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THE EFFECT OF SIBSHIP SIZE ON EDUCATIONAL ATTAINMENT IN CHINA: COHORT VARIATIONS

ABSTRACT

In industrialized nations sibship size generally depresses educational attainment—the larger the number of siblings, the lower the educational attainment, presumably because of the reduction of family resources (both material and intellectual) available to each child. However, this association is much less consistent in developing nations, and there is some evidence of substantial change over time. In this paper, we study the effect of number of siblings on educational attainment in China, a nation that has experienced sharp vacillations between policies designed to promote equality (between urban and rural residents and between men and women) and policies designed to promote economic development. The implementation of these policies in the educational arena has alternately reduced and increased competition for educational resources and, we show, has correspondingly reduced and increased the effect of the number of children in a family on their educational attainment.

INTRODUCTION

Studies conducted in the U.S. and Western industrialized societies show a clear negative effect of sibship size (also referred to as the number of siblings or family size) on children's educational attainment, even controlling for family socioeconomic background (Blau and Duncan 1967; Featherman and Hauser 1978; Blake 1981, 1989; Mare and Chen 1986; Downey 1995); each additional sibling reduces schooling by as much as one fifth of a year (Featherman and Hauser 1978; Mare and Chen 1986). This is a strong effect, exceeding that of other family origin variables (Blake 1989). The inverse relationship between number of siblings and educational attainment is often explained by a "resource-dilution" hypothesis—finite parental resources are distributed among siblings, which means that each additional sibling reduces the family resources available to each child (Blake 1981).

However, there is increasing evidence that the negative effect of the number of siblings is neither universal nor inevitable, particularly in developing countries, but depends on demographic, socioeconomic, and political factors external to the family, which influence both the availability of resources to the family and their internal allocation within the family in ways that affect children's education.

Given that the educational consequences of sibship size are importantly affected by societal-level changes and state policies, research focusing on as yet unstudied developing nations can be informative.[1] China provides a particularly interesting case. The past 60 years have seen

[1] Focusing on developing countries can be more informative than focusing on developed countries because relatively high fertility rates in developing countries are associated with greater variation in sibship size than in developed nations. Moreover, since fertility rates in such nations tend to be high because of a felt need for child

remarkable social, economic and political changes in China: dramatic socioeconomic development, especially since 1978; state educational policies that vacillated between those promoting educational equality and those promoting expertise; and concerted state intervention with respect to fertility control beginning in the late 1970s. All of these changes may influence the effect of sibship size on educational attainment, for reasons discussed in greater detail below. Moreover, gender and place, two important aspects of stratification in China, may interact with the sibship size effect, as a result of persistent son preference and rural-urban disparities.

Using data from the study of "Life Histories and Social Change in Contemporary China," a national probability sample of Chinese adults age 20-69 surveyed in 1996, we investigate the association between sibship size and educational attainment in China over four historical periods characterized by differing socioeconomic conditions and differing educational and other state policies, and study as well the mediating effect of gender and place on this association.

SIBSHIP SIZE AND EDUCATIONAL ATTAINMENT

The effect of sibship size on educational attainment has been studied in the last two decades as an aspect of educational stratification. Initially a no-effect hypothesis prevailed: the seeming effect of the number of siblings was spurious, a consequence of the fact that socio-economically disadvantaged families tended to bear more children. However, as noted above, subsequent studies conducted in the U.S. and other Western societies demonstrated that there is a clear negative effect of number of siblings on children's educational attainment, each additional sibling reducing years

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labor or old age security, or as an expression of traditional cultural norms (Blake 1968), the potential endogeneity of the sibship size effect is likely to be mitigated (Lu 2005). This point will be discussed further in the context of considering the "quality-quantity tradeoff."

of schooling by about one fifth of a grade net of family socioeconomic status.

The most widespread explanation for the sibset size effect is the "resource-dilution" hypothesis, which posits that finite parental material and nonmaterial resources are allocated among siblings and therefore each additional sibling results in a reduction of familial resources available to each child (Blake 1981; Downey 1995). "Resources" include nonmaterial assets such as parental time, attention, and emotional support, as well as material assets such as financial investments in children's education and study environments. These resources are less effective as sibship size increases since in large families resources tend to be distributed more thinly over each child. In a study that explicitly tested the resource-dilution theory, Downey (1995) found strong support for the hypothesis that parental resources account for the inverse relationship between sibship size and educational outcomes. He also found that material resources such as money saved for college and computers in the home decreased more rapidly with sibship size than did non-material resources.

Numerous studies in psychology have established links between sibship size and children's cognitive development, even controlling for the effects of maternal IQ and family SES (Gottfried and Gottfried 1984). Marjoribanks, Walberg, and Bargen (1975) theorized that a child's intellectual ability depends crucially on the amount of non-material resources, reflected in parental attention (Bakeman and Brown 1980; Field 1987; Clarke-Stewart 1988). However, the amount of parental attention available to a given child depends on the number of children in the family. In settings with more than one child, adults necessarily must give less attention to any given child, all else equal, thereby reducing the amount of cognitive stimulation. Children with more siblings are thus penalized by the limited attention they receive, in terms of the quantity and possibly the quality of parent-child interaction, which results in their slower rate of early development. Many studies show a negative relation between sibship size and cognitive

development—the larger the number of children in the family, the lower their intellectual level (Anastasi 1956; Nisbet and Entwistle 1967; Belmont and Marolla 1973; Breland 1974; Zajonc, Markus, and Markus 1979).

In sum, there are two ways sibship size affects children's educational attainment: per capita familial non-material resources contingent on sibship size (eg, parental attention) influence children's intellectual development and thus affect educational attainment indirectly, whereas familial material resources (e.g, financial support for school) affect educational attainment directly.

THE EFFECT OF SIBSHIP SIZE IN DEVELOPING NATIONS

While a negative effect of sibship size is widely observed in Western societies, and sibship size has become a standard variable in studies of educational attainment, emerging evidence in the developing world indicates that the negative association is not universal (Shavit and Pierce 1991; Lloyd 1994; Maralani 2004). Instead, as noted earlier, the effect often varies across contexts and population subgroups, which suggests the need for attention to conditions and institutions external to the family that influence within-family resource availability and distribution.

Sibship size may interact with the level of socioeconomic development and other societal level factors. At very low levels of development, sibset size is unlikely to affect educational outcomes because few children get more than minimal schooling (Lloyd 1994). In such settings, parents may be unable or unwilling to invest family resources in their children's education. Even where education is available, it may be expensive and beyond the reach of most people. Indeed, especially in Africa, educational attainment may be *positively* related to sibset size due to a positive association between income and fertility (Mueller 1984). The same positive relationship between

income and fertility has been observed in pre-transitional China (Lamson 1935; Barclay et al. 1976; Campbell, Wang, and Lee 2002). A negative association between sibship size and children's educational attainment may arise only at a later stage of socioeconomic development since development level affects the availability and importance of education, and hence the significance families place on education. As education becomes more widely available, families may begin to regard schooling as an important vehicle for socioeconomic attainment and thus initiate resource-distribution strategies to maximize their children's educational attainment (Hermalin, Seltzer, and Lin 1982; Mueller 1984; Sudha 1997). As a result, the amount of resources available to each child begins to matter. Sibship size may then negatively affect educational attainment by reducing the resources available to each child at any given level of family income. Evidence from Indonesia provides support for this type of change over time in the relationship between sibship size and children's schooling (Maralani 2004): in older rural cohorts, the association was positive but over time the relationship diminished and finally became modestly negative; in urban areas, on the other hand, a once non-existent association has become negative and then, in the most recent cohorts, monotonically negative.

Societal level demographic changes such as changing fertility levels also may modify the sibset size-education relationship. In Hungary, where the modernization process was accompanied by fertility declines and educational expansion, the negative sibship size effect increased over cohorts (Van Eijck and De Graaf 1995). As the proportion of large families decreased over time, the remaining large families became increasingly disadvantaged with respect to education; that is, children from smaller families benefited more from modernization, especially educational expansion, than did those from larger families.

The sibship size-education association is not only likely to differ depending on the

importance of education, but is also likely to depend on whether the costs of schooling fall solely on the parents or are shared by extended families. In industrialized societies relationships of obligation are generally restricted to the nuclear family and are centered on exchanges between parents and children. In these circumstances sibship size almost always negatively affects educational attainment. However, in some cultures, especially in developing countries, responsibility for supporting children includes extended family members and older siblings (Gomes 1984; Shavit and Pierce 1991). Among Arabs in Israel, where extended families are an important source of child support, the number of children in the nuclear family does not have an impact on educational attainment since families can and do draw on support from extended family members. In contrast, among Jews a negative sibship size effect is evident since relationships of obligation and support are largely restricted to the nuclear family (Shavit and Pierce 1991). Similarly, in sub-Saharan Africa the number of siblings has little effect on educational attainment since educational costs tend to be spread among a wide circle of relatives (Caldwell and Caldwell 1987). For example, Lu (2005) finds that among South African Blacks there is a negative effect of sibship size in nuclear families but no such effect in extended families. In Kenya sibship size is *positively* related to the educational chances of children because older siblings are a source of support for younger siblings (Gomes 1984). The way the process works is that since parents expect to receive direct income returns from the educational investments they make in their children, they tend to provide older children with educational resources to obtain early returns whatever the ultimate sibship size. But then older siblings provide remittances to supplement family resources, permitting the education of younger siblings.

The extent to which sibship size matters also may depend on specific public policies. For example, government subsidies reduce the direct costs of schooling, thus weakening the importance

of material resources and the negative effect of sibship size on educational attainment (Behrman, Pollak, and Taubman 1989; Pong 1997; Sudha 1997; Post and Pong 1998). Behrman et al. (1989) found a negative relationship between sibship size and educational attainment in the U.S. except for special situations that equalized access to financial resources to pay for education, such as the G.I. Bill and loan programs operating in the late 1980s. Similarly, Post and Pong (1998) found a diminishing sibship size effect in Hong Kong in the late 1970s, corresponding to a major expansion in free schooling. However, such benefits may be differentially available to different population subsectors. For example, in Malaysia most state subsidies are reserved for ethnic Malays. This affirmative action policy neutralizes the detrimental impact of sibship size among Malays. By contrast, a clear negative relationship is observed among Chinese and Indians, for whom state subsidies are scarce (Pong 1997; Sudha 1997). In sum, if the state subsidizes children's education, parental resources matter less, and so does sibship size. Finally, the state may influence sibship size purposefully by discouraging high fertility and compensating low-fertility families, as in China, which in turn shapes opportunities for children and modifies how sibship size matters (Steelman et al. 2002).

Gender and place may also mediate the effect of sibship size. In societies with strong son-preference norms, such as China and most other Asian countries, parents may choose to invest in the education of sons rather than daughters when their resources are inadequate to do both. This implies that the effect of sibship size on the education of females should be stronger than the effect on males, at least when parental resources are stretched thin (Lloyd 1994; Sudha 1997). A similar argument would lead us to expect a greater impact of sibship size on educational attainment in rural areas. Since rural families tend to be poorer than urban families, and since educational subsidies are often less readily available in rural areas, sibship size should have a stronger effect on educational

attainment in rural than in urban areas.

EDUCATIONAL POLICIES AND EDUCATIONAL STRATIFICATION IN CONTEMPORARY CHINA

Since 1949, the Chinese government has pursued the twin goals of economic development and promoting equality. However, given the limited resources of the new government, and the need to create incentives for individuals to act in ways that promoted economic development, these two goals were substantially incompatible (Hannum and Xie 1994). Although China experienced strong educational expansion throughout the 20th century, both before and after the communist government took power (Deng and Treiman 1997), during the communist period there was great tension between the two goals and as a result there have been periodic shifts in educational policy between an ideological socialist egalitarian agenda and a practical competitive agenda[2] (Hannum and Xie 1994; Hannum 1999; Tsang 2000). The socialist egalitarian agenda emphasized equal opportunities (mass education) and socialist ideals ("redness") under a uniform curriculum for children in all social groups, with the goal of promoting social equality and reducing status differences. As shown by numerous studies and specifically by Hannum and Xie (1994), such policies dominated the period before 1978 and reached their apex during the 1966-77 Cultural Revolution. In contrast, the practical competitive agenda focused on education for economic efficiency (expertise) and emphasized personal advancement as a device for producing experts who could promote economic development; an important goal of this strategy was to maximize economic returns to governmental

[2] We use Hannum and Xie's (1994) 'egalitarian' and 'competitive' terminology to distinguish the two competing policies. Although any dichotomization of historical periods will necessarily be something of a simplification, we think this dichotomy captures an important policy contrast central to our analysis, which focuses on state

investments in education. This agenda was ascendant during Liu Shaoqi's dominance in the early 1960s and, most importantly, during the post-Mao economic reform era that began in 1978.

In China, whether one lives in an urban or a rural area is crucial in determining one's life chances—both economic opportunities and educational outcomes (Knight and Shi 1996; Wu and Treiman 2004a, b). The rural-urban gap in educational attainment results from differences in the level of public funding and the quality and availability of schools; differences in the ability of rural and urban families to pay for schooling; and differences in the level of cultural capital of urban and rural people (Treiman 2006). Such disparities currently are regarded by the Chinese state as a serious problem because of their negative implications for social equality. Although little is being done at the moment to improve rural schools, efforts are being made to improve the standard of living of the rural population, which presumably will enable peasants to devote more resources to the education of their children. For example, in early 2004 the price paid by the government for grain was raised and taxes on the rural population were reduced with the goal of improving the standard of living of the rural population (China Daily 2004). Nonetheless, the urban-rural gap remains very large, because of the sustained emphasis on economic development over the past quarter century, which focused on urban areas. As we will see below, the egalitarian agenda places great importance in eliminating the rural-urban gap while the competitive agenda tends to favor the more developed urban areas (Hannum 1999).

Despite efforts made by the government to raise women's status, there is persistent son preference in China (Bauer et al. 1992; Hannum and Xie 1994). Decisions regarding schooling for sons and daughters reflect both parents' perceptions of gender roles and their understanding of

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educational policies and their impact on educational inequalities in each of several historical periods. Other aspects of state policy are not of relevance here.

gender differences in labor market returns to investments in education. Traditional Chinese marriage and kinship patterns are strongly patrilocal and patrilineal, with women expected to care for their husbands' parents rather than their own. Therefore, parents anticipate much greater old-age support from their sons than from their daughters, which means that they have a much stronger incentive to educate their sons than their daughters (Lavely et al. 1990). Such practices are still prevalent in rural China today, and the attendant norms persist even in the urban population (Yan 2003). A second such incentive comes from the greater earning power of men than of women and the greater access of men to jobs requiring educational credentials (Summerfield 1994). The greater earning power of men relative to women, which is more or less universal across societies (Treiman and Roos 1983) and in China as well,[3] means that even under circumstances in which old-age-support obligations extend to daughters as well as to sons, it still is more rational to maximize one's son's earning power.

In a manner similar to changing rural-urban differentials, gender differences in educational attainment reflect the vacillation of educational policies between egalitarianism and competitive growth. Periods with a strong emphasis on equality are characterized by decreases in gender inequality in education, whereas periods focusing on economic development are characterized by increases in gender inequality (Hannum and Xie 1994).

The vacillation between an emphasis on equality and an emphasis on development can be reasonably well captured by distinguishing four periods in recent Chinese history, each with distinctive socioeconomic conditions and educational policies. We posit sharply different expectations regarding educational stratification and, specifically, differences in the effect of sibship size on educational attainment across the four periods. Although finer distinctions would be

[3] In our data, among those with individual incomes, women on average earned 77 per cent of what men earned.

preferable, our sample size is not large enough to sustain analysis of more than the four periods discussed next.

Period 1: Pre-Liberation (Before 1950)

Before the 1949 Liberation, China's economy suffered from nearly two decades of war (the Anti-Japanese War and the Civil War). The economy had collapsed during this period and the level of socioeconomic development was extremely low. The formal educational system, which was not very extensive in the pre-war era, with schools very unequally distributed across regions, was badly disrupted, resulting in extremely limited educational opportunities. Government policies put little emphasis on either elite or mass education. The result was that more than 80 per cent of the urban population and nearly 95 per cent of the rural population was functionally illiterate (Ministry of Education 1981).

Period 2: The Early Years after Liberation (1950-65)

Since the establishment of the People's Republic of China, China has undergone numerous changes. The period from 1950, when the Communist government firmly established its control of the country, until 1959 was a time of economic recovery in which the primary goal was to promote rapid economic development (Zhou, Moen, and Tuma 1998). Because of the increasing demand for educated labor needed for national economic development, educational opportunities expanded. The educational policies during this period emphasized both economic development and social equality (Hannum and Xie 1994). Besides building a national education system, efforts to expand mass education focused on the early years of schooling, with an emphasis on establishing universal primary education and reducing illiteracy (Tsang 2000). However, under conditions of scarce societal-level resources and emphasis on economic development as a first priority, education did

not, in fact, expand to a degree that significantly reduced educational inequality. Hence, educational policies in this period have mixed implications for educational inequality.

In response to Mao's idea of accelerating the movement towards true communism, the Great Leap Forward period from 1958 to 1960 promoted educational equality through a substantial expansion of access to education, especially for peasant and working-class children (Tsang 2000). Education expanded at all levels and new schools proliferated for children from peasant households. However, at the same time, the attempt to promote rapid economic development failed, which led to an economic collapse and a nationwide Great Famine (Hannum and Xie 1994). As a result, even though education became more available, many parents kept their children out of school to contribute to economic support of the family and to reduce family expenses. This was especially true of rural families, which suffered the brunt of the economic collapse, and also for girls because traditional son preferences made girls more vulnerable to economic hardship of any kind (Hannum and Xie 1994). In short, during the Great Leap Forward and its aftermath educational policies promoting equality were greatly undermined by the economic collapse and Great Famine.

After three years of sharp economic decline (1958-1960), Liu and Deng took control of national affairs in 1961, and among other things revamped educational policies (Tsang 2000). They held the view that limited resources should be spent where they were most effective, with an emphasis on expertise. In order to produce technically trained personnel needed for economic development, Liu and Deng introduced a competitive educational agenda and abruptly reversed the previous egalitarian policy, building new urban "key-point" (academic elite) schools and closing low-quality schools, especially in rural areas. Generally, policy makers tended to invest in education in urban areas by building on the existing school systems of relatively high quality, where they could expect faster economic returns, rather than implementing policies of educational expansion in

rural areas designed to equalize educational opportunities (Hannum 1999).

Overall, despite expansion of the educational system relative to the pre-Liberation period, educational inequalities remained strong from 1949-65 due to great economic constraints and the competitive educational agenda implemented for part of this period. Also, rural-urban and gender specific education inequalities are evident in this period, with rural children and girls relatively disadvantaged[4].

Period 3: Cultural Revolution (1966-76)

Unsatisfied with Liu and Deng's policies, Mao again seized control of the party in 1966. He returned to the earlier emphasis on ideological egalitarianism and collectivist production (Tsang 2000). Specifically, policies promoting educational equality and ideological purity ("redness") regained priority. Almost all secondary and tertiary educational institutions were closed during the early years of the Cultural Revolution (secondary schools from 1966-68 and tertiary institutions from 1966-72). When they reopened they concentrated on political indoctrination and instituted policies and practices designed to narrow the gap between manual and non-manual workers, between urban and rural people, and between workers and peasants (Hannum 1999). There was also an ideological emphasis on gender equality during those years (Bauer et al. 1992). Politically oriented and class background admission criteria prevailed, which accomplished the purpose of increasing enrollments of worker and peasant children. Since an essential goal of the Cultural Revolution was to reduce differences between the peasantry and the remainder of the population (Deng and Treiman 1997), key-point schools, multiple tracks, vocational education, and entrance

[4] We conducted exploratory analysis in which we divided the 1950-1965 years into two periods: 1950-1957 and 1958-1965. However, the results for the two periods were substantially similar. Thus, in the interest of parsimony and to increase the sample size for this period, we analyze four rather than five periods.

examinations were abolished. At the same time, many new primary and especially secondary schools were opened in villages and made affordable, although typically with a low academic standard (Unger 1982). Colleges were closed to high school graduates, and only a limited number of students were allowed to enter college, on the basis of political and family background (low SES) selection criteria (Zhou et al. 1998). Urban students and other urban workers, especially the "intelligentsia" (professionals), were sent down to the countryside to work as peasants. One important result of these policies was to reduce the quality of education for children who were in school, or should have been in school, during the Cultural Revolution period. Treiman (2006) shows that the "cost," in terms of knowledge of vocabulary, of obtaining one's schooling during the Cultural Revolution was about the equivalent of one year of schooling, net of years of school completed and other factors.

The deliberate reversal of previous policies during this period led to a major expansion of the education system, increasing educational opportunities for children of peasants in particular at the expense of the children of urban workers and especially of the intelligentsia. Due to state interventions that explicitly promoted educational equality and a reduction of class differences, educational attainment in this period became less dependent on social origins (Deng and Treiman 1997). Further, the egalitarian political climate of this period had an equalizing effect on educational disparities between men and women (Hannum and Xie 1994).

Period 4: Post-Mao Economic Reform (1977-1996)

With the repudiation of the Cultural Revolution following the death of Mao, Deng geared the development of the educational system to the advancement of economic modernization and a competitive merit-based educational agenda was re-emphasized. The educational system prevailing during the Cultural Revolution was gradually re-structured. The rapid expansion of education

during the Cultural Revolution was blamed for the low quality of many schools and as a remedy schools regarded as of low quality were closed down. At the same time, key-point schools and vocational schools proliferated. Moreover, after 1978 the foundations of education financing were changed from a centralized system with a narrow revenue base to a decentralized system with a more diversified revenue base (Tsang 2000), which had the effect of exacerbating quality differences between schools and increasing government funding disparities in education, particularly between rural and urban schools. Although there have been subsequent efforts to further reduce illiteracy as well as to improve the quality of schools, the overall consequence of the post-Mao reforms was to increase inequality in educational opportunities and attainment (Rong and Shi 2001).

The decentralization of educational investment is embodied in the system of "local responsibility and administration by levels". Under this system, lower levels of local governments are responsible for the provision of primary and secondary education whereas before the reform period funds were allocated by the central government directly to schools (Tsang 1996). Since investment in education does not produce short-term profits that boost local revenues, there has been a strong incentive for local governments in poor areas to invest in profitable ventures instead of in education (Tsui 1997). Decentralization generally has led to an increase in educational fees, which particularly affects children in poor rural areas least able to subsidize schools. Also, higher fees increase the opportunity costs associated with educating children. Finally, with the introduction of the "household responsibility system" (in which collective land was allocated to individual families, who were allowed to sell on the open market for profit any grain remaining after they paid the in-kind grain tax and also to sell all other agricultural products that they produced), parents were more likely to keep children out of school due to the increasing economic value of

child labor (Summerfield 1994). Also, fertility control policies were introduced during this period, which were especially thoroughly implemented in urban China. Under these policies, the state promoted low fertility by compensating small families while at the same time imposing penalties on high-fertility families (Croll, Davin, and Kane 1985).

All of these factors contributed to an increase in educational inequality, especially between rural and urban areas, and to the curtailment of access to education for rural children in particular (Hannum 1999). These same factors also exacerbated differentials in the willingness of families to invest in their male and female children (Summerfield 1994). During the reform period, female participation in schooling declined at all levels of education and the gender gap increased (Rong and Shi 2001).

HYPOTHESES

Because of the marked variation in Chinese state policies over the past half century, the Chinese experience is a useful case for studying the impact of the political environment on individual outcomes, specifically the sibship size effect considered here. As we have noted, political changes may alter both access to education and the direct cost of education, and thereby affect the ability and incentives of families to keep their children in school. We thus expect sharp differences in the impact of the sibship size on educational attainment across the four periods identified above, and also differences in the effect of place and gender across these periods. We formalize these expectations in the following hypotheses.

Hypothesis 1: During periods emphasizing educational egalitarianism (Period 3: the Cultural Revolution Period), the effect of sibship size is negligible. By contrast during periods characterized by a competitive agenda and educational inequality (Period 2: the Early Years after Liberation;

and Period 4: the Economic Reform Period), the larger the number of siblings, the lower the level of education attained, net of other factors. (For our prediction regarding Period 1, see Hypothesis 3.)

As noted, educational policies in China after 1949 have fluctuated between an egalitarian emphasis and an emphasis on meritocratic competition. These two impulses have been accompanied by quite different practices. Although the Chinese education system has expanded more or less continuously since Liberation, only during egalitarian periods has this expansion been both extensive and relatively equally distributed. During periods of meritocratic emphasis, increases in the availability of schooling tended to be concentrated on the already-advantaged sectors of Chinese society, with most of the population left almost untouched. In contrast, during egalitarian periods schools were provided greater subsidies by the state, and fees paid by parents were reduced, resulting in increased educational opportunities. The expansion in the availability of schooling and the reduction in school fees were accompanied by a campaign of encouragement of parents, especially rural and laboring parents, to send their children to school. Finally, during egalitarian periods affirmative action policies were emphasized in which admission standards were relaxed for the children of workers and peasants. Meritocratic periods, by contrast, tended to require higher school fees and also emphasized examination performance as the basis for admission to each level.

The result of these policy differences was that during meritocratic periods family differences in material and cultural capital were much more important than during egalitarian periods, and so the dilution of these resources in families with many children was far more consequential in meritocratic than in egalitarian periods.

Hypothesis 2: During periods when educational inequality is large, the effect of sibship size is especially detrimental for the educationally disadvantaged—girls and rural children, whereas during egalitarian periods, their disadvantages are greatly reduced.

Hypothesis 2.1: The sibship size effect varies by sex. It is weak for boys in all periods but is strong for girls during meritocratic periods.

As a consequence of the strong male preference norms discussed above, families make an effort to secure education for their sons even when they experience resource constraints. Thus, the effect of sibship size is expected to be consistently weak for boys, independent of shifting policies. In contrast, because educating daughters is generally regarded as less important, their educational opportunities are the first to suffer when there are many children or when resources are limited. Thus, the education of daughters is especially vulnerable to political shifts that have alternately reduced and increased gender inequalities and competition for resources. During competitive periods, the direct costs of education increased because the government made little effort to promote education equality. In such periods, family resources became increasingly constrained yet more consequential for children's education. Additionally, government policies with a strong emphasis on economic development provided greater incentives to favor male education for higher economic returns, and subsequently increased the opportunity costs of educating girls. The lack of parental stimulus to invest in female education, therefore, exacerbated the preexisting gender gap in resource allocation, which implied that in competitive periods sibship size had especially significant consequences for girls' schooling. By contrast, during egalitarian periods gender disparities in education were reduced by policies that lowered the direct costs of schooling. The egalitarian ideology also increased the social value placed on education for all children, including daughters.

We thus hypothesize that during such periods the sibship size effect on female education was substantially weakened.

Hypothesis 2.2: The sibship size effect depends on type of place of residence, but in a complex way that varies by period.

The fundamental claim is the same as in Hypothesis 1—sibship size negatively effects educational attainment when competition for schooling is great. But competition for schooling in rural and urban areas varies across periods in ways discussed below. In China, the most important factor influencing educational attainment is residence (and residence rights) in an urban vs. a rural area (Wu and Treiman 2004a). The rural/urban divide reflects great institutional, social, and economic differences, which in turn affect both educational opportunities and resources (Knight and Shi 1996). Sibship size is likely to compound whatever hardships a family may face, particularly during periods characterized by unequal-access policies. In the Post-Liberation period, government provision was weak in rural areas, schools were relatively scarce, and families were poorer than urban families. Thus, relative educational costs were much higher, resulting in a more pronounced level of competition for limited family resources. For this reason, we expect a strong effect of sibship size for rural families during the early years after Liberation. During this period, however, the government concentrated investment in existing high-quality urban school systems to promote economic development, which had the consequence of reducing educational competition for urban children. We thus expect a reduced sibship size effect for urban children during this period.

In contrast, during the Cultural Revolution period, the government gave high priority to education for peasant children and opened many schools in rural areas. In addition, admissions criteria were revised to favor students with peasant background (*jiating chushen*). Under this egalitarian ideology, rural parents were encouraged to place increasing value on education for all

children. In consequence, during this period rural children suffered less from familial resource dilution, which implies that for these children the sibship size effect was greatly reduced. At the same time, however, educational opportunities were restricted for urban children. Many urban elite schools were shut down; admissions criteria were set to discriminate against or completely exclude children from urban backgrounds; and many urban students were "sent down" to the countryside to work as peasants (Bernstein 1977; Unger 1982). As a result of these state policies to promote rural education at the expense of urban education, competition among siblings for limited educational opportunities increased, resulting—we hypothesize—in a larger sibship size effect for urban children than in the preceding period.

Hypothesis 2.3: During the Economic Reform Period, state policies other than educational policies, such as the introduction of fertility control policies and the Household Responsibility System (HRS), also modified the sibship size effect: fertility control policies resulted in an increase in the negative effect of sibship size, whereas the HRS produced a positive sibship size effect.

As noted above, birth control policies were implemented in China from the 1970s on. As a result, the number of large families has decreased steadily, replaced by one- and two-child families, for which family resources are less thinly distributed. We conjecture that as the proportion of large families decreased over time, the remaining large families became increasingly disadvantaged in their ability to provide education for their children, much as Van Eijck and De Graaf (1995) found for Hungary. For this reason as well, we expect the sibship size effect to have increased during the reform period, especially for urban children.

We already have discussed the basis for our prediction that the decentralization of the education system during the reform period increased the sibsize effect in rural areas. We also have noted that the introduction of the "Household Responsibility System" in the early 1980s resulted in

children being held out of school to contribute labor to family enterprises. Here we elaborate this point with respect to its implications for the sibsize effect. We conjecture that in an environment in which child labor has economic value for family enterprises, there may be a strong incentive to take an only child out of school to enhance family income. However, when there are several children, the optimal family strategy may be to diversify risk by pulling some children out of school to work while keeping other children in school in order to gain enough education to obtain secure jobs. This suggests the possibility that there are two offsetting mechanisms in the reform period—an increase in the direct costs of education, which should increase sibship size effects, but an increased likelihood that parents with several children will keep at least some of them in school as a risk diversification strategy, which should reduce sibship size effects.

Hypothesis 3: At extremely low levels of economic development, there is no effect of sibship size on educational attainment. Thus, we expect no sibship size effect for the pre-Liberation period.

When educational opportunities are extremely limited, the number of siblings in a family matters little since almost no one attains much education (Hermalin et al. 1982; Sudha 1997). Before the 1949 Liberation, China was at an early stage of socioeconomic development. Educational opportunities and facilities were extremely limited. Also, because most jobs demanded muscle power more than human capital, education was not particularly valued. Thus, parents had little incentive to invest in their children's education, which meant that resource dilution due to a large number of offspring was not an issue.

A CAVEAT ON METHODOLOGICAL ISSUES

Before turning to the analysis, we need to dispose of two potential methodological difficulties: the possibility that we have the causal order wrong with respect to the relationship between sibship size

and education; and the possibility that the observed sibship size effect is spurious because it simply reflects other aspects of family composition, in particular, birth order effects.

Endogenous Quality-Quantity Tradeoff

Consider first the causal order, or endogeneity, problem. The relationship between sibship size and educational outcomes may arise in part from the fact that parents make fertility decisions based on their calculations as to how many children they can afford given their educational aspirations for their children (often referred to as the quality-quantity tradeoff; Steelman et al. 2002). In this case, the observed effect of sibship size on education is exaggerated relative to the true causal connection. The question is whether such reverse causality is important or is only a minor problem. We have found unpersuasive the evidence claiming that that endogeneity is a major and universal problem. Several studies take account of potential endogeneity by using exogenous fertility events such as the birth of twins, implemented via an instrumental variable approach, and find little or no effect of sibship size (Rosenzweig and Wolpin 1980; Black, Devereux, and Salvanes 2004). However, Conley and Glauber (2004) argue that the use of twin births as an instrument is problematic because the presence of twins is an unusual event that may affect the sibship size-education association in ways not present for single births. Guo and Van Wey (1999) use a longitudinal analysis of sibling models rather than the conventional cross-sectional analysis to account for endogeneity and also find no sibship size effect. Although their analysis is very thoughtful, it turns on the selection of a small, and distinctive, subsample and cannot be easily generalized to the general population; for critiques of their study, see Philips (1999) and Downey et al. (1999). As Philips (1999) and a number of other studies suggest, despite the potential tradeoff problem it is undeniably the case that sibship size is associated with familial resources, which in turn affect children's outcomes.

It would be ideal to account for the possibility of tradeoffs by employing appropriate instrumental variables or by using longitudinal data. Due to the lack of suitable data, we cannot directly address this problem. However, considerable evidence suggests that such tradeoffs are not a major problem for our analysis. As suggested by Lu (2005), the quality-quantity tradeoff is not a major issue concerning populations with a traditional view of childbearing, those in developing countries in particular, whereas it tends to be pronounced for populations adopting a western view of childbearing. Because children have long been valued in China as a source of labor and a resource for old age support, we think that quality-quantity calculations were relatively uncommon in Chinese families until very recently, with the emergence of an urban middle class. Thus our sample is unlikely to have been affected by such considerations given that it includes individuals born between 1927 and 1976, well before such tradeoffs would have been likely to be contemplated by incipient parents. Moreover, the first 20 years of the communist era, especially the Great Leap Forward period, were characterized by pro-natalist policies to promote mass production. As a result, China's fertility rate was artificially elevated throughout the 1950s, and remained fairly high until the late 1960s (Peng 1987). As would be expected, this high fertility rate is reflected in the relative cohort sizes in our data. Finally, to anticipate our results, we find a negative sibship size effect during the 1950-65 period, when quality-quantity tradeoffs were particularly unlikely, which contradicts the claim that the sibship size effect is caused by endogenous quality-quantity calculations.

Further, it is important to note that, rather than examining the absolute sibship size effect at a single point in time, our analysis focuses on the role of political institutions by assessing variations in the effect across periods. If quality-quantity tradeoffs were the main story, we would expect to find a gradual change in the sibship size effect as quality-quantity calculations

became more prevalent, rather than the abrupt shifts between the presence and absence of such effects that we show below. However, we must acknowledge that for the most recent cohort, especially the urban cohort, whose members tend to have smaller family sizes as a result of ideology and knowledge diffusion that favors low fertility, the endogeneity problem could well exist. That is, the sibship size effect for this cohort may partly reflect an endogenous quality-quantity tradeoff.

Sibling Configuration as a Confounding Effect

While studies of sibship size effects mainly focus on between-family inequalities and assume that resources are evenly allocated within families, other studies stress within-family inequalities by assuming that parental resources are not divided equally among all children within a family. There has been increasing interest in the effects of sibling configurations other than sibship size, though such effects have often been shown to be ambiguous, if not negligible. Observed effects often depend on the specific situation studied and it is not very clear why they arrive at different conclusions. These differences are presumably due to the fact that within-family processes tend to be entangled with individual values that are extremely diverse and difficult to generalize.

Consider birth order effects. A variety of plausible, but contradictory, hypotheses regarding the influence of birth order on children's outcomes have been advanced: some predict that earlier-borns will be higher achievers (Behrman and Taubman 1986; Black et al. 2004), some predict that later-borns will do better (Steelman and Powell 1991; Powell and Steelman 1995), while still others predict a curvilinear advantage for both the oldest and youngest siblings (Hanushek 1992; Van Eijck and De Graaf 1995). Empirically, most studies find very little or no effect of birth order and gender composition on educational attainment after controlling for sibship size (Olneck and Bills 1979; Hauser and Sewell 1985; Steelman and Powell 1985;

Kessler 1991; Kuo and Hauser 1997; Steelman et al. 2002). Even where an effect of sibling configuration is observed, this often is in studies that fail to account for the strong association between birth order and sibship size (e.g., Van Eijck and De Graaf 1995). That is, being early in the birth order is sometimes advantageous, but this effect may be due to the higher probability of being a child in a small family. In sum, observed effects of such measures of sibling configuration as birth order, spacing, and sex composition may largely reflect their association with sibship size.

However, a few studies have made the opposite claim—that observed effects of sibship size are spurious artifacts of the association between sibship size and birth order (Black et al. 2004). A potential problem involving studies of this kind is the multicolinearity between birth order and sibship size that results from including both measures in a single model (correlations of .7 between the two measures are not uncommon). But if both measures are thought to be influential, leaving one out results in the model being underspecified. An alternative way to study the effects of both factors is to decompose the sibship size effect into birth order, birth spacing, and sex composition effects. As demonstrated by Post and Pong (1998) and Chu, Yu, and Tsay (2004), this strategy can be implemented by separating the number of siblings into the number of older siblings vs. younger siblings, the number of brothers vs. sisters, the number of closely-spaced siblings vs. sparsely-spaced siblings, or combinations of these factors. If the signs of each of the paired coefficients (e.g., the number of older and younger siblings) are the same, we can infer a sibship size effect net of the sibling configuration (e.g., birth order). But if the signs are opposite, or the coefficients are not significant, which is often the case (e.g., Post and Pong 1998; Chu et al. 2004; and Lu 2005), no inference regarding sibship size effects is

possible. Still another option is to stratify the sample by birth order and to study the effect of sibship size for people at each birth order.

Unfortunately, our data do not permit any of these options since we have no information on birth order. Still, the preponderance of the evidence is that sibship size effects are much more robust than are birth order or other sibling configuration effects. Moreover, sibship size effects, which reflect between-family inequalities in educational chances, are much more sensitive to policy changes than are birth order or other sibling configuration effects, which reveal within-family inequalities. Since the impact of policy on educational opportunities is the focus of our analysis, we do not regard our inability to study, or to control for, sibling configurations as particularly troublesome.

DATA, VARIABLES, AND METHODS

Data and Methods

The data used here are from the survey of *Life Histories and Social Change in Contemporary China* (Treiman and Walder 1996), a multi-stage stratified national probability sample of 6,090 adults aged 20-69 from all regions of China except Tibet (Treiman 1998).[5] The sample was stratified by dividing each county into rural and urban portions, with the urban population sampled at three times the rate of the rural population. Within the rural sample, counties were divided into 25 strata on the basis of the proportion of the rural population with at least a middle school education. Two counties (*xian*) were chosen from each stratum with probability proportionate to the size of the rural adult population (PPS); within each county, one township (*xiang*) was chosen PPS; within townships, two villages (*cun*) were chosen PPS; within villages,

[5] The data and documentation can be downloaded from http://www.sscnet.ucla.edu/issr/da/.

30 households were chosen from the permanent and temporary *hukou* lists; and within households, one adult (age 20-69) was chosen at random; this procedure yielded 3,003 cases. The urban sample was selected in the similar way, with the stages comprised of counties or county-level units (county-level cities and districts of larger cities), "street committees," and "neighborhood committees," yielding 3,087 cases (see Treiman [1998: Appendix D] for details). This is effectively a national probability sample of the Chinese population, since the population of Tibet is so small that it is extremely unlikely that any Tibetan counties would have been selected even if Tibet had been included in the population from which the sample was drawn.

Given the sample design, respondents were selected from households with different numbers of adults; moreover, the current urban and rural populations were sampled at different rates. Thus, to render the data representative of the adult population of China, we apply case weight methods both for the descriptive statistics and for the model estimation. Also, because the sample is clustered, we utilize survey estimation procedures to obtain correct standard errors (StataCorp 2003).

The survey gathered extensive information on respondents' life histories, especially education histories and family socioeconomic background. This is a high quality survey with little missing data. After constructing a missing variable indicator for father's occupational status[6] and eliminating 31 cases with missing responses on any of the other variables considered here, the analysis is based on 6,059 cases. Our basic strategy is to estimate a series of OLS regression models

[6] Father's occupation is the only variable in the analysis that has missing data on more than a handful of cases. To maximize the number of cases for analysis, in cases where father's occupation is missing we substituted the mean ISEI score (see below) of the observations for which father's occupation is known and also included a missing data indicator for father's occupational status.

predicting years of schooling from the number of siblings plus a number of control variables described below. To highlight the impact of political shifts over time and to account for persistent rural-urban and gender differences, we also estimate separate models for cohorts corresponding to each of the four periods identified above (see below for details), and for rural and urban residents as well as for males and females.

Variables

The *dependent* variable is the total years of completed schooling, ranging from 0 to 18[7]. A potential problem with this specification of educational attainment is that some respondents could still be in school. However, this turned out to be the case for less than one per cent of the sample. Thus, the problem is of little practical importance. Given the extensive retrospective information collected in the survey, we are able to resolve the temporal ambiguity issue by studying the effect of sibship size measured when respondents were age 14 on their ultimate educational attainment, rather than the effect of current sibship size on current enrollment status, as in most other studies.

Our strategy has several additional advantages. Completed education is of essential interest in educational stratification research, whereas measures such as children's current educational status may obscure differences between permanent school leaving and short-term interruption or delays in schooling for reasons that may not affect an individual's ultimate attainment. In addition, completed education is the preferred variable from the point of view of examining the role of state policies—what we care about is the impact of policy on completed education rather than on the specific process by which education is achieved.

[7] Total years of schooling in the data is a direct transformation of respondent's highest educational level.

The key *independent* variable in the analysis is *sibship size*. We use the total number of siblings at age 14 as an indicator. This variable ranges from 0 to 14 in our data. We truncate it at seven in order to reduce the leverage of the small number of respondents with a very large number of siblings (less than one per cent of our sample reports eight or more siblings). The sibship size variable is treated as both continuous and a discrete in different parts of the analysis.

Gender is coded as a dichotomous variable (male=1, female=0). As noted, in China sons are strongly favored and thus tend to obtain more education than daughters. To control for this, it would be optimal to have information not only on the gender of the respondent but on the gender configuration of the respondent's siblings, to determine whether the gender effect varies depending on the gender of other siblings. For example, girls with many brothers may fare worse than girls with many sisters; but we do not have such information.[8] All we can do is to estimate effects of sibship size separately for girls and boys. However, since there is clear evidence in China that parents tend to continue to bear children if their earlier children are daughters in order to have at least one son (Feeney 1994; Poston 2002), we expect that girls are more likely than boys to have brothers. Thus, even without information on the gender composition of sibships, we can reasonably assume that girls suffer more from large sibships than do boys simply because girls are more likely to have brothers.

Urban (vs. rural) residential status is defined by formal registration status at age 14. Since

[8] Although complete household rosters are often collected in sample surveys, the usual practice is to collect information on the *current* household, which provides no information about the household composition when the respondent was growing up. We think collecting an additional, retrospective, household roster focusing on when the respondent was age 14 would be highly desirable in any survey designed to investigate intergenerational status transmission or status attainment. To our knowledge, this never has been done.

1955 China has had an internal registration (*hukou*) system, in which each person was assigned to either agricultural or non-agricultural (or, equivalently, rural or urban) status, with very different rights and privileges (Chan 1994; Wang, Zuo, and Ruan 2002; Wu and Treiman 2004a). Registration status is a better indicator of educational opportunities than is actual residence because rural *hukou* holders living in cities were not permitted to attend urban schools.[9] The survey data includes information on registration status at birth (ordinarily assigned on the basis of mother's status) and at age 14.[10] Although there is little *hukou*-mobility between birth and age 14, we regard the latter as a better indicator of the type of schooling available to individuals. We thus define urban (=1) vs. rural (=0) residential status on the basis of whether the respondent held an urban or rural *hukou* at age 14. However, about 20 per cent of the sample was age 14 before the *hukou* system was established. These people are coded as rural or urban on the basis of their actual residence at age 14—those residing in villages are coded as rural and those residing in towns or cities are coded as urban.

We also control for *parental education*, which is known to be an important determinant of offspring's education (Shavit and Blossfeld 1983; Treiman and Yip 1989; Ganzeboom and Treiman 1993). We define parental education by the years of school completed by the parent who achieved the most schooling. In Chinese families, father's education is often considered more important than that of the mother (Mare and Chang 2005). But the relative unimportance of mother's education is

[9] Very recently urban schools have been opened to rural children, but only upon payment of high "non-resident" fees.

[10] The survey also includes information on current registration status, but this variable clearly would be inappropriate because it may result from rather than determine education, particularly in China (Wu and Treiman 2004a).

largely due to the low educational level of women, who in our data average nearly two years less schooling than do men—5.4 years vs. 7.2 years. Since parents generally attempt to maximize the positive effect of their education, we expect that in families in which mothers are better educated than fathers, their education tends to be more influential. In the handful of cases where information was available for only one parent, that information was used.

We include *father's occupational status (ISEI)*[11] when the respondent was age 14 as one aspect of family socioeconomic background. More than 10 per cent of the data (N=731) are missing information on father's occupation. This information is not missing at random; rather, poorly educated people are less likely to know about their parental characteristics,[12] which means that the omission of such cases is likely to bias the sample. Thus, we include a dichotomous variable, scored 1 if father's occupation was missing and scored 0 otherwise, and assign the mean *ISEI* score to all cases missing information on father's occupation. This procedure yields appropriate estimates of the effect of other variables in the model, as well as of father's *ISEI*. The coefficient associated with the "missing value" dichotomy shows the difference in the average years of schooling between those who are missing information on father's occupational status and those who are not.[13] We are

[11] Father's occupational status is measured by the *I*nternational *S*ocio*e*conomic *I*ndex of Occupations *(ISEI)* (Ganzeboom, De Graaf, and Treiman 1992), which was added to the data by the original investigators. This scale has a metric ranging from 10 to 90 and was constructed from data for 17 nations using optimal scaling procedures that maximized the role of occupation categories as intervening between education and income. In practice, the scale behaves in a similar way to the well-known Duncan (1961) *SEI*.

[12] In our data, about 15 per cent of those with a primary education or less are missing information on father's occupation, compared to about seven per cent of those with at least a middle school education.

[13] In contrast to our treatment of parental education, we did not code the higher of father's and mother's ISEI because this information is missing for a large fraction of mothers (about one-third).

not able to control for family income or wealth when the respondent was age 14 due to the lack of such information in the data. However, parental education and occupational status, taken together, serve as a partial control for family economic status.

Period. To incorporate an historical perspective, we divide the sample into four cohorts corresponding to the four periods defined above, each with distinctive educational policies and levels of socioeconomic development. Studying the effect of historical events on educational attainment using cross-sectional data is difficult because it is unclear where in the educational process the impact will be the greatest, and an individual's educational process may overlap different historical events. In the present study, we use age seven—the modal school entry age in this data set—as the age at which people's education tends to be most affected. The school starting age is the age at which parental decisions regarding children's education are most decisive, since parents tend to plan children's education at the outset of their schooling—although, of course, such plans are subject to change both in response to children's performance in school and to changes in the family's economic circumstances. Parental decisions affecting children's educational outcomes may depend most powerfully on policies in place during their children's earliest school years, since some decisions, once made, cannot be undone. Also, since parents' influence and the effect of family background tend to decline over successive schooling decisions due to individual selectivity (Mare 1981), policies affecting early selection are likely to have the greatest impact on sibship size effects.

We thus define the four cohorts on the basis of the year the respondent turned seven: the Pre-Liberation cohort includes those who turned age seven before 1949; the Early Post-Liberation cohort includes those who turned age seven between 1950 and 1965; the Cultural Revolution cohort includes those who turned age seven between 1966 and 1976; and the Economic Reform cohort

includes those who turned age seven between 1977 and 1983. Because our choice of dividing points is necessarily somewhat arbitrary, we conducted sensitivity tests by comparing results obtained from different choices of cutting points. We found that our results are robust to alternative cutting points, especially those based on years close to the school beginning age, and that cutting points corresponding to substantially higher ages produced less clear cut outcomes.

Primary education was far from universal in China and illiteracy rates were relatively high (Tsang 2000): the percentages for the four cohorts are, respectively, 42, 21, 8, and 6.[14] Because of the substantial variation in educational attainment, even at the primary level, there was room for state policies to have substantial impact.

RESULTS

Descriptive Statistics

Tables 1-3 present means and percentages for each cohort as a whole, for cohorts subdivided by residential status, and for cohorts subdivided by gender. The general trends are as expected. From the top row of Table 1 we see that the average sibset size has declined from almost five children (the number of siblings plus one) in the second period to around 3.7 children in the fourth period, with the decline particularly sharp for the most recent cohort, which was influenced by the birth-control policies introduced in the 1970s.[15] At the same time, the average level of schooling increased from

[14] Even for the 4th cohort, primary school education was not required. This cohort typically began school between 1977 and 1983 but the Compulsory Education Law was not implemented until 1986.

[15] The somewhat lower average sibset size for the first cohort compared to the second probably reflects a combination of differential mortality (those from large sibsets were likely to be of low SES [Lavely and Freedman 1990; Zhang 1990] and hence to have been disproportionately likely to have died prior to the survey date [Men 1993; Banister and Hill 2004; Zimmer and Kwong 2004]) and the high infant mortality associated with the

3.9 years before Liberation to 8.2 years during the post-Mao economic reform period. By and large, the results reflect changes in governmental educational policies. During the pre-liberation period, which suffered from low socioeconomic development, the average years of schooling was very low and there was relatively large dispersion around the mean. After Liberation, the mean years of schooling increased while dispersion around the mean decreased. Notably, the greatest change was between the second and third periods, just as would be expected given the competitive policies implemented during the second period and the great emphasis on equality during the third, Cultural Revolution, period. Educational outcomes in the fourth, Economic Reform, period are not very different from the third period, presumably as a result of offsetting trends—a renewed emphasis on educational attainment but also increased opportunity costs associated with new economic opportunities for family enterprises. In addition, some fraction of the fourth cohort may not yet have completed its education by the time of the survey.

Table 2 shows rural-urban disparities period-by-period. In three of the four periods, the number of siblings is greater for those from rural than from urban origins whereas the level of education attained is lower, although the differences in sibset size are very small in the first two periods. In general, the period variations are similar for those from rural and urban origins, although the average sibset size fell in urban areas between the second and third periods but not in rural areas. The average level of schooling increased monotonically period-by-period in urban areas but remained the same between the third and fourth period in rural areas, presumably due to the increased opportunity costs associated with the introduction of the "Family Responsibility System." Consistent with our earlier discussion regarding the competitive thrust

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disruption of the war years (Banister 1987; Fang 1993; Peng and Guo 2000)—recall that the sibship size count is based on responses to the question, "How many siblings did you have when you were 14?"

of the second period and the egalitarian thrust of the third period, the average years of schooling increased much more substantially for those of rural origin than for those of urban origin, sharply reducing the rural-urban gap.

Several points are of interest in Table 3. First, policy effects are difficult to discern because they are swamped by the secular trend toward increasing educational equality between males and females. Although males achieve more education in every period, the gender gap has systematically declined over time. Second, in all four periods the number of siblings is slightly greater for females, which is consistent with the claim that when Chinese parents have daughters, they try again for a son.

Note that, as Appendix A shows, even in the most recent cohort—people born between 1970 and 1976—there is substantial variability in family size. Fully a third of those from urban origins had three or more siblings, as did about half of the men and about 60 per cent of the women from rural origins. Clearly, the fertility control policies implemented in the 1970s had little impact on this cohort, probably because these policies came into full force only late in the decade. The importance of this point for our analysis is that it makes clear that our results are unlikely to be driven by the extreme behavior of a small number of large families.

Overall Effect

To estimate the overall effect of sibship size on educational attainment, we first regress years of schooling on sibship size alone. It turns out that the gross cost of each additional sibling in China is about $1/5^{th}$ of a year of education (precisely, $\beta = -.18$). A significant, but smaller ($\beta = -.08$, $p = .023$) cost is observed even when we control for other background variables (parental education, father's ISEI, sex, residential status, and cohort). We have claimed that the cost of

additional siblings is due to the dilution of resources available to each child. We are able to make one explicit test of this claim, following the strategy of Downey (1995), by studying the impact of sibset size on the availability of a particular resource, whether the respondent had his or her own study desk at age 14. Specifically, we predict (via logistic regression) whether the respondent had a study desk from sibship size and the other control variables included above. The logit associated with sibship size (β = -.110; p = .004) indicates that, net of other variables, each additional sibling reduced the odds that the respondent had a study desk by about 10 per cent. We suspect that the availability to each child of other resources, both material and intellectual, would be similarly affected by the number of siblings, but are unable to make any additional tests due to the lack of suitable information.

Our next step was to extend the overall model of years of schooling reported above by including, first, interactions between the period dummies and each of the other independent variables; second, three-way interactions between the period dummies, gender, and each of the other variables; and, third, three-way interactions between the period dummies, registration status, and each of the other variables. All three models fit significantly better than the overall model ($p<.001$), and in each model all the interactions involving sibship size are at least marginally significant ($p<.12$, .05, and .03, respectively), which leads us to conclude that the process of educational attainment and, specifically, the effect of sibship size on educational attainment, varies by period, residential status, and gender, as expected from our theoretical discussion. In the remainder of the paper we therefore estimate separate models, first by period and then, separately, by period and residential status and by period and gender. It would, of course, have been preferable to disaggregate the analysis still further, by considering separate models for each combination of period, residential status, and gender. However, our sample size

is not large enough to sustain this degree of disaggregation. Moreover, the separate models we estimate do permit us to make explicit tests of the hypotheses specified above.

Sibship Size Effect by Cohort

Consider Table 4, which provides a test of Hypotheses 1 and 3. The evidence is consistent with these hypotheses. As predicted, for the second (Post-Liberation) and fourth (Economic Reform) cohorts, there are substantial negative effects of sibship size, with each additional sibling costing nearly a fifth of a year of schooling, net of other factors—an effect comparable in size to that observed in developed nations. By contrast, there is no effect of sibship size for the third (Cultural Revolution) cohort, as predicted in Hypothesis 1 or the first (Pre-Liberation) cohort, as predicted in Hypothesis 3.[16]

We also estimated parallel models treating sibship size as a set of discrete variables. The results are consistent with those from the continuous sibship size specification. For the Post-Liberation and Economic Reform cohorts, the coefficients associated with dummy variables for discrete sibship sizes become increasingly negative in a nearly monotonic way. By

[16] Table 4 also reveals other changes in factors affecting educational attainment not directly pertinent to our analysis. First, consistent with Deng and Treiman's (1997) claim that the Cultural Revolution greatly undercut the effect of family socioeconomic status on educational attainment, the effects of parental education and father's ISEI are smallest for the Cultural Revolution cohort. Second, the male advantage in educational attainment systematically decreases over time, from about 2 ½ years in the first cohort to just over a half year in the fourth cohort. Third, the urban advantage is even smaller in the fourth (Economic Reform) cohort than in the third (Cultural Revolution) cohort, which suggests that the Cultural Revolution period policy of promoting education in the countryside was not reversed in the subsequent period despite massive rural school closings.

contrast, for the other two cohorts, the coefficients for dummy sibship size variables show no clear pattern.[17]

Sibship Size Effect by Cohort and Rural/Urban Residential Status

To test Hypotheses 2.2 and 2.3, we estimate separate models within each cohort for those with rural and urban registration at age 14. The coefficients of these models are shown in Table 5. Our results are generally as expected, revealing the complex interaction between cohort and residential status posited earlier.

For the first cohort, no rural/urban differences are expected and none are found—there is no effect of sibship size for those from either rural or urban origins (consistent with Hypothesis 3). The results for the second and third cohort are consistent with Hypothesis 2.2. For the second (Post-Liberation) cohort, there are sharp urban-rural differences. Sibship size hardly mattered for those from urban origins, whereas it was detrimental for those from rural origins—each additional sibling reducing schooling by one fifth of a grade. Recall that this was the period in which the urban educational system expanded at the expense of the rural population, so that educational competition was much greater in rural than in urban areas. For the third (Cultural Revolution) cohort, the rural-urban differential effect is reversed, because educational expansion occurred mainly in rural areas and state policy promoted the schooling of peasant children, while urban secondary schools and tertiary institutions were shut down for several years and admission was difficult even after schools reopened. The result is that during this period there was no sibship size effect for those from rural origins, but a substantial negative effect (-.16) for those from urban origins.

[17] The results from the discrete sibship size models are not shown here. Tables are available at http://www.ccpr.ucla.edu/asp/papers.asp .

Results for the fourth (Economic Reform) cohort are largely consistent with Hypothesis 2.3. Recall that the Economic Reform period is characterized by competitive policies, which should lead to a strong sibship size effect. This is, indeed, what we observe in urban areas: the cost of each additional child is about a half year of schooling, a very strong effect. The size of the effect may result in part from intensified birth-control policies, which were much more strongly enforced in urban than in rural areas (Croll et al. 1985; Hsu 1985; Kane and Choi 1999). As fertility declined, the remaining large families in urban areas may have become increasingly disadvantaged due to policies that encouraged low fertility by compensating small families while penalizing large families. Hence, during this period large families may have experienced particularly severe resource constraints as a result of differential treatment. The unusually large effect may, however, also reflect endogenous quality-quantity calculations made by parents. That is, in addition to differential treatment of small and large families by the state, families wishing to maximize their children's educational attainment may have limited their fertility in order to ensure sufficient resources for each child. Unfortunately, we have no way of directly testing this conjecture. However, given the very large size of the effect for urban families, it is unlikely that endogenous quality-quantity tradeoffs are entirely responsible.

In rural areas, the sibship size effect, although negative, is small and not statistically significant. This is as expected. Recall that we hypothesized that in rural areas the reduction in educational opportunities resulting from fiscal decentralization and increased competition might be offset by the introduction of the Family Responsibility System, which increased the opportunity costs of children's education for rural families with small numbers of children but may have led larger families to keep some children in school as a risk diversification strategy. For families engaged in agriculture or family business, then, sibship size could actually have a positive effect on

children's educational attainment. A partial test of this claim is possible by modeling educational attainment separately for those from rural origins whose fathers were engaged in agriculture or small businesses when the respondent was age 14 and those whose fathers had other occupations. The results are shown in Table 6. As we see, for those from rural origins whose fathers were not engaged in agriculture or small businesses, there is a substantial negative effect of sibship size (although the effect is not as large as for the urban population and is only marginally significant due to the small sample size). By contrast, among those whose families were engaged in family enterprises, the sibship size effect does not become positive, but it essentially disappears, consistent with the conjecture that the Family Responsibility System makes schooling an opportunity cost for families with few children more than for families with many children and thus offsets the increasing cost of education during the Reform Period.

Sibship Size Effect across Cohort by Sex

To test Hypothesis 2.1 we estimate separate models for males and females within each cohort. The coefficients of these models are shown in Table 7. As expected, there is no sibship size effect for males in any cohort, but for females there is a strong negative effect of sibship size in the two periods characterized by a competitive educational agenda, Cohort 2 (Post-Liberation) and Cohort 4 (Economic Reform). The sharp gender contrast is consistent with our claim that during periods in which educational competition was strong, girls, who in China are valued less than boys, suffer when family resources are diluted by the presence of many children. The absence of a sibship size effect for males even in competitive periods suggests that whatever their circumstances, families tend to invest in the education of their sons. But investments in daughters are relatively less common, and only during the Cultural Revolution (as well, of

course, as the Pre-Liberation period) did girls from large families manage to attain as much schooling as girls from small families.

SUMMARY AND DISCUSSION

China provides an interesting case in which to study the effect of sibship size on educational attainment. In contrast to developed nations, where the detrimental effect of additional siblings appears to be nearly universal, in China sibship size effects have varied over time in response to vicissitudes in state policy, which alternately promoted educational equality and educational competition. These policies played out in complex ways, affecting males and females and those from urban and rural origins in different ways at different times. Because of its distinctive history, China presents an unusual opportunity for students of social stratification to explore the impact of government institutions in shaping the educational stratification process.

Although somewhat complex in their detail, the results presented here can be summarized quite simply: when schooling opportunities were limited and expensive, children in large families, and especially girls, obtained less schooling; and when schooling expanded and became relatively less expensive, the detrimental effect of having many siblings disappeared. The explanation for this result is that when competition for schooling is pronounced, family resources—both material and cognitive—become more important, and a larger number of children results in the dilution of resources available to any given child.

Because of limitations in the data available to us, our empirical analysis for the most part has not involved direct tests of the presence of resources within families nor of the degree of educational competition, but has proceeded indirectly through comparisons of sibship size effects across four historical periods (Pre-Liberation, Post-Liberation, Cultural Revolution, and Economic Reform)

and comparisons of effects for males and females and of those from urban and rural origins within each period. We have argued that the four periods were characterized by quite different educational policies, succinctly summarized as "egalitarian" and "competitive," which played out in complex ways in urban and rural areas, and also had a much greater impact on the educational chances of girls than of boys due to strong son preferences prevailing in China even today.

We found that sibship size had little impact on the education of males in any of the four periods. However, during competitive periods large sibship sizes tended to exacerbate the disadvantages already faced by girls, reducing the schooling they obtained compared to girls with few siblings. But when the state enforced an egalitarian agenda, during the Cultural Revolution, the disadvantage for girls with many siblings disappeared.

Rural-urban differences in the sibship size effect are more complex. During the Pre-Liberation period sibship size mattered little for anyone due to the extreme limitation in educational opportunities. In the immediate Post-Liberation period, when the urban educational system expanded but rural areas were subject to harsh conditions, sibship size had little impact on urban children, while it had a large influence on rural children. During the Cultural Revolution, however, the impact was reversed: schooling was constricted in urban areas, with many school closings, but expanded in rural areas. As a result, we observe a pronounced sibship size effect in urban areas but not in rural areas.

The fourth, Economic Reform, period is particularly complex, with several offsetting pressures. In urban areas, fertility control policies that subsidized families with few children and fined families with many children exacerbated disparities between small and large families in the resources available to each child. The result was an unusually large negative sibship size effect. In rural areas, however, the fertility control policies were not very strongly enforced. Moreover, the effect of

increased educational competition was offset by the Family Responsibility System, which created opportunity costs for families with few children, because children were needed to help in the fields. The result is that we observe small, and statistically non-significant, sibship size effects for those of rural origins.

Due to the lack of suitable data, we cannot control for the possibility of endogeneity—that parents decide to limit their fertility in order to maximize the education of the children they do have. However, our analysis suggests that endogeneity is not likely to seriously contaminate our results. As we have shown, endogenous quality-quantity calculations must have been relatively uncommon in China given the high fertility levels until the most recent period. State policy in the immediate Post-Liberation period was strongly pro-natalist as a result of Mao's advocacy of mass production, which greatly enhanced the value of and the need for labor, and thus the value of and the demand for children. This campaign was especially strong during the Great Leap Forward Period from 1958 to 1960 (Peng 1987). As Appendix A shows, fertility was quite high during this period, with an especially large proportion of this cohort coming from families with six or more children. Although it is of course possible that some families made endogenous fertility decisions, there could not have been many given the extremely strong ideological fever commonly observed in many social arenas in this period. For the Cultural Revolution cohort, endogenous quality-quantity tradeoffs are beside the point since we observe no sibship size effect in this period. This leaves the Economic Reform period, in which endogenous quality-quantity tradeoffs might have occurred in the urban population and could help to account for the extremely high sibship size effect—a reduction of one half year of schooling for each additional sibling. For the rural population, by contrast, the Family Responsibility System created an incentive to have more children in order to have more hands in the fields. We have suggested that families with many children kept some of them in school, despite the

loss of labor, as a risk diversification strategy. But none of this is consistent with a decision to limit fertility in order to promote educational chances.

We conclude that, in China, individual life chances under state socialism are extremely sensitive to political processes, and that changes in state policies can dramatically alter opportunity structures. By explicitly taking into account state policies, this research has contributed to our understanding of the mediating role of government policies in developing societies. The evidence from China clearly illustrates how forces external to the family—specifically, policies that affect the availability and cost of schooling—affect internal family dynamics, exacerbating or minimizing the role of sibship size as a determinant of educational outcomes.

The evidence presented here suggests that governmental equalizing policies have the potential to eliminate the educational disadvantages faced by children with many siblings, and particularly rural children and girls from both the countryside and the city, ultimately reducing educational, gender and place stratification. Our findings should hearten educational policy makers, because promoting equalizing policies is far more tractable than eliminating poverty. For comparativists, these results suggest that government policies in developing societies can play crucial roles in altering educational resources available to individual children, and in allocating these resources equally for boys and girls and rural and urban children. We hope our work inspires similar studies of other societies.

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Table 1. Means and Percentages by Cohort (standard deviations in parentheses), Chinese Adults 1996 (N=6,059)

	Cohort 1 (Pre-Liberation)	Cohort 2 (Early years after Liberation)	Cohort 3 (Cultural Revolution)	Cohort 4 (Economic Reform)	Total
No. of siblings	3.1 (1.8)	3.7 (1.8)	3.6 (1.6)	2.7 (1.6)	3.4 (1.8)
Parental years of schooling	1.6 (2.7)	2.3 (3.2)	4.2 (4.0)	5.9 (4.1)	3.2 (3.8)
Father's ISEI	23.1 (12.0)	23.2 (13.2)	26.8 (17.1)	26.7 (17.0)	24.7 (14.9)
Respondent's years of schooling	3.9 (4.2)	5.9 (4.0)	8.0 (3.6)	8.2 (3.3)	6.4 (4.1)
Urban	20.2	15.9	18.3	20.2	18.1
Male	55.0	50.9	50.1	52.0	51.7
Fr's ISEI missing	23.0	12.9	4.9	5.3	11.6
Weighted *N*	1,230	2,267	1,587	977	6,061
Unweighted *N*	1,260	2,240	1766	793	6,059

Table 2. Means and Percentages by Cohort and Rural vs. Urban Residential Status (standard deviations in parentheses)

	Cohort 1 (Pre-Liberation)		Cohort 2 (Early years after Liberation)		Cohort 3 (Cultural Revolution)		Cohort 4 (Economic Reform)		Total	
	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural
No. of siblings	3.1 (1.9)	3.0 (1.8)	3.6 (1.9)	3.7 (1.8)	3.0 (1.6)	3.7 (1.6)	2.2 (1.3)	2.9 (1.6)	3.1 (1.8)	3.4 (1.8)
Parental schooling	2.8 (3.7)	1.4 (2.3)	4.5 (4.3)	1.8 (2.7)	7.1 (4.5)	3.5 (3.6)	9.7 (3.9)	5.0 (3.6)	5.7 (4.8)	2.7 (3.3)
Father's ISEI	31.2 (15.8)	21.0 (9.9)	36.2 (17.2)	20.8 (10.7)	43.1 (17.7)	23.1 (14.7)	47.3 (16.8)	21.5 (12.6)	38.9 (17.9)	21.5 (12.0)
Respondent's schooling	6.5 (4.7)	3.2 (3.8)	9.0 (3.2)	5.3 (3.9)	10.5 (2.4)	7.4 (3.5)	11.0 (2.3)	7.4 (3.1)	9.2 (3.7)	5.8 (4.0)
Male	54.5	55.2	50.8	50.9	52.4	50.0	51.9	52.4	52.2	51.6
Fr's ISEI missing	24.5	22.6	11.9	13.1	6.1	4.7	4.3	5.6	11.9	11.6
Rural/Urban difference in schooling	3.3		3.7		3.1		3.6		3.4	
Weighted *N*	249	981	361	1,906	290	1,296	198	780	1,098	4,963
Unweighted *N*	388	872	618	1,622	488	1,278	236	557	1,730	4,329

Table 3. Means and Percentages by Cohort and Sex (standard deviations in parentheses)

	Cohort 1 (Pre-Liberation)		Cohort 2 (Early years after Liberation)		Cohort 3 (Cultural Revolution)		Cohort 4 (Economic Reform)		Total	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
No. of siblings	3.0 (1.8)	3.1 (1.8)	3.6 (1.9)	3.7 (1.8)	3.5 (1.7)	3.7 (1.6)	2.5 (1.4)	2.9 (1.7)	3.3 (1.8)	3.5 (1.8)
Parental schooling	1.6 (2.7)	1.7 (2.7)	2.3 (3.3)	2.2 (3.1)	4.3 (4.1)	4.0 (4.0)	5.8 (4.1)	6.1 (4.1)	3.2 (3.8)	3.2 (3.8)
Father's ISEI	22.9 (11.9)	23.3 (12.2)	23.0 (12.9)	23.5 (13.6)	27.0 (17.3)	26.5 (17.0)	26.1 (16.8)	27.4 (17.3)	24.5 (14.7)	24.9 (15.1)
Respondent's schooling	5.0 (4.1)	2.5 (3.8)	7.0 (3.5)	4.7 (4.1)	8.8 (3.2)	7.2 (3.8)	8.4 (3.2)	7.9 (3.4)	7.2 (3.8)	5.5 (4.3)
Urban	20.0	20.5	15.9	16.0	19.1	17.5	20.1	20.3	18.3	17.9
Fr's ISEI missing	23.0	22.9	13.3	12.6	4.7	5.2	4.7	5.9	11.8	11.5
Gender difference in schooling	2.5		2.3		1.6		0.5		1.7	
Weighted *N*	677	553	1,154	1,113	795	792	508	469	3,134	2,927
Unweighted *N*	665	595	1,156	1,084	855	911	399	394	3,075	2,984

Table 4. OLS Regression of Years of Schooling on Sibship Size and Control Variables, Separately by Cohort (standard errors in parentheses; p-values [2-tailed tests] in italics)

Independent variables	Cohort 1 (Pre-Liberation)	Cohort 2 (Early years after liberation)	Cohort 3 (Cultural Revolution)	Cohort 4 (Economic Reform)
Number of siblings	-0.044 (.057) *.443*	-0.164 (.054) *.003*	-0.032 (.069) *.649*	-0.153 (.074) *.039*
Male	2.553 (.232) *.000*	2.291 (.190) *.000*	1.437 (.171) *.000*	0.590 (.228) *.011*
Urban	2.343 (.362) *.000*	2.662 (.224) *.000*	1.999 (.195) *.000*	1.685 (.247) *.000*
Parental schooling	0.386 (.036) *.000*	0.219 (.031) *.000*	0.173 (.028) *.000*	0.232 (.050) *.000*
Father's ISEI	0.037 (.012) *.003*	0.028 (.008) *.001*	0.021 (.006) *.000*	0.028 (.008) *.001*
Fr's ISEI missing	-0.761 (.299) *.012*	-1.018 (.235) *.000*	-0.664 (.424) *.119*	-0.167 (.423) *.693*
Constant	0.829 (.337) *.015*	3.837 (.259) *.000*	5.760 (.326) *.000*	5.824 (.402) *.000*
R^2	0.275	0.253	0.214	0.312
Weighted *N*	1,230	2,267	1,587	977
Unweighted *N*	1,260	2,240	1,766	793

Table 5. OLS Regression of Years of Schooling on Sibship Size and Control Variables, Separately by Cohort and Residential Status at Age 14 (standard errors in parentheses; p-values [2-tailed tests] in italics)

Independent variables	Cohort 1 (Pre-Liberation)		Cohort 2 (Early years after liberation)		Cohort 3 (Cultural Revolution)		Cohort 4 (Economic Reform)	
	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural
Number of siblings	0.027 (.134) *.841*	-0.052 (.063) *.414*	-0.011 (.076) *.889*	-0.199 (.060) *.001*	-0.163 (.088) *.066*	-0.010 (.080) *.902*	-0.507 (.119) *.000*	-0.090 (.082) *.270*
Male	1.697 (.566) *.003*	2.770 (.238) *.000*	1.001 (.305) *.001*	2.542 (.222) *.000*	0.062 (.259) *.811*	1.752 (.196) *.000*	-0.001 (.325) *.999*	0.765 (.259) *.004*
Parental schooling	0.458 (.064) *.000*	0.329 (.050) *.000*	0.185 (.038) *.000*	0.233 (.039) *.000*	0.133 (.032) *.000*	0.181 (.036) *.000*	0.144 (.050) *.005*	0.258 (.060) *.000*
Father's ISEI	0.033 (.018) *.065*	0.045 (.017) *.009*	0.028 (.010) *.006*	0.034 (.011) *.003*	0.024 (.008) *.005*	0.022 (.007) *.002*	0.008 (.010) *.409*	0.037 (.010) *.000*
Fr's ISEI missing	-0.096 (.569) *.866*	-1.011 (.352) *.005*	0.267 (.528) *.615*	-1.324 (.267) *.000*	0.140 (.345) *.686*	-0.935 (.519) *.074*	-0.836 (.494) *.094*	-0.217 (.495) *.662*
Constant	3.352 (.871) *.000*	0.707 (.409) *.086*	6.610 (.508) *.000*	3.724 (.302) *.000*	8.971 (.662) *.000*	5.474 (.362) *.000*	10.379 (.605) *.000*	5.225 (.463) *.000*
R^2	0.200	0.206	0.149	0.169	0.157	0.124	0.228	0.156
Weighted *N*	249	981	361	1,906	290	1,296	198	780
Unweighted *N*	388	872	618	1,622	488	1,278	236	557

Table 6. OLS Regression of Years of Schooling on Sibship Size and Control Variables, by Father's Occupation at Age 14, Economic Reform Cohort with Rural Status at Age 14 (standard errors in parentheses; p-values [2-tailed tests] in italic)

Independent variables	Agriculture or small business (*getihu*)	Other
Number of siblings	-.028	-.266
	(.090)	(.181)
	.755	*.144*
Male	.730	.759
	(.295)	(.430)
	.014	*.080*
Parental schooling	.280	.202
	(.064)	(.095)
	.000	*.035*
Constant	5.578	7.823
	(.467)	(.952)
	.000	*.000*
R^2	0.107	0.114
Weighted *N*	655	120
Unweighted *N*	441	110

Table 7. OLS Regression of Years of Schooling on Sibship Size and Control Variables, Separately by Cohort and Gender (standard errors in parentheses; p-values [2-tailed tests] in italics)

Independent variables	Cohort 1 (Pre-Liberation)		Cohort 2 (Early years after liberation)		Cohort 3 (Cultural Revolution)		Cohort 4 (Economic Reform)	
	Male	Female	Male	Female	Male	Female	Male	Female
Number of siblings	-0.147 (.094) *.121*	0.096 (.069) *.164*	-0.004 (.067) *.953*	-0.324 (.079) *.000*	0.003 (.091) *.976*	-0.066 (.088) *.454*	-0.076 (.092) *.409*	-0.197 (.100) *.051*
Urban	1.827 (.527) *.001*	2.989 (.433) *.000*	2.152 (.294) *.000*	3.219 (.352) *.000*	1.234 (.257) *.000*	2.786 (.274) *.000*	1.233 (.305) *.000*	2.151 (.372) *.000*
Parental schooling	0.369 (.056) *.000*	0.419 (.051) *.000*	0.225 (.045) *.000*	0.212 (.041) *.000*	0.186 (.035) *.000*	0.163 (.038) *.000*	0.257 (.067) *.001*	0.218 (.059) *.000*
Father's ISEI	0.045 (.019) *.016*	0.025 (.016) *.119*	0.011 (.012) *.356*	0.043 (.011) *.000*	0.017 (.008) *.038*	0.026 (.007) *.000*	0.030 (.008) *.000*	0.023 (.014) *.096*
Fr's ISEI missing	-1.644 (.411) *.000*	0.407 (.356) *.255*	-1.013 (.341) *.003*	-1.004 (.360) *.006*	-1.078 (.546) *.050*	-0.375 (.588) *.525*	0.538 (.647) *.407*	-0.687 (.653) *.294*
Constant	3.842 (.511) *.000*	0.234 (.412) *.571*	6.019 (.335) *.000*	4.004 (.392) *.000*	7.284 (.394) *.000*	5.645 (.432) *.000*	6.069 (.519) *.000*	6.094 (.525) *.000*
R^2	0.176	0.280	0.151	0.235	0.159	0.205	0.308	0.316
Weighted *N*	677	553	1,154	1,113	795	792	508	469
Unweighted *N*	665	595	1,156	1,084	855	911	399	394

APPENDIX

Table A. Percentage Distribution of Number of Siblings by Cohort, Residential Status, and Gender

Period	Number of siblings										N [a]	N [b]
	0	1	2	3	4	5	6	7+	Total	Mean		
Pre-Liberation												
Urban												
Male	7.4	15.1	19.6	22.8	16.1	7.7	8.0	3.3	100.0	2.97	136	204
Female	10.3	9.7	21.0	16.7	18.9	11.1	6.7	5.6	100.0	3.12	116	189
Rural												
Male	6.5	13.3	21.3	22.1	17.1	9.5	7.0	3.3	100.1	3.03	544	465
Female	7.1	14.0	18.9	22.4	17.7	9.8	6.7	3.4	100.0	3.03	441	413
Early years after Liberation												
Urban												
Male	2.9	9.6	17.2	18.5	24.5	14.9	6.9	5.6	100.1	3.52	183	320
Female	6.4	9.0	13.0	18.7	23.7	14.6	10.3	4.3	100.0	3.50	178	299
Rural												
Male	4.8	7.2	14.2	22.7	23.9	12.2	8.6	6.4	100.0	3.57	972	837
Female	2.6	6.7	14.1	25.5	18.4	15.7	10.2	6.7	99.9	3.72	944	791
Cultural Revolution												
Urban												
Male	2.0	15.7	24.6	30.8	12.4	8.0	2.0	4.5	100.0	2.90	152	238
Female	1.7	8.4	23.8	30.3	19.3	8.9	5.5	2.1	100.0	3.16	139	252
Rural												
Male	1.8	6.2	17.8	27.7	18.4	16.5	6.5	5.2	100.1	3.56	642	618
Female	0.6	3.4	15.4	23.2	26.2	16.8	8.7	5.7	100.0	3.85	656	661
Economic Reform												
Urban												
Male	4.5	35.5	25.7	20.4	9.2	3.0	1.4	0.2	99.9	2.10	102	121
Female	3.6	29.7	28.5	24.2	7.3	4.3	0.0	2.5	100.1	2.27	95	115
Rural												
Male	2.1	17.5	33.3	24.3	13.3	5.4	1.8	2.3	100.0	2.64	406	278
Female	1.6	15.9	25.6	21.8	16.3	10.2	2.4	6.2	100.0	3.07	374	279

[a] Weighted *N*.
[b] Unweighted *N*.

Table A. OLS Regression of Overall Sibship Size Effect With and Without Control Variables (standard errors in parentheses; p-values [2-tailed tests] in italics)

Independent variables	Without controls	With controls
Number of siblings	-0.182 (.043) *.000*	-0.082 (.036) *.023*
Male		1.838 (.118) *.000*
Urban		2.281 (.147) *.000*
Parental schooling		0.225 (.023) *.000*
Father's ISEI		0.025 (.004) *.000*
Fr's ISEI missing		-0.764 (.166) *.000*
Early years after liberation cohort		1.965 (.148) *.000*
Cultural revolution cohort		3.471 (.181) *.000*
Economic reform cohort		3.106 (.242) *.000*
Constant		1.896 (.195) *.000*
R^2	0.006	0.353
Weighted *N*	6,061	6,061
Unweighted *N*	6,059	6,059

Note: P35 in the text.

Table B. Testing Resource-dilution Hypothesis: Logistic Regression of Whether Respondent Had A Study Desk at Age 14 on Sibship Size and Control Variables, (standard errors in parentheses; p-values [2-tailed tests] in italics)

Independent variables	Availability of own study desk at age 14
Number of siblings	-0.110
	(.038)
	.004
Male	0.254
	(.126)
	.046
Urban	0.218
	(.135)
	.109
Parental schooling	0.111
	(.018)
	.000
Father's ISEI	0.018
	(.004)
	.000
Fr's ISEI missing	-0.430
	(.224)
	.056
Constant	-3.440
	(.208)
	.000
Weighted *N*	6,054
Unweighted *N*	6,056

Note: P36 in the text. Number of cases is smaller because of missing responses in the outcome variable.

Table C. OLS Regression of Years of Schooling on Discrete Sibship Size and Control Variables, Separately by Cohort (standard errors in parentheses; p-values [2-tailed tests] in italics)

Independent variables	Cohort 1 (Pre-Liberation)	Cohort 2 (Early years after liberation)	Cohort 3 (Cultural Revolution)	Cohort 4 (Economic Reform)
Number of siblings (ref. 0-2)				
3-4	-0.041	-0.440	0.127	-0.638
	(.234)	(.213)	(.279)	(.301)
	.861	*.041*	*.650*	*.036*
5-6	-0.207	-0.614	0.008	-0.205
	(.290)	(.249)	(.312)	(.337)
	.477	*.015*	*.980*	*.544*
7+	0.058	-1.072	-0.147	-0.368
	(.612)	(.389)	(.496)	(.640)
	.924	*.007*	*.768*	*.566*
Male	2.554	2.292	1.450	0.622
	(.233)	(.190)	(.171)	(.230)
	.000	*.000*	*.000*	*.008*
Urban	2.338	2.655	2.016	1.667
	(.361)	(.226)	(.199)	(.246)
	.000	*.000*	*.000*	*.000*
Parental schooling	0.386	0.219	0.175	0.236
	(.036)	(.031)	(.029)	(.049)
	.000	*.000*	*.000*	*.000*
Father's ISEI	0.038	0.028	0.021	0.029
	(.012)	(.008)	(.006)	(.008)
	.003	*.001*	*.000*	*.000*
Fr's ISEI missing	-0.748	-1.026	-0.668	-0.219
	(.298)	(.231)	(.420)	(.428)
	.013	*.000*	*.114*	*.610*
Constant	0.735	3.652	5.579	5.603
	(.320)	(.235)	(.305)	(.345)
	.023	*.000*	*.000*	*.000*

R^2	0.275	0.253	0.215	0.315
Weighted *N*	1,230	2,267	1,587	977
Unweighted *N*	1,260	2,240	1,766	793

Note: P37 in the text.