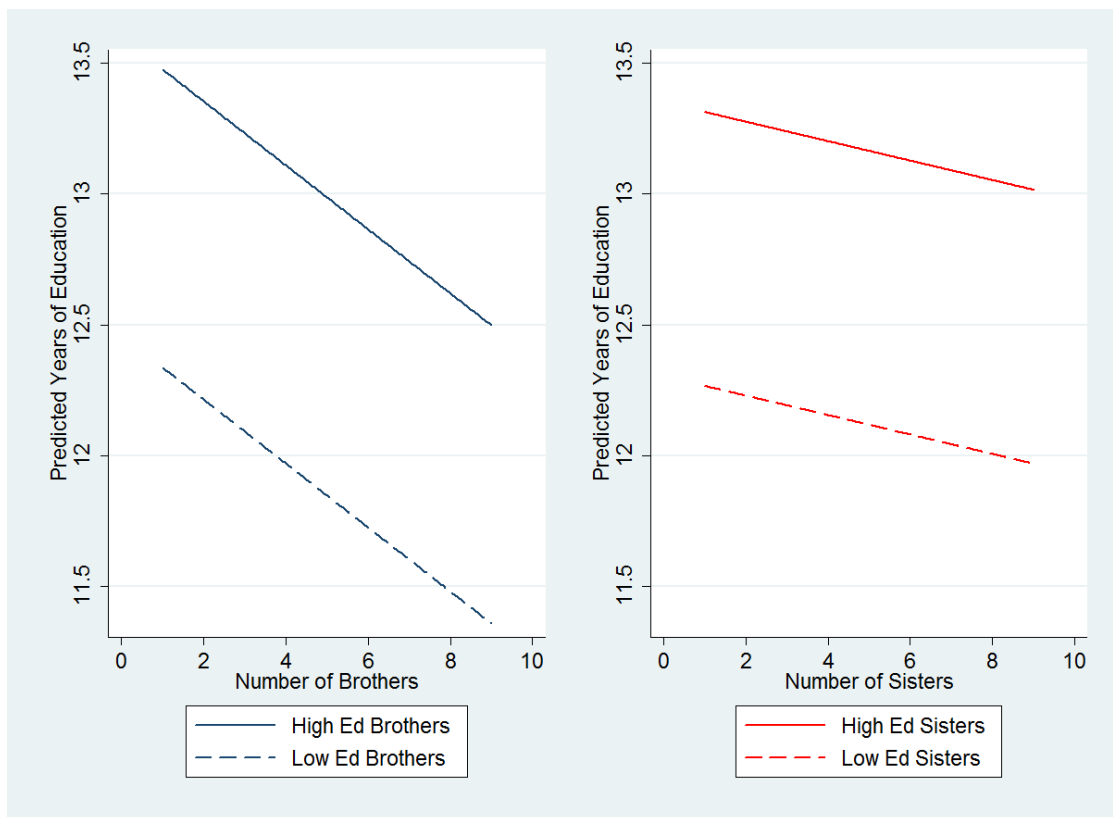
	Model 1	Model 2	Model 3	Model 4
Intact family	0.308*** (0.078)	0.049 (0.073)	0.313*** (0.078)	0.055 (0.073)
Household income (logged)	0.244*** (0.040)	0.132*** (0.037)	0.245*** (0.040)	0.132*** (0.037)
Mother's education	0.239*** (0.013)	0.136*** (0.013)	0.239*** (0.013)	0.136*** (0.013)
<b>Constant</b>	6.529*** (0.716)	4.082*** (0.662)	6.666*** (0.719)	4.201*** (0.722)
<b>N</b>	4,059	4,059	4,059	4,059
<b>R-squared</b>	0.175	0.299	0.176	0.300

Note: \*\*\*  $p < 0.001$ , \*\*  $p < 0.01$ , \*  $p < 0.05$ , +  $p < 0.1$ . (two-tailed tests); robust standard errors adjusted for clustering in families in parentheses

on females' and males' educational attainment. But the effect of having sisters is different from that of having brothers. Significance tests show that there is no significant difference on the effects of the number of sisters on males' and females' education ( $F = 0.09$ ,  $p > 0.1$ ); but the negative effects of having *brothers* are significantly higher among males in comparison to females ( $F = 4.35$ ,  $p < 0.05$ ). In Model 4, the number of sisters and brothers do not influence *females'* education after controlling for their education. Interestingly, for males, when accounting for their education, brothers still have detrimental effects on individual educational attainment, whereas the negative effects of sisters substantially decrease and lose significance. Hypotheses 3c and 3d are confirmed.

Figure 12 provides a more intuitive view of the effects of brothers and sisters on males' educational attainment. In general, there is a positive association between brothers' and sisters' educational attainment and individual education. On average, individuals with academically high-achieving brothers and sisters obtain at least more than one year of education compared to those with low-achieving brothers and sisters, net

of other variables. Individual educational attainment significantly decreases as there are more brothers in the family, but the educational gap between males with more sisters versus those with fewer sisters is not as big after accounting for siblings' education.



**Figure 12. Predicted Years of Education among Males with Both Brothers and Sisters**



### Discussion

Hypothesis 1 is supported by Model 2 in Table 4. The results show that both sibship size and siblings' educational level are important in influencing individual educational attainment. The inclusion of siblings' years of education substantially increases the explanatory power of the model and significantly decreases the effect of sibship size, suggesting that the effect of sibship size on education is mediated by siblings' education. In addition, sibship size has a significantly stronger effect on males' educational attainment than females'. For females, the effect of sibship size disappears after controlling for siblings' educational attainment.

Models 3 and 4 in Table 4 provide empirical support to Hypothesis 2. Previous studies constantly find that the quantity of siblings has a negative effect on individual educational outcomes. A closer examination in this research suggests that this relationship might not always hold for women. For women, there is no influence of sibship size on educational attainment as siblings' education is included in the model, indicating that this effect is fully mediated by siblings' educational attainment. For men, the effect of sibship size is partially mediated by siblings' education, suggesting that sibship size may have both direct and indirect effects on individual educational attainment.

Both sibship size and siblings' education exert effects on family resources and interaction processes, but they function in opposite ways. Sibship size is in general negatively associated to educational attainment in that more siblings often dilute economic resources and parental attention. Siblings' education is positively related to educational outcomes because academically high-achieving siblings promote positive intellectual atmosphere and inspire each other in the family. Considering that both parents and siblings exert important influences in shaping the learning resources and the environment within families, it is possible that men and women respond differently to the

resource allocation and interaction settings between parents and children as well as among siblings.

As discussed earlier, parents are inclined to maintain smooth communications with daughters and provide emotional support and academic guidance with their schoolwork. The well-maintained parent-child relationship might serve as a safety net and enable females to experience less of the “dilution” process compared to males even as the number of siblings increases. The effect of siblings’ education matters more for females since the negative effect of sibship size is largely reduced. For males, the parent-child interactions are often vulnerable and sensitive to the interactions between parents and other siblings. Additionally, since males might not be as learning-oriented as females, the resources and positive interaction process from academically high-achieving siblings could not compensate the dilution of material and emotional resources resulting from each additional sibling. As a result, the negative effects of sibling structure remain for males even after accounting for siblings’ education.

Hypotheses 3a and 3b are not supported according to the effects of having single-sex and mixed-sex siblings. Among individuals with single-sex siblings, as sex minorities or majorities in the family do receive more years of education compared to those with other types of sibship sex compositions, but it is mainly due to the fact that most sex minority/majority children are born in smaller families. However, it is important to note that the results do not indicate that being sex minority/majority in the family has no influences on education compared to other children *with the same sibship size*.

Models in Table 7 lend support to Hypotheses 3c and 3d using restricted sample, and further reveals that the detrimental effects of sibship size on males’ education is mainly attributed to the number of brothers in the sibling group. Among individuals with mixed-sex siblings, on average their educational attainment decreases significantly as the number of brothers increases, even when brothers’ education is held constant.

### Conclusion

The relationship between sibship structure and educational attainment has been well studied. Yet the role of siblings' education and the gender variation in the sibship effect is underdeveloped in the literature to date. In this chapter, I have extended research on sibship size and education by asking whether siblings' educational attainment mediates the relationship between sibship size and educational attainment. I also examine what other aspects of sibling structure influence this effect, and to what extent the effect of sibling structure on education varies by gender.

This study has a number of important findings. First, I find that it is important to underscore the influence of siblings' education when examining the impact of sibling size on education. Previous studies have shown that in general, children with a large number of siblings size tend to obtain fewer years of education compared to children with fewer siblings. The results suggest that this negative effect of sibsize could be mediated through siblings' educational attainment. Learning attitudes and behavior are constructed by complex cognitive and developmental processes, and siblings' educational attainment significantly influences individual educational attainment. Besides influences that occur outside families, several factors might contribute to high-achieving children with large sibship size. For instance, children are less likely to experience the dilution process in families with affluent resources or in families where parents devote additional efforts and encouragement to each child as the number of children increases. It is also possible that in spite of the disadvantages and diluted resources, siblings support and inspire each other to overcome the difficulties that often accompany large families. It would also be interesting to explore under what situations or by what mechanisms siblings exert positive influences on academic performance.

Second, I further explore how brothers and sisters influence individual educational attainment. The tension between feminized academic activities and masculinity in male peer culture often leads to boys' underperformance in school through

the conception of male identity and the perception of peer pressure. Girls are less likely to define study as de-feminine and indeed may even attribute academic success as a positive feminine quality (Legewie and DiPrete 2012). Therefore, although each additional sibling dilutes parental resources and influences the interaction patterns in the family, each additional brother might exert different influences in shaping the overall learning atmosphere in comparison to each additional sister. More brothers not only share educational resources in the family, but may also foster anti-academic orientation among siblings. More sisters, on the other hand, might facilitate a learning-oriented environment and reduce the deleterious effect of sibship size.

A third important finding is that sibling structure has differential effects on men's and women's education, and in general, the effect of additional siblings appears more pronounced among men. For males, siblings' achievement does not substantially change the deleterious consequences of increasing sibsize for educational attainment. For females, there is also a negative association between sibship size and educational attainment, but this effect no longer exists after accounting for siblings' education. In other words, a woman's educational attainment is more influenced by siblings' education rather than the number of siblings. If her siblings are academically well-performed, then the woman is likely to be inspired to achieve more years of education; if most of her siblings drop out of school and do not attend college, then she is more likely to follow the pattern. The effect of brothers and sisters also has divergent effects on males and females. Females are less influenced by the detrimental effects of brothers. On average, males' underachievement combined with the negative effects of brothers on education makes males differentially suffering from additional brothers in sibling group.

This finding broadens insight into the mechanisms by which sibling structure impacts educational attainment. The resource dilution hypothesis proposes that each additional sibling will influence the allocation of resources *equally* among males and females. But the divergent effects on men and women indicate that sibship size not only

influences the distribution of resources, but also the interactions among siblings, as well as the perceptions of child towards parent-child relationship and parental expectations for his/her academic attainment. Since childhood, girls and boys are socialized according to socially appropriate gender schema (Bem 1981; Fagot, Rodgers, and Leinbach 2000). Although many modern parents become increasingly liberal towards children's sex role development, in practice, girls remain socialized to be more dependent and sensitive to the relationships and needs of others, whereas boys are encouraged to be independent and assertive (Harach and Kuczynski 2005; Marini 1978; Schulenberg, Vondracek, and Crouter 1984; L. Steinberg 1987). These gendered qualities contribute to different parent-child interaction patterns for girls and boys. Women and men perceive different levels of support from mothers in college with women's ratings higher than men's (Furman and Buhrmester 1992). The fragile parent-son relationship might become more vulnerable in face of competition from additional siblings.

The findings are limited in some regards. Most important, due to lack of adequate data, I could only use educational attainment of siblings to indicate siblings' learning attitudes and behavior. This variable could be highly correlated with other factors that facilitate/impede education in addition to siblings' influences, such as genetic heritage, social capital and cultural capital in the family, and school environment. Although I attempt to control these associations by incorporating some important background variables in the model, it is still possible that there are other unrevealed yet influential elements that impact the mechanisms by which sibling structure influences educational outcomes beyond the mutual influences among siblings.

Additionally, the theory I propose in this study indicates that sibling structure has varying effects on males' and females' education through its influences on resource allocation and interaction styles between three agents, the individual, parents, and siblings. The empirical analysis, however, only focuses on the *results* of these processes, rather than the processes *per se*, such as the frequency and intensity of communication

and the perceptions of child toward siblings' influences. When there are data available, researchers could examine how men and women with different sibling structures react differently to parents' and siblings' involvement in education.

Finally, the study focuses on only one major educational outcome, years of completed education. Previous studies have shown that sibling structure also influences other academic abilities and performances, such as intelligence (Galbraith 1982; Guo and VanWey 1999), verbal achievement (Breland 1974; Hanushek 1992), and educational aspirations (Kao and Tienda 1998). Whether these effects remain robust after accounting for siblings' academic attitudes and behavior is an important question for future research.

## CHAPTER IV. BIRTH ORDER AND OCCUPATIONAL ASPIRATIONS

### Introduction

The occupational aspirations of adolescents and young adults are highly sex-typed in the United States. Female adolescents tend to expect to work in traditional female occupations, and males tend to expect to work in traditional male occupations (Kenkel and Gage 1983; Marini 1978; Mau and Bikos 2000; Shu and Marini 1998; Tully, Stephan, and Chance 1976). Based on nationally representative data (National Longitudinal Survey of Youth 1979), Marini and Brinton (1984) found that the index of segregation for the occupational aspirations of adolescents and young adults aged 14 to 22 is 61, which indicates that 61 percent of women or men would have to change their occupational aspirations to achieve gender equality with respect to occupational aspirations (Duncan and Duncan 1955). The sex-typing of occupations is also closely associated with status and earning difference. Predominately male jobs on average have higher earnings, more flexible schedules, and unsupervised break time (Cotter et al. 1997; England 1984; England et al. 1988; Glass 1990). One of the main reasons for this is due to the fact that men are assumed to be more competent and given higher status than women in society (Correll 2004; Ridgeway and Correll 2004). Therefore, for females, having sex-typical occupational aspirations will likely lead to work in low prestige and low income occupations.

Researchers have explored many macro-level predictors of teenage boys and girls occupational aspirations, including social culture and context (Baird 2008; Schoon and S. Parsons 2002; Schoon et al. 2002; Shu and Marini 1998), sex stereotypes (Kenkel and Gage 1983; Matsui, Ikeda, and Ohnishi 1989; Ruble, Cohen, and Ruble 1984), family background (Allen 1980; Almquist and Angrist 1970; Marjoribanks 1997; Schoon and Polek 2011; Trice and Hughes 1995), school experiences (Braddock and Dawkins 1993;

Kfir 1988; Wilson and Wilson 1992), and psychological characteristics (Wigfield and Eccles 2000).

Among these influences, family background has been found to play a primary role in shaping children's gender role attitudes and the sex-typing of occupational aspirations. For example, researchers have focused on the impact of family socioeconomic status (Hannah and S. E. Kahn 1989; Marjoribanks 1997; Schoon and Polek 2011), mother's employment (Almquist and Angrist 1970; Auster and Auster 1981; Burlin 1976), and parental encouragement (Ferry, Fouad, and Smith 2000; Hoffman 1972) on adolescents' occupational aspirations.

Because children in the same family are exposed to the same family environment, it is not surprising that siblings are similar to each other in terms of occupational aspirations. However, researchers find that although siblings share a certain level of similarities in occupational aspirations, there are substantial differences (Burden and R. Perkins 1987; Edwards and Klemmack 1973; Marjoribanks 1995). This study examines one underexplored factor that may lead to different occupational aspirations among siblings within the same family – birth order.

Although birth order has been relatively understudied as a predictor of occupational aspiration, social scientists have long investigated the effect of birth order on a number of other attitudinal and behavioral outcomes, beginning with Galton's (1874) argument on the significance of birth order in occupational achievement. In his book *Born to Rebel*, Sulloway (1996) applies the Darwinian evolutionary theory to explain the functioning of birth order. This theory argues that given limited family resources, sibling competition requires children to adopt different strategies and distinguish themselves to maximize their chance of survival and reproduction. Firstborns often serve as surrogate parents and are inclined to defend their power and status in front of younger siblings. Laterborns are likely to resist the power of earlyborns. They also tend to pick different interests and develop different strengths from earlyborns in order to



decrease direct competition and increase parental investment. As a result, laterborns are often rebellious, open to experience and unconventional. The strategies children choose significantly impact personality traits (Beck, Burnet, and Vosper 2006; Healey and Ellis 2007; Paulhus, Trapnell, and Chen 1999) as well as other relevant outcomes, such as educational achievement (Booth and Kee 2008; Buckles and Munnich 2012; Zajonc and Markus 1975), workplace performance (Black, Devereux, and Salvanes 2005), and youth delinquent behavior (Argys et al. 2006; Bègue and Roché 2005).

According to the Darwinian framework, it is possible that birth order impacts occupational aspirations by influencing personality traits that are associated with career outcomes. Because firstborn children often receive more parental attention and are highly motivated to meet parental expectations (Burden and R. Perkins 1987; Price 2008), they tend to be more ambitious, achievement oriented, and confident (Sulloway 2002, 2007). Most of these characteristics are rewarded in the labor market, and thus firstborns are more likely to aspire to prestigious occupations. Many empirical studies find that there is a “firstborn advantage” in terms of occupational prestige among siblings. For example, compared to laterborns, firstborns are overrepresented among political leaders and entrepreneurs (Bowen and Hisrich 1986; Hudson 1990; Newman and Taylor 1994; Steinberg 2001). Laterborns, on the other hand, are inclined to rebel against the power and status of firstborns and seek alternative areas to distinguish themselves. In this way, the achievements of laterborns are not simply repetitions of that of elder siblings because they want to attract parental attention and investment.

Drawing on current literature on occupational aspirations and the evolutionary framework, this study examines the extent to which birth order influences one important developmental outcome: occupational aspirations. In this chapter, I focus on adolescents’ occupational aspirations rather than on adults’ actual occupational choices because research has shown that a variety of intervening factors both at the individual and the contextual levels affect the transition from occupational aspirations to actual jobs, such as

information obtained, opportunity structures, and statistical discrimination in the labor market (Reskin 1993). Because birth order mainly impacts personality and attitudes at the individual level, it is more effective to examine the relationship between birth order and occupational aspirations.

This is not the first empirical study on the impact of birth order on adolescent occupational aspirations. A few studies have explored the relationship between birth order and occupational aspirations. For example, Burden and Perkins (1987) find evidence that parents in general have the highest expectations for their firstborn children in terms of occupational attainment. In a study of college women, Edwards and Klemmack (1973) report that firstborn women have a higher probability of aspiring to culturally non-feminine occupations. Marjoribanks (1995) also observes that birth order rank is negatively associated with the prestige of expected occupations for both men and women.

But these studies are limited in two regards that might impede a thorough understanding of the relationship between birth order and occupational aspirations. First, they typically focus on the aspirations of firstborns, and treat middleborns and lastborns as a homogeneous group, typically referred to as laterborns. Considering that lastborns are more likely to be open to experience and support unconventional ideas, and they often receive special parental attention and investment as the youngest and most vulnerable child in the family (Sullo way 1996, 2002, 2007), it is possible that their attitudes and behavior are substantially different from middleborns. Therefore, the use of two categories of birth order (firstborns vs. laterborns) might underestimate the birth order effect and neglect the differences between middleborn and lastborn children.

Second, the outcome variables in these studies are either occupational prestige or the sex type of expected occupations. These pioneering studies are important in explaining the influence of birth order on adolescent occupational aspirations, and they also call for a simultaneous examination of the prestige and the sex type so that

researchers could have a thorough understanding on this relationship. More specifically, although these two dimensions of occupational aspirations are often closely related to each other, birth order will affect the two dimensions via different mechanisms. High prestige occupational aspirations may reflect that the children are confident in their abilities to handle challenges and solve problems (Bedeian 1977; D. Brown 2002; Douvan and Adelson 1966) because they receive relatively affluent parental attention and family resources. Nontraditional occupational aspirations may reflect the rebellious personality of children and their willingness of doing something different and unconventional (Gottfredson 1981).

This study is designed to fill the gaps in this literature by bridging two research areas (research on birth order and occupational aspirations) and examining the effect of three major birth order positions on two dimensions of occupational aspirations. My main research question is: How are firstborns, middleborns, and lastborns different from each other in terms of the prestige and sex type of expected occupations? Based on the considerations above, in this chapter I focus on the “lastborn effect” in the sex type and prestige of the expected occupation. More specifically, I hypothesize that lastborns are more likely to have nontraditional occupational aspirations compared to firstborns and middleborns. I also hypothesize that firstborns and lastborns are more likely to have high prestige occupational aspirations compared to middleborns. I believe that birth order plays an important role in determining occupational aspirations, and the “firstborn advantage” is only part of the story in assessing the influence of birth order on occupational outcomes.

This study contributes to current scholarships in three ways. First, it examines how children in the same family develop different occupational aspirations, which is often neglected in current studies of occupational aspirations. Second, this study extends the effect of birth order to both the prestige and sex type of adolescent occupational aspirations. Finally, this research makes improvements in the study of birth order by

proposing a “lastborn effect” and differentiates lastborns from middleborns, two groups which are often depicted together as “laterborns”. A distinction between these two birth ranks enables researchers to detect the nuanced differences of birth positions and have a better understanding on the functioning of birth order in real life.

### Background

#### Sex-Typed Occupational Aspirations

As mentioned earlier, a number of studies have shown that adolescents’ occupational aspirations are highly sex typed in the United States (Kenkel and Gage 1983; Marini 1978; Mau and Bikos 2000; Shu and Marini 1998). Mirroring occupational sex segregation in the labor market (Bielby and Baron 1986; Charles and Grusky 2004; Jacobs 1989), adolescent girls tend to expect to work in predominately female jobs, such as nurses, receptionists, secretaries, and primary school teachers, and adolescent boys tend to expect to work in predominately male jobs, such as engineers, computer scientists, executives and firefighters.

Eccles and colleagues (Eccles, Wigfield, and Schiefele 1998; Eccles and Wigfield 2002; Eccles 1983, 1994; Wigfield and Eccles 2000) have proposed an expectancy-value model to explain how social and psychological factors account for differences in occupational aspirations. This theoretical model suggests that occupational aspirations are determined by two sets of beliefs: expectation for success and the importance or value the individual attaches to the options available (i.e., “task-value”). More specifically, the expectation for success is derived from the matching of personal ability such as personal efficacy and relevant skills, with the evaluation of barriers and opportunities of a specific upcoming task and/or a given domain. If this matching process goes well, it indicates that the individual believes that she has confidence and is able to solve the problems and perform well in the domain. The second component, task-value, determines personal importance of doing well on the task. An individual may have a wide range of options in

which she has confidence to succeed, while the value she assigns to each task is different and the range narrows down as she picks the one that matters most for her.

Ridgeway, Correll and colleagues (Correll 2001, 2004; Ridgeway and Correll 2004; Ridgeway and Smith-Lovin 1999; Ridgeway 2009) argue that the gender schema in our society assumes that men have higher status and are more competent in society than women. Men are typically favored in mixed-sex groups and in traditionally masculine contexts, while women only have advantage in traditionally feminine contexts. As a background identity, gender substantially frames self-perceptions and goals, and biases the behaviors, performances, and evaluations of men and women. Based on experiments and real-world survey data, Correll (2004) find that cultural beliefs about gender could also evoke gender differentiated performance and later bias the assessments women and men make of their own competence and career-relevant tasks.

Drawing upon the expectancy-value theory and the gender belief argument, men and women develop different patterns of expectancy for success and different values associated with tasks. As a result, men and women tend to occupational aspirations that are often socially considered as gender appropriate. Men and women perceive their strengths and weaknesses differently and expect success in different areas. Empirical research supports these theories. In a study of adolescents, females anticipate more barriers than males in the formulation and pursuit of career goals (McWhirter 1997). Among high-school seniors, males have higher confidence in science-related jobs and are more likely to value math/computer work and machinery work. Females, on the contrary, have higher confidence in human services jobs and are more likely to value people-oriented work (Jozefowicz, Barber, and Eccles 1993). The second component of the expectancy-value model, personal value of different occupations, is also important. Weisgram and colleagues (2010) found that traditionally feminine occupations are rated higher for fulfilling family and altruistic values compared to traditional masculine occupations, and female adolescents tend to endorse altruistic and family values more

strongly than males. Therefore, females show greater interest in traditionally female occupations. Similarly, male adolescents are more likely to expect to work in traditionally male occupations because these occupations are rated as higher for fulfilling money and power values, and male adolescents value money and power more strongly than females.

### Sulloway's Evolutionary Theory on Birth Order

The expectancy-value theory and gender belief argument together suggest that men and women tend to develop conventional and sex-typical occupational aspirations. But there remain some individuals, though only accounting for a small percentage of the whole population, who aspire to work in unconventional and nontraditional occupations. What factors contribute to these atypical occupational aspirations? This chapter discusses one factor that influences this process: birth order. In this section, I introduce Sulloway's evolutionary theory examining the effect of birth order on individual characteristics, which explains how siblings develop different personality traits and sheds lights on the influence of birth order on occupational aspirations.

### Sulloway's Study

Based on the systematic documentations of the roles of historical figures in important social events and on a meta-analysis of 196 studies on personality and birth order, Sulloway (1996) applies the Darwinian evolutionary theory to explain the birth order effect. Sulloway incorporates both parent-driven and sibling-driven processes (Rohde et al. 2003), and postulates that limited parental resources, both physical and emotional, require children to compete for parental favor and investment to maximize their probability of survival and success. According to this theory (Sulloway 1996, 2002, 2007, 2011), sibling competition promotes children of different birth order positions to adopt distinct strategies and pick suitable roles and niches (the microenvironment for each child) within the family system. These strategies and niches contribute to the development of disparate personalities of siblings. For example, as the first child in the

family, firstborns are likely to align with parents. They tend to take charge among siblings and have everything under control. As younger brothers and sisters, laterborns are inclined to use “low-power strategies”, such as whining, humor, and rebellion (Sulloway 2002). These strategies and corresponding personalities of children often endure into adulthood.

Sulloway assesses the effect of birth order positions using the classic “Five Factor Model” of personality (Costa and MacCrae 1992), which proposes five basic dimensions of personality, conscientiousness, agreeableness, extraversion, openness to experience, and neuroticism. Sulloway (2002, 2007) summarizes five causal mechanisms that relate birth order to personality<sup>12</sup>: (1) differences in parental investment – children who receive more resources tend to be more conscientious and agreeable; (2) niche partitioning, which leads laterborns to seek underdeveloped interest areas and become open to unconventional experience; (3) dominance hierarchy strategies, by which dominant siblings (typically firstborns) are inclined to be more conscientious and extraverted (in terms of being assertive), less agreeable, less open to rebellious experience, and less neurotic; (4) sibling de-identification, which produces the zigzag trends among siblings to maximize differences; and (5) birth-order stereotypes, which may reinforce the birth order effects produced by other mechanisms<sup>13</sup>.

As a result, firstborns, middleborns, and lastborns<sup>14</sup> possess distinct personalities and characteristics. Since firstborns typically receive greater parental investment, pick the first niche among siblings, and occupy dominant roles, they tend to act as surrogate parents and identify more strongly with power and authority than laterborns. In terms of

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<sup>12</sup> See Table 1 in Sulloway (2002) and Table 21.1 in Sulloway (2007) for more details.

<sup>13</sup> For comments on the birth-order stereotypes and their reflection in reality, please refer to Herrera et al. (2003).

<sup>14</sup> Only children manifest personalities typically in between those of firstborns and lastborns (Sulloway 1996). Since this is not the focus of this paper, I did not explain it in detail here.

the five factors of personality, firstborns are inclined to be more conscientious, less agreeable, more extroverted in the sense of being more assertive, more open to intellectual experience, and less neurotic (Sulloway 1996, 2002, 2007). Laterborns, on the other hand, are expected to display different personality traits from firstborns. They are more likely to resist status and power, seek alternative ways of distinguishing themselves, and sympathize with unconventional views (Paulhus, Trapnell, and Chen 1999). Based on 27 controlled studies, Sulloway (2002) found that laterborns are 43 percent more likely than firstborns to hold nontraditional social attitudes and support liberal or radical social change.

### Empirical Evidence of the Evolutionary Theory on Birth

#### Order

According to Sulloway's evolutionary explanation, firstborns and laterborns often adopt distinct strategies and corresponding personalities that maximize their chances of survival and reproduction. Although there are some mixed findings (for instance, Beer and Horn 2000), the evolutionary thesis receives substantial support in personality studies. By measuring birth order using two categories, firstborns and laterborns, these studies yield consistent findings that firstborns are more achieving and conscientious when compared to laterborns, and laterborns are more rebellious, liberal, agreeable and open to new experiences (Beck, Burnet, and Vosper 2006; Healey and Ellis 2007; Paulhus, Trapnell, and Chen 1999).

In spite of the supportive evidence in personality studies, the results are less consistent in other research fields. Some studies lend support to the evolutionary explanations in other outcome variables. For example, Zweigenhaft and Von Ammon (2000) suggest that laterborns are more likely to perform unconventional behavior and challenge the status quo, and this hypothesis is confirmed using real-life data predicting the probability of being arrested for participation in civil disobedience. Based on cross-



national data from six countries, Rohde and colleagues (2003) also find supporting evidence that lastborns tend to be the “rebel” of the family when compared to first and middleborn children. Saad et al. (2005) applies Sulloway’s theory into the consumer-marketplace domain and their results suggest that laterborns are more open to product innovations than firstborns.

But some other studies provide evidence against Sulloway’s predictions on the associations between birth order and social attitudes. For instance, Freese, Powell, and Steelman (1999) examine 24 measures of social attitudes from the 1994 General Social Survey to test whether firstborn adults are more conservative, supportive of authority, and “tough-minded” in comparison to laterborns. Their results show that the relationships are either statistically insignificant or opposite to the predicted direction. But later Sulloway (2007) conducted a meta-analysis of 20 relevant studies, seven of which report insignificant or inconsistent findings (including the Freese et al. paper), and found a mean-weighted correlation of 0.10 between being laterborn and supporting unconventional alternatives.

The inconsistency in study results may reflect two important issues that researchers need to be cautious of in birth order studies. First, as Sulloway (2002) points out, it is crucial to note that the influence of birth order on the expression of personality is context sensitive. The meaning of being “rebellious” or “unconventional” is likely to be different under different circumstances. For example, the academy encourages and welcomes scientific innovation, and so making creative progress becomes part of the routine process rather than unconventional (Sulloway 1996, 330). In a similar vein, norms change over time, and so some behavior that was radical or controversial in previous times might be commonplace today, such as female labor force participation. Therefore, researchers should be cautious about the context when testing the effect of birth order on attitudes or other outcomes.

Furthermore, following Sulloway (1996), most empirical studies highlight the contrast between firstborns and laterborns, which implies that laterborns are one unifying group and blurs the differences between middleborn and lastborn children. Middleborns, by definition, are the lastborns in the family during the first period of their lives. However, depending on when the next child is born, middleborn children stop being the lastborns and start to share resources with both elder and younger siblings, and thus they may develop personalities that are substantially different from lastborns (Hertwig, Davis, and Sulloway 2002). Compared to middleborns, both firstborns and lastborns enjoy unique niches in the family in that firstborns are the first child of the family and lastborns are considered the most vulnerable and in need of special attention from parents (Sulloway 2002).

#### Birth Order and Occupational Aspirations

As mentioned earlier, sociologists explain the influence of family on occupational aspirations from different perspectives. Earlier status attainment researchers focused on the impacts of family background, such as social class (for example, Empey 1956; Jahoda 1953; Tseng 1971) and parents' socioeconomic status (Burlin 1976; Marini 1978; Sewell, Haller, and Portes 1969). Schulenberg and colleagues (1984) proposed that the family's influence on occupational development operates through two interdependent dimensions. The first involves resources and opportunities provided by the family for children's development. The second and often-ignored dimension involves family processes, "specifically socialization practices and parent-child relations". As a response to this call, there is a growing academic interest in how one aspect of family process – the parent-child relationship – impacts children's occupational aspirations (Hargrove, Creagh, and Burgess 2002; Marjoribanks 1997; Seginer and Vermulst 2002). Meanwhile, research has also been conducted on the effect of another family process – sibling dynamics – on occupational aspirations. Following Adler's vocational theory (1956) on the importance

of birth order on one's lifestyle development, Watkins (1984) proposes an Adlerian vocational theoretical framework suggesting that "birth order creates a particular set of interactional-environmental events that influences the view of self as worker, adoption of work behaviors, and interpersonal work style."

Empirical evidence suggests that birth order has a significant impact on occupational interest and achievement, and most studies found that firstborns have more advantages in occupational achievement (D. D. Bowen and Hisrich 1986; Leong et al. 2001; B. S. Steinberg 2001; Watts and Engels 1995; J. White et al. 1997). For example, using the data of women who came to power in 41 independent states around the world<sup>15</sup> from 1960 to 1989, Steinberg (2001) found that similar to firstborn men, firstborn women are overrepresented among presidents and prime ministers. In a review of studies of female entrepreneurs, Bowen and Hisrich (1986) report similar findings that on average 45 to 60 percent of female entrepreneurs are firstborns. Leong et al. (2001) found that there are significant differences in vocational personality type, occupational interests, and values among three birth-order groups (only children, firstborns, and laterborns), and that laterborn students in their sample score significantly higher than firstborns on music and athletics in terms of occupational interests. Although these studies provide rich insights into how ordinal positions of sibship might affect vocational aspirations, they offer little understanding regarding the overall picture of the prestige and sex type of occupational aspirations because of their focus on specific job categories, such as political leaders and entrepreneurs. These studies also do not examine specifically the occupational aspirations of middle- and last-born children besides firstborns.

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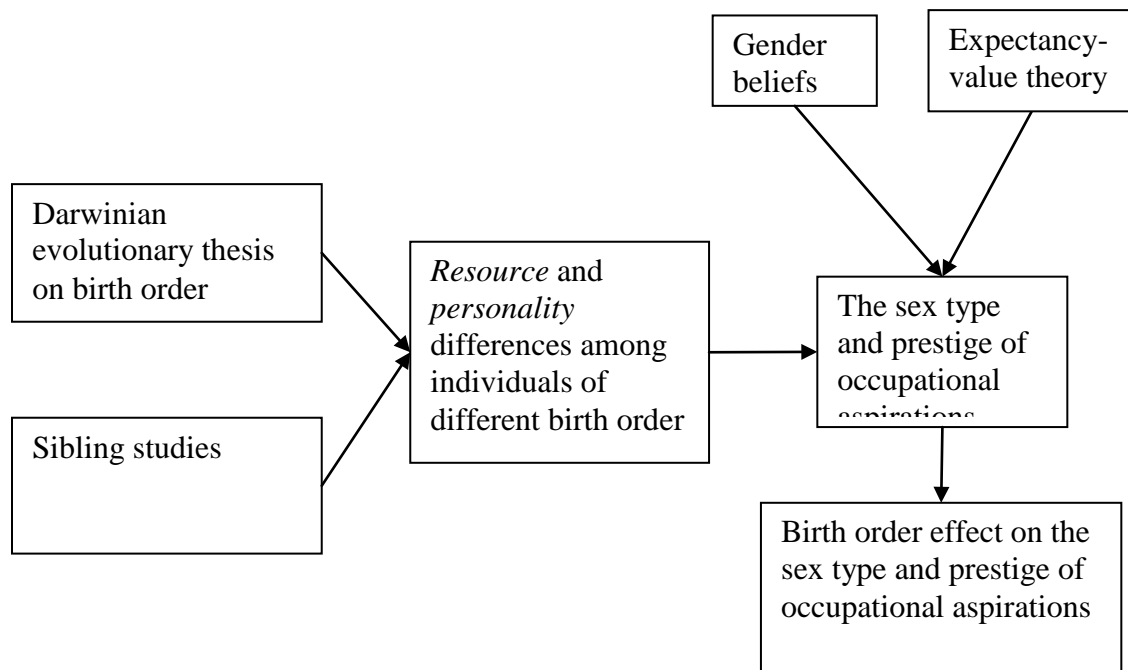
<sup>15</sup> The author examined all countries with female prime ministers or presidents during that period (see Table I in Steinberg 2001). The countries include Sri Lanka, India, Israel, Argentina, Central African Republic, Portugal, Bolivia, Great Britain, Dominica, Iceland, Norway, Yugoslavia, New Zealand, Switzerland, etc.

### The Current Study

As mentioned earlier, the “firstborn advantage” has been well documented in previous research (D. D. Bowen and Hisrich 1986; Hudson 1990; Newman and Taylor 1994; B. S. Steinberg 2001), and most studies suggest that laterborns have to share family resources with elder siblings, which often negatively impacts their educational and occupational outcomes. However, lastborn children may also be different from other children regarding occupational aspirations for two reasons. First, lastborn children are likely to have more access to family resources than middleborns; access to family resources is often associated with self-efficacy and confidence, both leading to high prestige occupational aspirations (Bedeian 1977; Eccles, Wigfield, and Schiefele 1998; Eccles and Wigfield 2002). The fact that firstborns typically receive more parental investment (Leong et al. 2001; Sullo way 2007; Watts and Engels 1995; J. White et al. 1997) does not necessarily indicate that middleborn and lastborn children equally share the remaining family resources. Lindert (1977, 1978) finds that birth order influences children’s subsequent outcomes because of parents’ time and commodity inputs into children, and “competition from a younger siblings would be stronger than that from an older sibling because younger siblings require more care” (Hauser and Sewell 1985, 5–6). Therefore, without competitions from younger siblings, lastborns are likely to perform better and have higher expectations. Besides, parents have their lastborn child at a relatively older age compared to the time they give birth to the first child. This means that it is possible that parents are in a better financial situation and they have developed more sophisticated and effective parenting styles from the experience of rearing elder children. As a result, the lastborn child might be provided more opportunities and resources and thus have higher occupational aspirations.

Second, the evolutionary framework points out that laterborns (including lastborns) tend to be rebellious and unconventional, which facilitates nontraditional occupational aspirations (Helson 1971; Noble 1987; Parsons, Frieze, and Ruble 1978). In

a social environment with a high-level of occupational sex segregation, being rebellious to social conventions in occupational choices suggests that laterborn adolescents are more likely to aspire to work in sex-atypical occupations. Figure 13 illustrates the theoretical background based on which I develop the hypothetical effect of birth order on occupational aspirations.



**Figure 13. Theoretical Background on the Effect of Birth Order on the Sex-Typed Occupational Aspirations**

In this study, I examine the effect of birth order on the prestige and sex type of occupational aspirations. More specifically, I test two hypotheses:

*Hypothesis 1:* Firstborn and lastborn adolescents are more likely than middleborn adolescents to expect higher prestige occupations.

*Hypothesis 2:* Lastborn adolescents are more likely to expect nontraditional occupations than firstborn and middleborn adolescents.

This research contributes to current scholarships in three ways. First, it explores the effect of birth order, an important non-societal factor, on occupational choices. Traditional occupational expectation establishes a certain associations between gender and job characteristics. It is often viewed as an important source of both vertical and horizontal occupational sex segregation (Grusky and Levanon 2008). In the vertical dimension, traditional expectation associates men with prestigious positions that require substantial human capital investment while associates women with lower-status positions. In the horizontal dimension, women are presumed to be good at jobs involving care-giving, personal service, and interpersonal interactions, while men are presumed to be well suited for occupations requiring mathematical skills, strength, and interaction with things (Charles and Grusky 2004, 15). Researchers typically attribute traditional occupational aspirations to the influence of contextual factors, such as cultural stereotype (Bielby and Baron 1986; Grusky and Levanon 2008) and the taken-for-granted opportunity structure in the labor market (Chan 1999; Reskin 1993). However, only a few studies examine occupational aspirations as a function of birth order (for instance, Marjoribanks 1995). Social change does not merely occur in the public arena; rather the seed that triggers transformative opinions might be planted in private settings such as the family. Therefore, it is important to understand the influencing factors at both the societal and the family level.

Second, based on the evolutionary thesis, this study extends the effects of birth order into an important area: occupational aspirations. As discussed earlier, researchers

sometimes find that birth order plays an important role in the expression of personality but not in other relevant areas, such as social attitudes (Freese, B. Powell, and Steelman 1999). Considering the context-sensitive nature of the birth order effects, the impacts of birth order on occupational aspirations may be better revealed by analyzing a time period (such as early 1980s) when choosing sex-atypical jobs is viewed “rebellious” or unconventional.

Finally, I examine whether a “lastborn effect” exists, by differentiating lastborn children from middleborn children in this study. As discussed earlier, many earlier studies treat middleborns and lastborns as a monolithic group (i.e., “laterborns”) and neglect the possible differences between them. A distinction between these two birth ranks enables researchers to detect the nuanced differences of birth positions and have a better understanding on the functioning of birth order in real life. In fact, although most studies examine the difference between firstborns and laterborns, the few studies that use a more detailed categorization find that lastborn children display different social orientations and personal traits from middleborn children (for example, Kidwell 1982; Salmon and Daly 1996; Tomeh 1970). Therefore, it is possible that lastborns may possess different occupational aspirations compared to middleborn children.

## Method

### Data and Variables

#### Data

I use the first wave (1979 wave) of National Longitudinal Survey of Youth 1979 (NLSY79) to test the hypotheses.<sup>16</sup> I use this dataset because (1) the interview took place during the time when occupational sex integration just started (Reskin 1993) and it was

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<sup>16</sup> For a detailed description of the NLSY79 data, please refer to the data section in Chapter III.

an innovative idea to many people to work in sex-atypical occupations, and (2) it measures sibling structure and occupational aspirations in the same year. If I use sibling structure and occupational aspirations measured from different waves, it is possible that children who identified themselves as lastborns in the earlier wave might become middleborns in the later wave because of the coming of a younger sibling. In the 1979 wave, respondents provide information on their occupational aspirations and sibling information, including sibship size and birth order. The base sample in 1979 includes 12,686 respondents aged 14 to 22. Because the focus of this study is the effect of birth order, I only include respondents with at least one sibling in the sample. After excluding cases with missing data on the variables used in the analysis, the final analytic sample consists of 7,826 respondents (see Table A4 of Appendix for details on sample creation).

#### Dependent Variable and Main Independent Variables

Occupational aspiration is derived from the question, “What kind of work you would like to be doing when you are age 35 years old?” Respondents’ responses were originally coded with the 3-digit 1970 census occupation codes.

I use these occupation codes to create a new variable, *occupational prestige*. It is measured by Duncan’s SEI scores as a continuous variable. In this sample, the most prestigious occupations are dentists (SEI=96) and judges (SEI=93) and the least prestigious occupations are woodchoppers and spinners (SEI=4).

The creation of my second dependent variable requires several steps. First, the percentage of women in the expected occupation is obtained from the *Dictionary of Occupational Titles* for 1970 census categories (Bureau of the Census 1973). Based on the same occupational categories, Bielby and Baron (1986) suggest that a detailed occupational category is considered “mixed” if males account for 20 to 80 percent of employees. Based on this definition, most people work in sex-typical occupations (Bielby and Baron 1986). In my analytic sample, only 27 percent of respondents expected to be



employed at mixed occupations. Three quarters of the men (3,054 out of 4,033) preferred male occupations, and approximately 50 percent of women (1,831 out of 3793) preferred female occupations. I generate an ordinal variable for the second dependent variable, *sex type of expected occupation*, with values varying from 1 to 3 (1=20% of employees are females, i.e., male dominated occupation; 2=mixed occupation; and 3=80% of employees are females, i.e., female dominated occupation).

The main predictor variable in my analysis is birth order. I use two sets of variables to measure birth order. The first birth order variable, *birth order index*, is calculated following Booth and Kee's (2008) suggestions. This index denotes the ratio of the respondent's birth order to the average birth order of the family. It is calculated using the absolute birth order of the respondent  $\varphi$  (1=firstborn, 2=second born, 3=third born...) and the total number of children in the family,  $N$ , according to the formula  $B = \varphi / [(N+1)/2]$ . For example, for a third child in a four-child family and an eighth child in a twelve-child family, their birth order indices are both equal to 1.2 in spite of different number of siblings.<sup>17</sup> This measure is useful because it effectively separates the effect of birth order from that of sibship size, which is very important considering that these two variables are closely connected. For example, high birth order rank is only possible in large family (for instance, there is no fifth child in a three-child family). If sibling size is not controlled, the negative effect of birth order might in fact capture the effect of large sibship size rather than the effect of birth order per se.

The second set of birth order variables entails three dichotomous variables indicating whether the respondent is a firstborn child (*firstborn*), a middleborn child (*middleborn*), or the lastborn child (*lastborn*). I create this categorical variable, in

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<sup>17</sup> For this sample, the birth order index varies from 0.1 to 1.9 and the range indicating middle child is from 0.8 to 1.2.

addition to the index, so that I can examine whether firstborn and lastborn children are substantially different from in-between children.

### Control Variables

I include a similar set of control variables as I did in Chapter 3. The demographic information is captured by *gender* (female=1) and race (three dummy variables, *African Americans*, *Hispanics*, and *Whites and other racial groups*). I also control for four family background variables, including *intact family* (both biological parents at home=1), *household income* (logged), *mother's education*, and *sibship size*. I also include the variable *year of birth* to control for cohort effects. Year of birth consists of nine dichotomous variables indicating respondents' birth year. Table A5 of Appendix reports correlation matrix among these variables.

### Analytical Strategy

I use ordinary least-squares (OLS) models to predict prestige of the expected occupation as a function of birth order variables and run the analysis on the whole sample. I use ordinal logit model to predict the sex type of the expected occupation because the dependent variable is an ordinal variable indicating the three sex types (1=predominately male occupations, in which females accounting for less than or equal to 20% of employment, 2=mixed occupations, in which female account for 20% to 80% of employment, and 3=predominated female occupations, in which females accounting for more than 80% of employment). Considering that the percentage of women in the expected occupation confers different meanings to males and females, I run separate models for males and females when estimating the sex type of expected occupation.

For each outcome variable, I predict the birth order effects in two ways corresponding to the two measures of birth order. First, I include the birth order index as a key predictor to examine whether the effects are monotonic. In other words, whether the effects increase or decrease in a linear way for firstborn, second born, and so on.

Second, I include the two dummy variables indicating firstborns and lastborns in the model (with middleborns as the comparison group) to see whether firstborn or lastborn children are different from middleborns in occupational aspirations.

Due to the sample design of the NLSY79, 46 percent of respondents come from the same household. Since respondents from the same households are likely to be correlated with each other, I correct the estimated standard error with Huber-White adjustment.

### Results

Table 8 summarizes the descriptive statistics of all variables used in the analysis. On average, the expected occupational prestige is 53 in Duncan SEI score. As mentioned earlier, the sex-type of occupational aspirations are significantly different for male and female adolescents. In terms of sibling structure, each respondent has four siblings on average. Twenty-three percent of the respondents are firstborns, fifty-two percent are middleborns, and twenty-five percent are lastborns. Approximately fifty percent of respondents are females and the average age (not shown) is 18 years old. Sixty percent of the adolescents and young adults in the sample are Whites or other races, and the majority of them (70 percent) live with both biological parents at home.

Table 9 summarizes the effects of birth order on expected occupational prestige in regression analyses based on the whole sample. As Model 1 shows, the coefficients for birth order index are not statistically significant for both females and males, indicating that birth order does not have a statistically significant association with expected occupational prestige. The estimated coefficients for the control variables are, in general, in the expected directions. Sibling size is negatively related to the prestige of expected occupations, net of other variables. Girls on average expect to work in high prestige occupations than boys because predominantly female occupations are overrepresented in the middle and upper-middle range of the distribution of occupational prestige, and

**Table 8. Descriptive Statistics for All Variables, NLSY79**

	Mean	S.D.
<b>Dependent Variable</b>		
Expected occupational prestige	52.82	23.22
Sex type of expected occupation	1.76	0.82
<b>Key Independent Variables</b>		
Birth order	3.12	2.15
Birth order index	1.03	0.43
Firstborns	0.23	0.42
Middleborns	0.52	0.50
Lastborns	0.25	0.43
<b>Control</b>		
Sibship size	3.89	2.53
Female	0.48	0.50
Hispanic	0.16	0.36
African American	0.25	0.43
Whites and other races	0.60	0.49
Intact family	0.69	0.46
Household income 1979 (logged)	9.23	1.09
Mother's education	10.92	3.13
Year of birth		
1957	0.03	0.18
1958	0.13	0.34
1959	0.13	0.34
1960	0.13	0.33
1961	0.13	0.33
1962	0.12	0.32
1963	0.13	0.34
1964	0.13	0.33
1965	0.08	0.27

N=7826

**Table 9. OLS Regression Results Predicting Expected Occupational Prestige, NLSY79**

	Model 1	Model 2
<b>Birth Order</b>		
Birth order index	0.433 (0.609)	
Firstborns		2.487*** (0.695)
Lastborns		1.845** (0.659)
Middleborns (ref.)		
<b>Control Variables</b>		
Sibship size	-0.784*** (0.112)	-0.585*** (0.122)
Gender (female=1)	4.645*** (0.507)	4.652*** (0.506)
Hispanic	6.109*** (0.822)	6.069*** (0.821)
African American	3.809*** (0.636)	3.861*** (0.635)
Whites and other races (ref.)		
Intact family	0.698 (0.581)	0.723 (0.580)
Household income 1979 (logged)	0.967*** (0.265)	0.995*** (0.264)
Mother's education	1.451*** (0.096)	1.448*** (0.096)
Year of birth (not shown)		
<b>Constant</b>	28.190*** (2.945)	26.483*** (2.942)
<b>Observations</b>	7,826	7,826
<b>R-squared</b>	0.064	0.066

Notes: \*\*\* p<0.001, \*\* p<0.01, \* p<0.05, + p<0.1; Robust standard errors in parentheses

underrepresented in the highest (such as doctors and lawyers) and lowest (such as blue-collar workers) levels (Hout and Morgan 1975; Marini and Greenberger 1978). After controlling for socioeconomic status, minority status is positively related to occupational aspirations. Intact family status does not influence respondents' occupational aspirations. Respondents from rich households expect occupations with higher prestige compared to those from poor households. Mother's education is positively associated with expected occupational prestige.

Model 2 tests whether firstborns and lastborns express substantially different occupational aspirations compared to middle children. Consistent with studies asserting the "firstborn advantage," firstborn children have significantly higher occupational aspirations, net of other control variables. In addition, the results also support the hypothesis that lastborn children also have higher expectations compared to middleborns.

Table 10 presents estimated coefficients for the sex type of expected occupation from ordered logit models. In these models, negative coefficients for females and positive coefficients for males indicate nontraditional occupational aspirations. The results are ordered logit regression coefficients and difficult to interpret. Thus I translate the coefficients into predicted probabilities after explaining the statistical significance of the coefficients.

According to Model 1, the likelihood of pursuing sex-atypical occupations increases for both women and men as birth order increases, net of other control variables. In other words, female respondents with a higher birth order (i.e., laterborns) are more likely to prefer socially non-feminine jobs and laterborn male respondents are more likely to prefer socially non-masculine jobs. Turning to the effects of control variables, sibship size has a significant effect on the sex type of future occupations. On average, respondents from a larger family are more likely to expect sex-typical jobs. Compared to Whites and other races, Hispanics (both women and men) and African American men are more likely to have nontraditional occupational aspirations. Family background

**Table 10. Ordinal Logit Regression Results Predicting the Sex Type of the Expected Occupation, NLSY79**

	Female		Male	
	Model 1	Model 2	Model 1	Model 2
<b>Birth Order</b>				
Birth order index	-0.210** (0.075)		0.197* (0.090)	
Firstborns		-0.057 (0.084)		0.191+ (0.101)
Lastborns		-0.184* (0.079)		0.335*** (0.095)
Middleborns (ref.)				
<b>Control Variables</b>				
Sibship size	0.037* (0.015)	0.022 (0.016)	-0.049** (0.017)	-0.023 (0.018)
Hispanic	-0.453*** (0.103)	-0.435*** (0.103)	0.325** (0.114)	0.328** (0.114)
African American	0.082 (0.078)	0.086 (0.078)	0.516*** (0.090)	0.532*** (0.090)
Whites and other races (ref.)				
Intact family	0.212** (0.072)	0.205** (0.072)	-0.064 (0.082)	-0.065 (0.082)
Household income 1979 (logged)	-0.095** (0.030)	-0.096** (0.030)	-0.014 (0.037)	-0.010 (0.037)
Mother's education	-0.118*** (0.013)	-0.117*** (0.013)	0.027* (0.014)	0.027+ (0.014)
Year of birth (not shown)				
<b>Constant</b>				
Cut1	-3.383*** (0.380)	-3.298*** (0.376)	1.389*** (0.415)	1.480*** (0.419)
Cut2	-1.853*** (0.376)	-1.768*** (0.372)	4.131*** (0.427)	4.224*** (0.431)
<b>Observations</b>	3,793	3,793	4,033	4,033

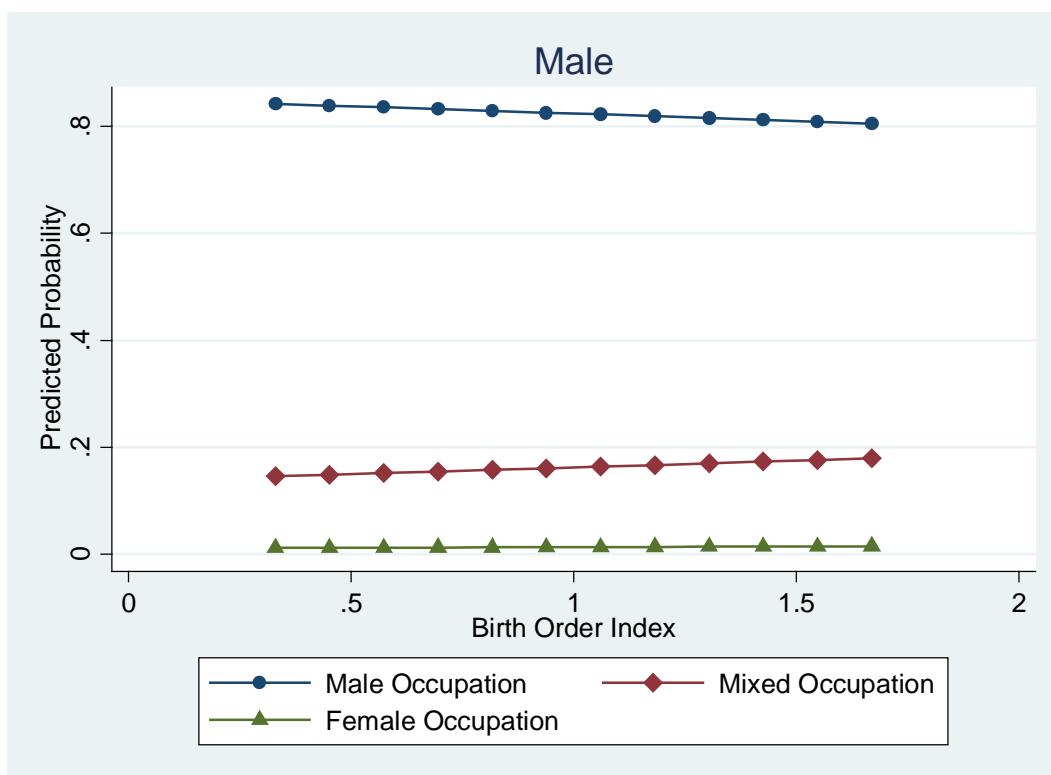
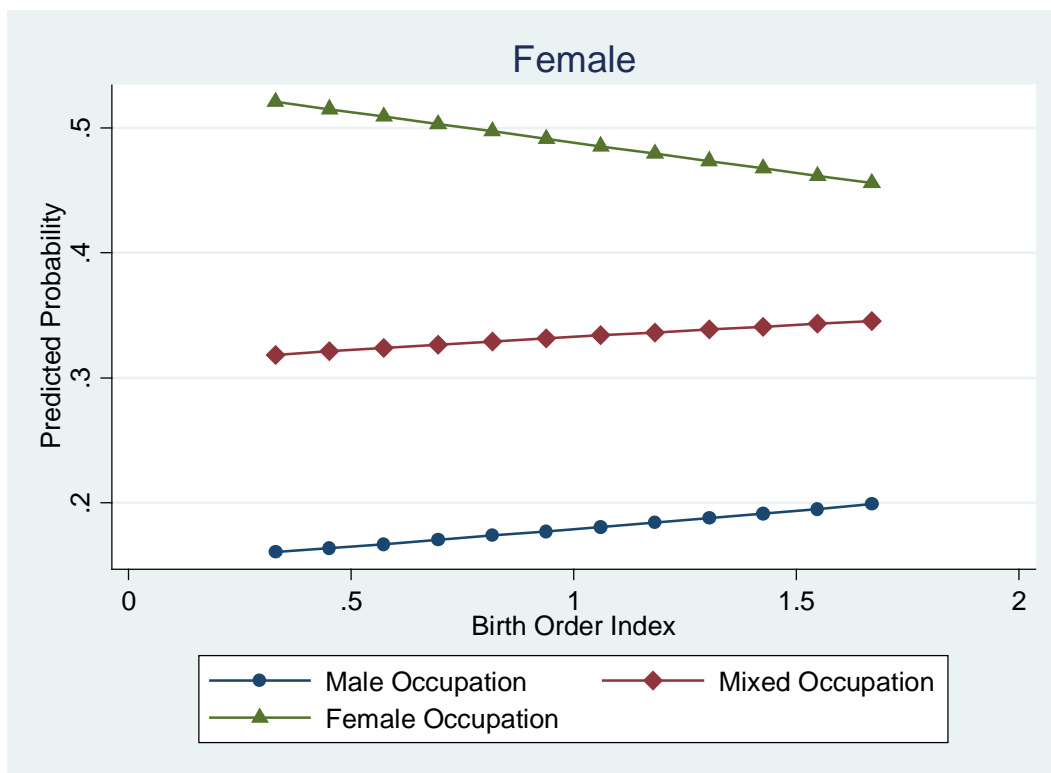
Notes: \*\*\* p<0.001, \*\* p<0.01, \* p<0.05, + p<0.1; Robust standard errors in parentheses

(including intact family status, household income, and mother's education) does not have a significant impact on men's occupational aspirations in terms of sex type of occupation. Women from intact families are more likely to prefer sex-typical occupations compared to women from non-intact families. Also, for women, household income and mother's education are negatively associated with nontraditional occupational aspirations.

In Model 2, I examine whether firstborn or lastborn children are significantly different from middleborns in terms of sex type of the expected occupation. The results provide partial support for the second hypothesis. For both females and males, the coefficients representing lastborn children are in expected directions (i.e., negative for female lastborns and positive for male lastborns) and significantly different from zero, indicating more preferences for sex-atypical occupations compared to that of middleborns. Compared to firstborns (results not shown), the coefficients are also in expected directions (the coefficients are  $-.127$  for female lastborns and  $.144$  for male lastborns), but neither is significant.

Taken together, the results in Table 10 in general indicate that laterborns tend to prefer sex-atypical occupations compared to firstborn and elder children. Figure 14 reports predicted probabilities using the estimated coefficients from Model 1 in Table 10. I calculate these predicted probabilities for a respondent who is White or another race, from an intact family, and born in 1960. The rest of the variables (including sibship size, household income, traditional gender ideology, and church attendance) are held at their mean. The first panel shows the predicted probabilities for women. Although the predicted probability of expecting sex-typical occupations is more than 40% for female respondents overall, there is a tendency that laterborns are less likely to have sex-typical occupational aspirations and more likely to have sex-atypical occupational aspirations. More specifically, the predicted probabilities of the expected occupations to be female jobs, mixed jobs and male jobs are respectively 52%, 32% and 16% for firstborn females, and 46%, 35%, and 20% for lastborn females. The second panel presents the predicted





**Figure 14. Predicted Probabilities of Sex Type in the Expected Occupation, by Gender, NLSY79**

probabilities for men. Although the majority of male adolescents tend to expect male occupations, laterborns are slightly more likely to have sex-atypical aspirations. The predicted probabilities of the expected occupations to be female jobs, mixed jobs and male jobs are respectively 1%, 15% and 84% for firstborn males, and 2%, 18%, and 80% for lastborn males.

### Discussion and Conclusion

Sulloway's evolutionary thesis proposes that human beings develop adaptive strategies and corresponding personality to increase their chances of survival and reproduction in a given environment. Birth order constitutes the primary family environment and thus generates unique experiences for each individual occupying different birth order positions in the same family. Siblings seek diverse niches to solve adaptive problems and cope with their special situations. These niches are not randomly selected; rather, attitudinal and behavioral patterns associated with birth order status are found across families (Sulloway 1996).

Firstborns are the first child of the family and gain undivided resources and full attention from parents until the coming of the second sibling. Firstborn children tend to align with parents and protect their special status. Consequently, they are more ambitious, conservative, and socially dominant. Because firstborns are older in age, have more expertise and have already claimed their niches, laterborns are naturally at a disadvantage compared to older siblings. They are under the pressure of challenging the status quo in the family and competing with their siblings (often in alternative ways) in acquiring family resources. The higher the birth order is, the more likely one diversifies interests and abilities to avoid direct competition with older siblings and increase parental investment (Sulloway 1996, 105–112). As a result, later-born children are inclined to be rebellious, open to experience and advocate unconventional ideas.

The current study applies the evolutionary framework to explore whether occupational aspirations of adolescents and young adults vary by birth rank. In particular, I focus on whether birth order influences the prestige and sex type of the expected occupation, two aspects corresponding to the achievement-orientation and rebelliousness of respondents. I also examine the patterns of the birth order effects (monotonic versus curvilinear) and explore whether firstborn and lastborn children are substantially distinct from in-between children.

My results are consistent with findings from the evolutionary framework theory. The “firstborn advantage” is confirmed for both women and men. Additionally, I find that there is a lastborn advantage as well. Therefore, birth order has a U-shaped effect on the expected occupational prestige, and firstborn and lastborn children on average have higher occupational aspirations. Regarding the sex type of occupational aspirations, those with a higher birth rank (especially lastborns) are more likely to prefer sex-atypical occupations. This is consistent with Sulloway’s findings on the “rebellious laterborns.”

This research sheds important light on how to appropriately understand the effect of birth order. First, the findings illustrate the importance of context in examining the birth order effects in research fields other than personality studies. The respondents in this study were interviewed in 1979, the end of the second wave of women’s movement in the United States. One theme of the second wave of women’s movement is to seek greater female participation in the economy and advocate equal wage between males and females (Crittenden 2001; Friedan 1963). The 1970s witnessed the starting of occupational sex integration (Reskin 1993). My findings that lastborns, especially females, are more likely to pursue high prestige occupations in nontraditional fields may in fact reveal the pioneering attitudes of laterborns in such a social environment. It may be that, in current times, birth order is no longer an important predictor of occupational aspirations, since today most people acknowledge women’s rights and capability in the labor market and it is not as unconventional as in the past to assume that women would

expect to work in male-dominated occupations (Greenfeld, Greiner, and Wood 1980; Jagacinski 1987).

Second, this research also points out the importance of differentiating lastborns from middleborns when studying birth order. It is likely that some previous studies failed to find a birth order effect because they simply use only two birth order categories (firstborns versus laterborns). This research is too simplistic since it ignores the fact that firstborns and lastborns share similarities in resource allocation and “niche seeking”. My research suggests that middleborn children are substantially different from firstborns and lastborns in that they experience “squeezed” or distracted parental attention from two directions.

Two points need to be noted when interpreting the results from this study. First, although the findings show that birth order plays an important role in predicting occupational aspirations after controlling for other variables, the findings do not necessarily indicate that the effects of birth order exceed those of other family configuration and background variables. Rather, birth order should be understood as one factor that constructs the microenvironment which in turn influences individual’s socialization process and further shapes future expectations. In addition, the results cannot rule out the possible influence of birth order stereotypes. It is likely that laterborns have nontraditional occupational aspirations because they are under the impression that as laterborns, they are expected to show unconventional qualities compared to their elder siblings.

While this study furthers research on the relationship between birth order and occupational aspirations, it also has broader implications. First, the findings indicate that it is important for sociologists to examine macro-level factors as well as the microenvironments within families in studying individual decision-making process. The effects of family configuration factors such as birth order and sibship size might not be as influential as parental socioeconomic status, but they are definitely not negligible. Second,

many other attitudes and behaviors could be classified along the conventional versus rebellious continuum. This study suggests that the experience and strategies derived from sibling competition can have long-term effects on social orientations and developmental outcomes under appropriate situations.

## CHAPTER V. CONCLUSION

### Research Significance

As an important arena for early socialization, family significantly shapes a number of attitudes, beliefs, and behaviors that lead to divergent outcomes between men and women. For instance, previous studies have found that parents serve as role models of appropriate gender roles for children (Blakemore and Hill 2008; Kulik 2002; Marks, Lam, and McHale 2009), maternal employment during childhood significantly increases men's involvement in housework in adulthood (Gupta 2006), high-status parents tend to foster a learning-oriented environment in the family and in particular suppress anti-school attitudes among boys (Willis 1977), and parental involvement and aspirations are crucial in determining daughters' occupational expectations in prestigious professional fields (Burlin 1976; Eccles 1994; Shu and Marini 1998).

These studies provide researchers with rich theoretical frameworks and solid empirical evidence of family influences on child outcomes. Most of the studies focus on the resource flow from parents to children and the parent-child interactions, while ignoring to a large extent the socialization practices among siblings. Besides parents, siblings are also important family members that influence individuals' housework performance, educational attainment, and occupational aspirations in childhood. The interactions with siblings provide a context during growing-up years in which children develop cognitive abilities, social skills, and future aspirations. Among existing studies, there is evidence that additional siblings dilute family resources and decrease parental time and energy for each child (Blake 1981; Booth and Kee 2008; Kuo and Hauser 1997). Sisters on average have either no influence or a negative influence on children's educational outcomes while brothers tend to have a negative impact (Kaestner 1996; Powell and Steelman 1990). Firstborns are in general more achievement-oriented and laterborns are likely to be rebellious (Beck, Burnet, and Vosper 2006; Healey and Ellis

2007; Paulhus, Trapnell, and Chen 1999). Considering that gender is a primary cultural frame for coordinating attitudes and behaviors and organizing social relations in society (Ridgeway and Smith-Lovin 1999; Ridgeway 2009), the consequences associated with different sibling structures might not have equivalent effects for girls and boys, and thus reinforce gendered outcomes among children. However, the role of siblings in children's gendered outcomes is underdeveloped in current scholarship.

### Summary of Findings

The objective of this dissertation is to investigate the role of siblings in individual outcomes by examining the functioning and the gendered effect of sibling structure in three areas: housework performance, education, and occupation. To complete this objective, I conducted three empirical studies for each outcome using data from China and the United States.

In the first empirical study, I examined the effect of sibling structure on children's housework performance in China. The implementation of the one-child policy increases the number of one-child families in China. Researchers suggest that this policy may inadvertently benefit girl singletons in a society with a traditional male-preference culture. In this chapter, I study how the family structure influences one important outcome that is closely related to later life gender performance – housework. Using data from the 2006 wave of the China Health and Nutrition Survey, I found that for both girls and boys, singletons are significantly less likely to do housework when compared to children with siblings. In two-child families, for girls, a brother increases the likelihood of doing housework, whereas a sister has no impact. For boys, the presence of a younger brother increases the likelihood of performing housework, whereas a sister (regardless of birth order) or an older brother has no impact. Therefore, the results indicate that the gender gap in housework performance is bigger among children with a large sibship size and/or with more brothers in the family compared to children with a small sibship size

and/or with fewer brothers. The results also show that mothers' education plays an important role in the association between sibling structure and children's housework time. Mothers' education is negatively associated with the number of siblings and children's housework performance, such that the housework gap between children with and without siblings narrows after mothers' education is controlled.

In the second empirical study, I focus on the relationship between sibling structure (sibship size and sex composition in particular) and educational attainment and the role of siblings' education in this relationship. Based on the data from the National Longitudinal Survey of Youth 1979 (NLSY79), I found that the effect of sibship size on educational attainment is mediated through siblings' educational attainment and this effect is divergent for men and women. For men, siblings' achievement does not substantially change the deleterious consequences of large sibsize for educational attainment. For women, there is also a negative association between sibship size and educational attainment, but this effect is not statistically different from zero after accounting for siblings' education. The study also shows that brothers and sisters have different impacts on educational attainment. Number of brothers is negatively associated with male respondents' educational attainment even after controlling for brothers' education. This might be due to the widespread conflict between academic performance and masculinity in male peer group culture among American adolescents. I also found that the number of both brothers and sisters does not influence women's educational attainment after accounting for their educational performance. For men, the negative effects of sisters disappear whereas brothers still have detrimental effects on individual educational attainment even after controlling for their education.

The results suggest that sibship size has a weaker impact on women's educational attainment when compared to siblings' educational attainment. Women surrounded by high-achieving siblings (regardless of the gender of the siblings) are likely to achieve more years of education even in large families. For men, sibship size, sex composition



and siblings' achievement are all important in educational development. Even with high-achieving siblings, large sibship size and having brothers could still deteriorate men's educational attainment. Taken together, the results indicate that the gender gap in educational attainment is bigger among individuals with more brothers in the family compared to individuals with fewer brothers.

In the third empirical study, I investigated the influence of birth order on adolescents' occupational aspirations. According to the evolutionary perspective, birth order is expected to influence personal traits because each child gets access to different amounts of resources and adopts distinct strategies to maximize their chances of survival and reproduction. Because laterborns need to compete with firstborns for family resources and parental attention, they tend to seek alternative ways of distinguishing themselves and support unconventional opinions. For both males and females, sex-atypical occupational aspirations are often considered as unconventional. In addition, until the 1970s, it was considered unconventional for women to expect to attain a prestigious occupation. Considering that lastborn children often receive more parental care and resources as the "baby" of the family, I suggest that among laterborns (i.e., all children but firstborns), lastborn children might be substantially different from middleborn children. Therefore, I hypothesize that both male and female lastborns are more likely to expect to work in nontraditional occupations compared to firstborns and middleborns and female laterborns are more likely to expect occupations with higher prestige compared to middleborns. Using the 1979 wave of the NLSY79, I found evidence supporting the hypotheses. The results show that for both males and females, lastborn adolescents are significantly more likely to have nontraditional occupational aspirations compared to firstborn and middleborn adolescents. They also on average expect occupations with higher prestige compared to middleborn adolescents. Therefore, the gender gap is expected to be smaller among firstborns and lastborns compared to middleborns.

### Limitations and Future Considerations

Due to the lack of direct attitudinal and behavioral measures of siblings, I could not examine some important aspects of communications and interactions between parents and children and among siblings that might influence later outcomes. For instance, an important assumption in the study of sibling structure is that each additional sibling decreases the average share of resources for all siblings in the family. However, this effect could not be empirically tested because neither datasets used in this dissertation posed questions to parents about their views of how their resources were divided as more children were born into the family. In the second study, there were no available variables about siblings' academic attitudes and engagement, and thus I could not consider the specific mechanisms that contribute to the learning environment in the family besides siblings' educational attainment. In the third study, it would be very helpful to include personality variables so that the relationship between birth order and occupational aspirations could be better revealed through the impact of birth order on personalities.

Additionally, although the datasets are longitudinal, the variables indicating sibling structures are measured in a cross-sectional way. In the NLSY79, the questions on siblings were only included in two waves, the 1979 and 1993 waves. As a result, it is difficult to document the arrival of each additional sibling and the corresponding changes in the family, such as how parents alter their educational practices and balance their investments among children, how older siblings develop new identities and roles towards the younger sibling, and how current family members adjust their ways of interacting to cope with a new family member.

Furthermore, due to the nature of the research questions in the second and third studies, I exclude singletons in the analyses of educational attainment and occupational aspirations. Unlike Chinese parents whose fertility decision is mainly influenced by the national policy, individuals in most countries usually make fertility decisions depending on personal preferences and evaluations of possible benefits and constraints. For instance,

in the United States, singletons are more likely to come from single-parent families (Falbo 1978, 1982) or have mothers with higher education and nontraditional backgrounds (Falbo 1982). Although the purpose of this dissertation is not to conduct a cross-national comparison, it would be interesting for future studies to examine how singletons exhibit similar or different personality traits and achievements in different social and cultural contexts.

Finally, researchers who are interested in the effect of sibling structure in other countries or societies should be cautious about generalizing the findings in their study. Because of the use of data from China and the United States, the findings are inevitably culturally bound. An appropriate interpretation of the findings of each specific study requires social scientists to place their research in historical and cross-cultural contexts (for example, see Goode 1963). This is also true in the study of sibling structure and gender inequality.

The historical dimension shows how historical legacy and institutional paths influence and change the role of sibling structure on gender inequality. For instance, before the implementation of the one-child policy, the Communist Party had strongly advocated an egalitarian gender ideology. Although this increased female labor force participation in Mao's time, it did not substantially wipe out the legacy of patriarchy and change women's status at home (Hershatter 2011). The main aim of the one-child policy is not to improve gender inequality in China. As an unintended consequence, however, this policy has significantly changed the structural dynamics in the family by allowing each couple to have one child and promoted gender equality in the Chinese society by increasing the number of families with female singletons. More specifically, the structural dynamics in one-child families effectively eliminates potential gender competition between female and male offspring and places female singletons in a similar position as male singletons in terms of family responsibilities and resources. From a historical perspective, it seems that the structural change, even at the family level, plays a

more significant role in transforming gender ideology compared to political campaigns and propaganda in the Chinese context.

The cross-cultural dimension enables researchers to compare and contrast the effect of sibling structure on women's gendered experiences across regions and countries with specific cultural, ideological, and institutional backgrounds. For example, in the third study, based on US data, I find that due to sibling competition and children's choice of adaptive strategies, firstborn, middleborn and lastborn adolescents develop different tastes and aspirations towards sex-atypical occupations. The relationship between birth order and occupational aspirations and other outcomes might be enhanced or suppressed depending on the cultural and structural variations across societies. Lastborns might tend to be more rebellious in a society where firstborns are given higher status and power compared to a society where all children are treated equally by law. Today, male primogeniture remains widely established in the United Kingdom (Watt 2011), but in the United States, there are no such cultural and legal barriers that prohibit women from inheritance (Menchik 1980). Based on the considerations above, when there are comparable data available, my thesis calls for comparative studies on the relationship between sibling structure and gender inequality from a historical and cross-cultural perspective.

In spite of the limitations, the dissertation offers some broader implications. To start with, one practical implication for parents is to apply different parenting styles towards children with different types of sibling structure. For instance, the finding that girls with brothers are most likely to perform housework indicates that parents might consider an equal housework allocation to both daughters and sons to reduce girls' load and increase boys' participation. This may increase children's well-being in the long run because research has shown that housework performance in childhood is crucial in predicting housework performance in adulthood (Cunningham 2001; Gupta 2006), women on average experience less family-work conflict if they spend less time on

household labor (Fuwa and Cohen 2007; Hochschild 1997) and there is more marital satisfaction when husbands participate more in housework (Baxter and Western 1998; Benin and Agostinelli 1988; Frisco and Williams 2003). In terms of education, parents could seek more effective strategies to encourage sons' academic engagement and decrease the potential devaluation of education among boys. Considering that firstborn and middleborn children are less likely to have nontraditional occupational aspirations, parents could provide more opportunities for these children to learn about sex-atypical careers and jobs.

Second, this study also sheds light on the possible effects of decreasing family size around the world on gender inequality. Since 1970, the average world total fertility rate (TFR) has declined from 4.45 to 2.52 children per woman (World Bank 2012a). In most developed countries, the TFR is between 1 to 2 children. This indicates in most families, there would be smaller sibship size, fewer types of sibling sex combinations, and fewer middle children on average. Based on the results of the first and second studies, smaller sibship size contributes to less housework burden on children (especially daughters) and more years of education among children. Although I did not examine singletons' outcomes in the second and third studies, based on the findings from the first study, it is possible that the gender gap might decrease among singletons in comparison with children with siblings. The chances of having same-sex children also increase as family size becomes smaller. Considering that cross-sex siblings provide parents with more possibilities to socialize children according to traditional gender ideology, the increasing number of same-sex siblings might decrease traditional gender display in the family, at least in terms of housework performance. Furthermore, with an average of two children in the family, there are more undeveloped fields for laterborns to build their strengths without competing directly with elder sibling(s). Additionally, because they are often "squeezed" simultaneously by both older and younger siblings, middleborn adolescents on average are less likely to expect nontraditional and higher prestige

occupations than lastborns. Smaller family size indicate that most children will be singletons, firstborns, or lastborns, and the number of middle born children will decrease (in one- and two-child families, there are no middle children). Therefore, the gender gap is expected to decrease on average, because as mentioned earlier, the gender gap is smaller among firstborns and lastborns compared to middleborns.

Finally, while this study mainly concerns the micro structure of sibling groups, the findings also inform our knowledge of the effects of group structure in general. One of the contributions of this study is to show that group size, sex composition, and individuals' positions in a group are all crucial in determining one's role, identity, values, and outcomes. Given a certain amount of resources, large group size decreases the average share of resources, increases competition, and produces imbalanced results among group members. In addition, as shown in this study, sex composition of siblings is important in determining child outcomes. For instance, girls are less likely to perform gendered activities (such as housework) if growing up with an elder sister rather than an elder brother. Boys with more sisters would have more years of education than their counterparts with more brothers. In the same vein, depending on the goal of the group, sex composition of the group could also significantly influence the performance of women and men. Some studies have already been conducted along this direction and most of them focus on working organizations (for example, Cohen, Broschak, and Haveman 1998; England, Reid, and Kilbourne 1996). It would also be interesting to investigate how sex composition might influence other non-work related task-oriented groups, such as study groups and volunteer organizations.

## APPENDIX

**Table A1. Details on Sample Selection of Focal Child, CHNS 2006**

	N	Percent remaining
Original sample	1,954	
Exclude:		
Younger children from multi-children households	1,548	79%
Children aged 5 years or younger	1,187	61%
Children living with a single parent	882	45%
Complicated sibling structure	846	43%
Missing data on housework variable	823	42%
Missing data on children's characteristics	821	42%
Missing data on parents' characteristics	744	38%
Missing data on household characteristics	733	38%

**Table A2. Details on Sample Selection, NLSY79 (Chapter 3)**

	N	Percent remaining
Original sample	12,686	
Exclude:		
Missing data on dependent variable (educational attainment)	8,399	66%
Missing data on sibling structure	8,216	65%
Missing data on siblings' educational attainment	7,855	62%
Missing data on respondent's gender	7,842	62%
Missing data on respondent's age	7,842	62%
Missing data on respondent's race	7,842	62%
Missing data on respondent's family structure (intact family or not)	7,831	62%
Missing data on respondent's household income during adolescence	6,304	50%
Missing data on mother's education	5,976	47%
Missing data on educational attainment of brothers and sisters respectively	4,059	32%



**Table A3. Correlation Matrix among Variables Used, NLSY79 (Chapter 3)**

	1	2	3	4	5	6	7	8
Highest grade								
1 completed	1.000							
Average years of								
2 education of siblings	0.521*	1.000						
3 Sibship size	-0.251*	-0.306*	1.000					
4 Number of sisters	-0.191*	-0.214*	0.770*	1.000				
5 Number of brothers	-0.194*	-0.257*	0.769*	0.185*	1.000			
6 Opposite-sex siblings	0.105*	0.149*	-0.344*	-0.265*	-0.265*	1.000		
7 Same-sex siblings	0.089*	0.123*	-0.308*	-0.240*	-0.236*	-0.181*	1.000	
8 Mixed-sex siblings	-0.151*	-0.213*	0.510*	0.395*	0.391*	-0.650*	-0.630*	1.000
9 Female	0.038*	-0.026*	0.044*	0.043*	0.0242	0.0019	-0.028*	0.020
10 Age	0.033*	0.067*	0.049*	0.036*	0.039*	-0.0073	-0.0182	0.020
11 Hispanic	-0.127*	-0.193*	0.148*	0.101*	0.127*	-0.057*	-0.040*	0.075*
12 African American	-0.069*	-0.084*	0.225*	0.190*	0.158*	-0.086*	-0.085*	0.133*
13 Intact family	0.136*	0.191*	-0.087*	-0.061*	-0.072*	0.051*	0.036*	-0.068*
Household income								
14 1979 (logged)	0.223*	0.250*	-0.207*	-0.177*	-0.143*	0.077*	0.058*	-0.105*
15 Mother's education	0.395*	0.443*	-0.357*	-0.283*	-0.266*	0.120*	0.117*	-0.185*

Note: \* p<0.05

**Table A3. Continued**

	9	10	11	12	13	14	15
Highest grade							
1 completed							
Average years of							
2 education of siblings							
3 Sibship size							
4 Number of sisters							
5 Number of brothers							
6 Opposite-sex siblings							
7 Same-sex siblings							
8 Mixed-sex siblings							
9 Female	1.000						
10 Age	0.014	1.000					
11 Hispanic	0.007	-0.006	1.000				
12 African American	0.011	-0.010	-0.317*	1.000			
13 Intact family	-0.002	0.071*	-0.0161	-0.247*	1.000		
Household income							
14 1979 (logged)	-0.043*	-0.062*	-0.107*	-0.244*	0.277*	1.000	
15 Mother's education	-0.022	0.002	-0.431*	-0.008	0.078*	0.255*	1.000

Note: \*  $p < 0.05$

**Table A4. Details on Sample Selection, NLSY79 (Chapter 4)**

	N	Percent remaining
Original sample	12,686	
Exclude:		
Missing data on dependent variable (occupational aspiration)	10,874	86%
Missing data on sibling structure	10,196	80%
Missing data on respondent's demographic information (gender, age, and race)	10,196	80%
Missing data on respondent's family structure (intact family or not)	10,179	80%
Missing data on respondent's household income during adolescence	8,249	65%
Missing data on mother's education	7,826	62%

**Table A5. Correlation Matrix among Variables Used, NLSY79 (Chapter 4)**

	1	2	3	4	5	6	7	8
1 Expected occupational prestige	1.000							
2 Sex type of expected occupation	-0.031*	1.000						
3 Birth order	-0.087*	0.042*	1.000					
4 Birth order index	-0.019	0.014	0.711*	1.000				
5 Firstborn	0.071*	-0.018	-0.537*	-0.694*	1.000			
6 Middleborn	-0.09*	0.020	0.252*	-0.005	-0.569*	1.000		
7 lastborn	0.033*	-0.006	0.232*	0.680*	-0.314*	-0.602*	1.000	
8 Sibship size	-0.13*	0.048*	0.745*	0.136*	-0.300*	0.432*	-0.207*	1.000
9 Female	0.096*	0.623*	0.027*	0.020	-0.0094	0.006	0.002	0.016
10 Hispanic	-0.010	-0.006	0.034*	-0.048*	-0.001	0.051*	-0.058*	0.110*
11 African American	0.020	0.063*	0.148*	0.013	-0.065*	0.113*	-0.068*	0.2010*
12 Whites and other races	-0.010	-0.051*	-0.155*	0.024*	0.058*	-0.137*	0.103*	-0.266*
13 Intact family	0.032*	-0.006	-0.039*	0.025*	0.006	-0.037*	0.037*	-0.088*
14 Household income 1979 (logged)	0.083*	-0.056*	-0.089*	0.005	0.026*	-0.042*	0.023*	-0.144*
15 Mother's education	0.195*	-0.075*	-0.260*	-0.065*	0.111*	-0.132*	0.045*	-0.332*
16 1957	0.008	-0.021	-0.036*	-0.047*	0.024*	-0.004	-0.0188	0.000
17 1958	0.005	-0.008	-0.046*	-0.047*	0.010	0.014	-0.026*	-0.008
18 1959	0.012	0.002	-0.012	-0.011	-0.008	0.007	0.001	-0.001
19 1960	-0.011	-0.017	-0.015	-0.011	0.002	-0.004	0.003	-0.006
20 1961	0.004	0.008	0.010	-0.007	0.001	0.017	-0.020	0.024*
21 1962	0.001	0.002	0.009	0.015	-0.009	-0.005	0.014	-0.002
22 1963	-0.008	0.026*	0.041*	0.030*	-0.008	0.001	0.008	0.023*
23 1964	0.008	0.004	0.016	0.028*	0.009	-0.020	0.015	-0.018
24 1965	-0.020	-0.008	0.021	0.036*	-0.011	-0.009	0.021	-0.014

Note: \* p<0.05

**Table A5. Continued**

	9	10	11	12	13	14	15	16
1 Expected occupational prestige								
2 Sex type of expected occupation								
3 Birth order								
4 Birth order index								
5 Firstborn								
6 Middleborn								
7 lastborn								
8 Sibship size								
9 Female	1.000							
10 Hispanic	-0.002	1.000						
11 African American	0.025*	-0.247*	1.000					
12 Whites and other races	-0.021	-0.520*	-0.699*	1.000				
13 Intact family	-0.009	-0.008	-0.216*	0.196*	1.000			
14 Household income 1979 (logged)	-0.026*	-0.031*	-0.135*	0.142*	0.218*	1.000		
15 Mother's education	-0.013	-0.385*	-0.017	0.299*	0.080*	0.199*	1.000	
16 1957	-0.026*	-0.0345	-0.012	0.037*	0.010	-0.039*	0.000	1.000
17 1958	-0.008	-0.040*	-0.031*	0.057*	0.041*	-0.062*	0.042*	-0.072*
18 1959	0.001	-0.026*	-0.032*	0.047*	0.041*	-0.053*	0.035*	-0.071*
19 1960	0.002	-0.011	-0.033*	0.037*	0.038*	-0.033*	0.030*	-0.069*
20 1961	-0.003	0.016	0.031*	-0.039*	0.0046	0.004	-0.031*	-0.070*
21 1962	0.007	0.020	0.030*	-0.041*	-0.016	0.055*	-0.0063	-0.067*
22 1963	0.015	0.019	0.024*	-0.035*	-0.031*	0.042*	-0.038*	-0.071*
23 1964	0.009	0.033*	0.020	-0.042*	-0.036*	0.041*	-0.021	-0.070*
24 1965	-0.010	0.011	-0.001	-0.007	-0.059*	0.036*	-0.013	-0.053*

Note: \* p<0.05

**Table A5. Continued**

	17	18	19	20	21	22	23	24
1 Expected occupational prestige								
2 Sex type of expected occupation								
3 Birth order								
4 Birth order index								
5 Firstborn								
6 Middleborn								
7 lastborn								
8 Sibship size								
9 Female								
10 Hispanic								
11 African American								
12 Whites and other races								
13 Intact family								
14 Household income 1979 (logged)								
15 Mother's education								
16 1957								
17 1958	1.000							
18 1959	-0.151*	1.000						
19 1960	-0.148*	-0.146*	1.000					
20 1961	-0.149*	-0.147*	-0.144*	1.000				
21 1962	-0.144*	-0.142*	-0.139*	-0.140*	1.000			
22 1963	-0.151*	-0.149*	-0.1460*	-0.147*	-0.142*	1.000		
23 1964	-0.149*	-0.148*	-0.145*	-0.146*	-0.141*	-0.148*	1.000	
24 1965	-0.113*	-0.112*	-0.110*	-0.111*	-0.107*	-0.112*	-0.111*	1.000

Note: \* p<0.05

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