Title:

"Eldest Brother is like Father:"

The Influences of Sibling Structures in Educational Attainment in Taiwan

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Abstract

This study examines the structure of sibling groups on educational attainment in Taiwan during the early period of development. We contend that previous research failed to take into account the cultural meaning of birth order and hierarchical relations among siblings in Chinese families. We pay special attention to the sibling matrix made by both gender and birth order, which has implications for one's power and status relative to one's siblings, and therefore determines one's chance of receiving more or less than the equal share of the restricted family resources invested in education. Using the Panel Study of Family Dynamics in Taiwan, our analyses show that a male firstborn child's entitlement to educational investment is unlikely to be affected by succeeding siblings, whereas a female firstborn child can easily presume the maternal role that includes sacrificing individual needs for the family, and hence has her share of family resources disproportionately diluted by younger siblings. Our research contributes to prior literature on sibling configuration and educational outcomes by bringing in the cultural element and emphasizing the determinants for one's role and status among siblings.

INTRODUCTION

It has been a long tradition for sociologists to study the role of family in individual achievement (Blau and Duncan 1967; Boudon 1974; Buchmann and Hannum 2001; Cherlin and Furstenberg 1994; Coleman 1988; McLanahan 2000; McLanahan and Sandefur 1994; Steelman et al. 2002). While family transformations and their impact on children form one dominant direction for relevant research (e.g., Goldscheider and Waite 1991, McLanahan 1985; McLanahan and Sandefur 1994; Seltzer 1994; Smock 2000), the structure of the sibling group, as many sociologists acknowledge, is another important element in family structures that determine individual outcomes, particularly educational outcomes (see Steelman et al. [2002] for references).

With more sophisticated statistical techniques and more detailed datasets, the debate on the effects of sibling configuration has become more heated in recent years (Downey et al. 1999; Guo and Van Way 1999a, 1999b; Philips 1999; Steelman et al. 2002). Nevertheless, most of the empirical evidence was based on data from the United States, in spite of the awareness of different family dynamics in developing economies and across cultural settings (Buchmann and Hannum 2001; Steelman et al. 2002). Among a handful of research that focuses on sibship structures and educational attainment in developing countries, several challenge the negative effects of sibship size found in the majority of research in Western societies (Buchmann 2000; Buchmann and Hannum 2001), and many stress somewhat different effects of birth order and gender composition of siblings on educational performance, compared to experiences in advanced economies (Greenhalgh 1985; Parish and Willis 1993; Post 2000). While disagreement exists on family structures and education in developing countries, these prior attempts have demonstrated the importance of adding international research to the ongoing discourse.

This study examines the structure of sibling groups on educational attainment in Taiwan, among individuals who grew up in a time of rapid economic development, educational expansion, and demographic transformation. We argue that in a time when the variation of family size is large, family resources are restricted, and educational opportunities are not equal and widespread, parameters of sibling

structures, including sibship size, gender composition, and birth order, would have particular relevance to individual educational attainment. Moreover, we contend that previous research on similar settings failed to take into account the cultural meaning of birth order and hierarchical relations among siblings in Chinese families (Greenhalgh 1985; Parish and Willis 1993). We pay special attention to the interaction of gender and sibship structures on education, which also needs to be explained within the cultural context. Our research contributes to prior literature on sibling configuration and educational performance by bringing in the cultural element in the social context.

THEORETICAL BACKGROUND

Family Structures, Resources, and Educational Attainment

Regardless of the context, the resource dilution theory is the most prominent explanation of the effects of sibling structures on educational attainment in sociological research (Buchmann and Hannum 2001; Downey 1995, 2001, Parish and Willis 1993; Steelman and Powell 1989; Steelman et al. 2002). This perspective argues that families adjust their investment, be it financial support or parental attention, in each child based on the resources available and the number of children in the family. Hence, the addition of any child will dilute family resources and lowers educational investment allocated to the rest of children. Therefore, the larger the sibship size, the lower one's educational attainment (Blake 1989; Downey 1995; Parish and Willis 1993; Steelman and Powell 1989). Based on this logic, the negative effect of sibship size should be particularly strong in developing countries where fertility rates are high and family budgets are commonly constrained (Parish and Willis 1993; Pong 1997; Shreeniwas 1997).

Furthermore, since family resources are not invariant over time, later-born children are likely to take advantage of their parents' better financial status and to be provided with more material support than their elder siblings in the process of educational attainment. While prior research in the United States finds mixed effects of birth order, studies on developing countries have often demonstrated an inverse relationship between birth order and educational attainment, net of period effects (Buchmann and Hannum 2001; Parish and Willis 1993). This finding is consistent with the resource dilution model

because changes in resources over the family cycle make significant differences when the total resources are largely constrained and have to be distributed over a fairly long time span, which is often the case of families in developing countries.

In contrast, proponents of the confluence theory, standing from a social psychological approach, have a somewhat different view of what makes up family resources. According to this model, family structures determine the intellectual climate a child is exposed to, and therefore have impact on educational attainment (Zajonc 2001; Power and Steelman 1990; also Steelman et al. [2002] for a review). Hence, the theory states that firstborn children have the advantage in intellectual development with their parents' undivided attention before the younger siblings were born. Moreover, the more widely siblings are spaced in age, the better one's educational outcomes, in particular for firstborn children. The predictions of the confluence theory regarding birth order are generally unsupported by findings from developing countries (Buchmann and Hannum 2001; Parish and Willis 1993).

Gender, Parental Expectations, and Resource Allocation

Studies on educational attainment often find gender differences, and many agree that family plays a role in the process. Previous studies show that, depending on the context, parents may have different preferences and expectations for their sons' and daughters' education, which in turn results in their differential allocation of resources within the family (Brinton 1988, 1993; Buchmann and Hannum 2001; Greenhalgh 1985; Parish and Willis 1993; Powell and Steelman 1990). Nevertheless, researchers debate on how family makes decisions on investment in sons' and daughters' education. The patriarchy explanation argues that parents prefer sons over daughters as the return to the investment in the former is better (Lee, Parish, and Willis 1994; Lin et al. 2003), and are willing to sacrifice daughters' schooling to exchange for greater family income to be invested in sons' education (Greenhalgh 1985). Rational-choice-based explanations, in contrast, view the differential human capital investment as a result of parents' conscious assessment of their sons' and daughters' relative market opportunities and returns to education, especially when family budget is limited (Brinton 1988; Parish and Willis 1993). However, the

strategy can also be modified if parents perceive high utility of education in the marriage market, regardless of its utility in the labor market, for daughters (Brinton and Lee 2001). Thus, this set of explanations portrays parents' decisions to be out of altruism conditioned by both family budgets and their perceptions of utilities of education for sons versus daughters.

The other debate regarding gender and resource allocation within the family lies on the effects of having same- or opposite-sex siblings. The results from studies on the United States are mixed in terms of whether additional sister or brother is detrimental to one's educational outcomes (Powell and Steelman 1990; Steelman et al. 2002). While some studies find a "liability of having brothers" in educational attainment for both sexes, the others argue the opposite pattern (see Steelman et al. [2002] for a review). Yet, Hauser and Kuo find little effect of gender composition of siblings (1998). Moreover, there is no agreement on how and whether siblings of the same sex compete, or bargain collectively, for resources. For example, while Conley finds detrimental effects of opposite-sex siblings on educational attainment in the United States (2000), Parish and Willis demonstrate that same-sex siblings dilute family resources more than opposite-sex siblings in Taiwan (1993).

These two debates are to a large extent intertwined. The effects of gender composition of siblings in part depend on how and whether parents develop differential investment strategies for sons and daughters to receive "proper" education. Hence, the effects on gender composition of siblings could vary across contexts. However, parents' preferences between education for sons and daughters are not the only factor that contributes to the effects of having brothers versus sisters. Gender composition of siblings could affect family climates and the provision of gender-specific resources for children, given that the society has different expectations for boys and girls in academic performance (Conley 2000; Powell and Steelman 1989, 1990). As a result it impacts individual educational achievement.

Birth Order: Bringing in the Cultural Element

Regardless of whether previous research examines birth order effects from the resource dilution or confluence perspectives, birth order is conceptualized as the timing when a child is born into a family, and

the effects, if any, are relevant to the possession of tangible and intangible family assets determined by the timing in the family cycle. Beyond that, previous research at most takes into account power relations among siblings that are shaped by their ordinal positions (Sulloway 1996).

In societies where seniority-based hierarchy within family is emphasized, such as Confucianism-influenced societies in East Asia, the meaning of birth order goes beyond the temporal dimension; there is also a cultural dimension. In Chinese societies, not only are older siblings entitled power over younger ones in general, but also the ultimate authority within the family is passed onto the eldest son from his father; the eldest son is expected to be the most dominant and respected in the patrilineal family that will later include his married brothers and their families (Lin 1988). Thus, as the leader and primary representative of the whole, extended family, the eldest son's educational achievement is important for the whole family. The expression in Chinese that "eldest brother is like father" demonstrates the unique position of the firstborn son in the family.

In contrast, "eldest sister is like mother" to her siblings. While the firstborn son is automatically given the paternal authority, the firstborn daughter takes on the maternal role, whenever needed, to sacrifice and care for the family. It is important to note that in the context of Chinese culture, seniority-based hierarchy among siblings may confound the patriarchal hierarchy. For example, the authority granted to the eldest son would be weakened if he is also the lastborn child who has the lowest position in the seniority hierarchy among siblings. Thus, when the firstborn child happens to be male, the expectation for him to inherit paternal authority is at its most, while maternal images imposed on the eldest daughter are also the most pronounced when she is also the first child in the family.

While Parish and Willis find negative effects of birth order on educational attainment for both genders in Taiwan, controlling for sibship size (1993), we contend that their measuring birth order as a linear function is not the most adequate. A linear measurement would consider birth order solely as an indicator for resources available along family cycles. Given the cultural context, we argue that a proper theory on birth order effects in Chinese societies should treat firstborn sons and daughters separately, with the relevant cultural norms taken into account.

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THE CONTEXT

Taiwan experienced rapid economic development in the postwar era (Cuming 1987; Hamilton and Biggart 1988). The economic development was accompanied by drastic social change. The percentage of the work force in the agricultural sector declined from nearly 60 percent in the 1950s to under 10 percent in the 1990s (DGBAS, ROC various years). In the mean time, the female labor force participation rate increased over 20 percent, and the proportion of paid employees among female workers rose from 30 percent to over 70 percent (Yu 2001b). Furthermore, the age of first marriage increased and fertility rates declines rapidly during last several decades (Brinton, Lee, and Parish 1995).

Despite the speed of social change, most of the transformations occurred after the late 1960s. Family size was fairly large in the first two decades after the War; the total fertility rate decreased from 7.0 in 1951 to 5.8 in 1961, and then to under three for the first time in 1976 (Ministry of Internal Affairs various years). Controlling population growth, especially discouraging additional childbirth caused by the cultural norm of needing a son to "carry on the family name," was one of the government's major agenda until the 1980s. Accompanying social change, mandatory educational level was extended from primary to middle schools in 1968, and the use of child labor (under age 15) became illegal afterwards. Corresponding to the extension of female education and the rapid growth of the nonagricultural sector since the late 1960s, the transformation of women's employment opportunities took place. By the 1980s, the vast majority of women participated in the labor force as paid employees before marriage, thus educational credentials for women became increasingly valuable (Yu 1999, 2001a, 2001b).

Our study investigates family structures and educational attainment in the context of developing Taiwan, of the early stage of development in particular. As we will disclose in the data section, most of the families we examine were facing high opportunity cost of putting children in school, as the fertility rate was high, mandatory education was only to primary school, and the child-rearing period stretched extensively in the family cycle. Furthermore, in the context where these families evolved, the connection between women's education and employment opportunities was only weakly established. The low average of education for females at the time also made it less than necessary to educate daughters for the

marriage market (Tsai, Gates, and Chiu 1994). That said, the prevailing Confucianism culture did give education high values, and encourage children to pursue further schooling when family conditions permitted.

HYPOTHESES

We expect that the effects of family structures on educational attainment in the context of Taiwan are determined by family resources and cultural norms related to both gender and birth order. Following previous research on developing countries, we expect the confluence model to be invalid to explain the effects of family structures in Taiwan. We hypothesize:

Hypothesis 1: For male firstborn children, sibship size, density, and gender composition have no impact on their educational opportunities; their educational attainment is merely a function of their parents' education and socio-economic status. The status of firstborn males in Chinese families ensures that other children do not dilute their resources.

For children who are not entitled to the same status, we expect their educational opportunities to be explained by the resource dilution theory. However, because during the early stage of development, men's educational attainment on average was higher than women's, and men were expected to be the sole breadwinner for the family, parents generally consider male children to be in greater need for education than female children. The fact that male children would spend more years in schooling means a male child caused a larger decrease of family resources. As a result:

Hypothesis 2: Sibship size has a negative effect on educational attainment, and having younger brothers is more detrimental than younger sisters for children other than male firstborns.

As discussed, female firstborn children have different status in the family from that of their male counterparts. Nonetheless, their status is unique in its own way. Female firstborns are expected to play the role of mother to their siblings, whenever necessary. Moreover, net of the total number of children, the longer a family undergoes child rearing – that is, the more widely siblings are spaced in age – the more likely the mother will be unavailable for bringing in supplementary income or contributing to household

chores, and the more likely a female firstborn child takes up mother's responsibility. In addition, the farther the age gap between a female firstborn child and her younger siblings, the more likely the former is expected to play the mother's role, which often includes sacrificing individual interests for family goals. These cultural norms lead to our next two hypotheses:

Hypothesis 3: Having a working mother harms female firstborn children's educational attainment, because the shortage of household labor during the mother's absence, is the mostly like to be filled by female firstborn children. The effect lessens for other female children.

Hypothesis 4: Unlike what the confluence theory will predict, the age gap between the first and second children does not increase firstborn children's educational attainment in developing Taiwan. On the contrary, the average age spacing has a negative impact on female firstborn children's educational attainment.

While the cultural norm gives particularly high status to male firstborn children, a firstborn son that is not the oldest among siblings still occupies a significant position in the family. For male secondborn children, having an elder sister makes them the eldest son in the family, the next best status for any son in a Chinese family. In contrast, having an elder sister does not impact a female secondborn child's status in the sibling hierarchy, nor do resources allocated to her. However, for the female firstborn, a female succeeding sibling can be detrimental. This is because, we argue, the addition of another daughter immediately after a female firstborn child devalues the utility of the eldest daughter to the parents. Despite the preference for sons over daughters, parents in this culture would still appreciate to have at least one daughter, in addition to many sons. Having two daughters in a row, especially before any son is born into the family, creates a "surplus" of daughters, which makes it easier to sacrifice the eldest one, who is supposed to give up her own interests like a mother does. Therefore, we hypothesize:

Hypothesis 5: Having an elder sister is beneficial for the second child's schooling only if the second child is male; the eldest child's gender has no impact on the female secondborn children's educational attainment.

Hypothesis 6: The next sibling being female has a negative effect on female firstborn children's

educational attainment.

DATA, METHODS, AND VARIABLES

This study uses data from the Panel Study of Family Dynamics (PSFD) conducted in 1999 and 2000 by the Institute of Economic s at Academia Sinica in Taiwan. The PSFD data were collected at two time points, 1999 and 2000, on respondents aged 36-46 and 46-66, respectively. There are some different between the two questionnaires. The combined data includes a nationally representative sample of 2928 men and women from ages 36 to 65 as of 1999. The PSFD survey asked respondents to report age, education, occupation, and sex of up to five live siblings. Over ninety percent of the respondents reported to have more than two siblings. The average sibship size among the respondents in this survey is near six.

In order to examine the way in which the cultural meanings of birth order interact with the effects of sibling structures on educational attainment, we reconstruct the data to allow the family each respondent was born into to be the unit of analyses, and then apply separate models to firstborn children, secondborn children, and third-born children in our family-based sample. Furthermore, for children of each ordinal position, we examine the effects on educational attainment on male and female children separately. We expect to show that family structures function differently for children of different genders and ordinal positions. For the analyses on first- and secondborn children, we exclude families with only one child. We select families with at least three children for models on third-born children' s educational attainment.

This research design forces us to exclude many cases that provide incomplete information on the full sibling structure. As the survey asked respondents to provide information for up to five live siblings without identifying the birth order at least in one of the questionnaires,[1] we are unable to identify children in the family by birth order if the respondent had any deceased sibling, which is not uncommon for older people, or more than five siblings. We also have to exclude cases when the age of any of the

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[1] There are differences between the two questionnaires used in 1999 and 2000. The 1999 survey did not ask respondents to identify birth order when giving information of live siblings, which increased our difficulty to identify children in the family by ordinal positions.

reported siblings is missing. In addition, we exclude cases with inconsistent reports of siblings' birth orders and ages. Older respondents in the sample were more likely to be unable to recall the exact age of all siblings. As a result, our selection of cases is biased against older and larger families. We admit this limitation and potential bias of our selected sample, but argue that families are the mostly likely to differentiate educational investment in children after the onset of industrialization and fertility limitation, when parents start to trade quantity for quality of children (Buchmann and Hannum 2001; Parish and Willis 1993). Thus, our selection of younger and less large families in the early period of development allows us to capture the reality in families that are relatively conscious about strategic investment in children's education under budget constraints.

We use ordinary least squares regression models for the analyses. All the models are for predicting years of schooling. For independent variables, we include a set of independent variables for family background, including parents' years of education, father's employment status, and parents' socio-economic status estimated with the International Socio-Economic Index of Occupational Status (ISEI) proposed by Ganzeboom and Trieman (1996). Because our selected samples of early-born children were somewhat above middle age in the survey year, the nature of their fathers' work is far from the usual type in industrial societies. More than 40 percent of fathers of the families in our sample were farmers, and near 20 percent were self-employed. As father's employment status affects the stability of family finance and children's career expectations, we argue that it is important to control for it. We also include government employment in father's employment status as the Taiwanese government has been subsidizing children's education for its employees, and thus reduced the opportunity cost of children's schooling for the family.

We also include ethnicity as an independent variable, because it has been well documented that Mainlanders, immigrants to Taiwan after the Kuomintang regime lost the civil war in 1949 in China, had significant advantage in educational attainment over other ethnic groups, including Fukienese, Hakka, and Aborigines (Tsai 1996; Tsai, Gates, and Chiu 1994). In addition, we control for birth cohorts, as educational opportunities were not equally provided across periods. We categorize birth cohorts into three

groups: 1) before the end of the War, when Taiwan was still a Japanese colony, 2) from 1946 to 1955, when mandatory education was provide through primary school, and 3) from 1956 onward, the birth cohort which would be benefited from the extension of mandatory education to 9 years.

With respect to the effects of family structures, we include a dummy variable indicating that the father of the family had died before the firstborn child turned age 15, in order to examine whether father's absence affects children's, in particular firstborn children's, educational opportunities. We also include a dummy variable indicating mother being a homemaker for most of one's childhood, in order to test Hypothesis 3 regarding the eldest sister being a substitute for the mother's domestic labor in the family. For parameters of the sibling structure, we include sibship size, age difference between the first and second children, average age distance among siblings as an estimate for parents' fertility strategies, number of younger siblings, number of younger brothers and sisters, as well as gender of children before and after oneself in the family. The variables used in each model vary depending on the ordinal position of the examined group. A more detailed description of the variables and measurement is provided in Table 1. In addition, Table 2 provides descriptive statistics for different groups in our examinations.

[Tables 1 and 2 about here]

RESULTS

Table 3 presents coefficients from a series of OLS models determining educational attainment. Parents' education and father's socio-economic status have positive effects on children's educational attainment in most models, across children's genders and birth orders. When a mother is working in the labor market, her occupational status affects daughters' education positively, but has little effect on son's schooling. Our results are also consistent with previous research that Mainlander descendants had significant advantage over other ethnic groups in educational attainment. Moreover, children of fathers working in the public sector or as the self-employed obtained significantly more years of schooling than their counterparts whose fathers were employed dependently in the private sector. It is certainly unsurprising to find a large and positive effect of father's government employment on both boys' and

girls' education, because the subsidy from the government reduced the cost of children's education for these families. However, our results disagree with common wisdom that will predict those with self-employed fathers to leave school earlier than others for the purpose of helping out in the family business. To explain this, we have to keep in mind that Taiwan had just begun to industrialize in the period when the respondents' fathers worked, so those who were dependently employed were likely to hold poorly paid, low-skilled, manufacturing jobs. Hence, families with self-employed fathers were likely to be better off financially. Our findings also show that, as tiny-scaled self-employment (i.e., not hiring anyone in the establishment) generates relatively low and unstable profits, the effect on children's education is also smaller and less significant than government employment or larger-scaled self-employment. These results indicate that family budgets play an important role in children's educational attainment.

[Table 3 about here]

With respect to the effects of sibling structures, Models 1A to 1C support Hypothesis 1 that none of the parameters of sibling configuration has any significant impact on male firstborns' education. Parents in Chinese families make every effort possible to increase male firstborns' educational achievement, and the existence of other siblings has no impact on their share of resources. It is worth noting that male firstborns' educational opportunities would not be harmed even if they lost their fathers in a young age. Perhaps this is because extensive kinship networks in Chinese societies would play a buffering role when a family lost its primary provider, as seen in other developing societies (Buchmann and Hanumm 2001). Furthermore, like prior research on developing countries, our results do not render support to the confluence model, even though it will also predict firstborn children's inequitable advantage. Age difference between the first two children in the family, which is expected to be positively associated with the first child's educational success by the confluence theory, has no significant impact in Model 1A and a weak and negative effect in Model 2A.

As hypothesized, sibling structures matter more for female than male firstborns. Coefficients from Model 2B show that an additional sibling dilutes female firstborn children's educational investment and

therefore significantly shortens their years of schooling (-.155). It becomes particularly detrimental if the next sibling to come is also female (-.577). Furthermore, Model 2C shows that for female firstborns, the "liability" of having a younger sister is only significant when a younger sister comes to the family immediately after themselves. This finding supports our Hypothesis 6.

Results from Models 2B and 2C also support Hypotheses 3 and 4 regarding a female firstborn child as a substitute for the mother in the family. Estimated from coefficients in Model 2B, those with a homemaking mother would attend school for additional 0.52 year than their counterparts with an average working mother (i.e. the mother's ISEI score equal to 27.15, as in panel 2 of Table 2). The effect of having a homemaking mother is much smaller and weaker for female secondborn children. This is consistent with our argument that female firstborns are the most likely to fill the void of mother's domestic labor. Nonetheless, having a homemaking mother also has a large and positive effect on female thirdborn children's education, according to Model 6. Note that for the thirdborn children we include only families with more than three children. This further selection may leave us a sample of larger, and possibly more conservative, families in which all female children are disadvantaged when mothers participated in the labor force. Whether this selection criterion for Model 6 has contributed to any increase in the effect of having a homemaking mother needs further investigation.

Our findings also support Hypotheses 4 that average age spacing between siblings has a negative effect on female firstborns' schooling, but not female secondborns', as Models 2B, 2C, and 3 demonstrate. Sibling density also has no impact on education for male first- and second-born children. Although average age spacing among siblings has a negative effect in Models 5 and 6, among the thirdborn, it is important to note that the meaning of age spacing is different for the middle-born children. While for female firstborns larger age spacing among siblings means a greater need for her to take on the mother's responsibility, for the third child in the family, who is often the middle one in our sample (see Table 2), it is an indicator of age differences to both end of siblings. It is possible that a middle child in a large family is particularly deprived of attention when the family spaces childbirths so widely that he or she would be born when the parents were no longer young; yet, he or she is not much benefited from the family's

improving financial status, as a lastborn child in a family of wide age spacing of children would. This possibility applies to both male and female middle children. Given the difference in meanings of average age spacing for early- and middle-born children, we argue that the significant effects we find in Models 5 and 6 do not give evidence to overthrow our hypothesis.

Supporting Hypothesis 5, the coefficients of the eldest sibling's gender from Model 3 and 4 indicate that having an elder sister is beneficial to male secondborn children's schooling (.449), but not female secondborn children's. We have hypothesized that this is not simply a result of patriarchy. Elder sisters are not always helpful for male children's schooling. Model 5 shows that the effects are not significant on male thirdborn children's schooling if the first and second ones in the family are female. We have argued that being the eldest son has a significant meaning in Chinese families. Moreover, the higher the eldest son is in the seniority hierarchy of siblings, the more legitimate for a family to disproportionately distributes resources to this son. Having an elder sister makes a male secondborn child the eldest son in the family. The cultural norms regarding both gender and birth order cause the positive effect of having an elder sister on education among male secondborn children.

In order to directly compare the effects of sibship size and gender composition of younger siblings across genders and birth orders, we regress on the same set of independent variables for each sibling group in Models 7 and 8, and present the effects in Table 4. We also apply Model 9, which in design is the same as Model 1B and 2B, to second- and third-born males and females, to provide more detailed results for Hypothesis 6, regarding the effect of having a younger sister following oneself. The inclusion of the next sibling's gender causes Model 9 to eliminate secondborn children who did not have any younger siblings, as well as thirdborn children who were the lastborn in the family.

[Table 4 about here]

Results from Models 7 and 8 support our hypotheses. Sibship size has a negative effect on one's educational attainment unless one is firstborn and male. Moreover, our results disagree with the previous findings by Parish and Willis on Taiwan that same-sex siblings dilute resources from each other (1993). Rather, except for the male firstborns, the results show a constant pattern that having an additional

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younger brother is more detrimental to one's own education than an additional younger sister. This is consistent with our argument that raising a boy, given men's higher average of schooling in the society, was more costly than raising a girl. The last row in Table 4 shows that, as hypothesized, next sibling's gender has a bearing on educational attainment only for female firstborn children, because as a family needs only one girl, the addition of a younger sister changes the first girl's status from the desirable to an excess. The devaluation transforms into a decrease of resource investment for eldest sisters only because their ordinal position legitimizes their sacrifice for the family.

DISCUSSION AND CONCLUSION

This study, using the case of Taiwan, demonstrated that family structures play a critical role in individual educational attainment in developing economies. While parents' characteristics, such as education and occupational status, determine the total amount of resources available for children in the family, the sibling configuration in the family affects the distribution process of family resources. Our findings generally support the resource dilution hypothesis that siblings serve as competitors for parental resources, and it hurts individual educational attainment to have a large group of competitors. However, this study goes beyond the resource dilution model, and shows that the nature of sibling competition is complicated and dynamic. In addition to sibship size, sibship density, gender composition of siblings, and the sibship matrix composed by gender and birth order all have effects on the distribution of educational investment within the family.

Our results demonstrated the importance of taking into the cultural context when considering the effects of sibling structures. We have argued that one's relative status to siblings in the family depends on two different hierarchies in Chinese culture: the seniority hierarchy and gender hierarchy. A child's position in the sibling structures functions as ascribed status to enable certain advantages or disadvantages in the sibling competition. The male child who is in the top of the seniority hierarchy is given the paternal authority, while the female firstborn child presumes the maternal role. Cultural norms that are imposed to children based on their gender and ordinal position affect not only the way in which parents allocate

family resources among children, but also children's own expectations for their family roles and, in turn, educational achievement. As Coleman argues that social capital brought by adults in the family affects one's educational expectation and attainment (1988), a developing child modifies his or her expectation for educational achievement based on parents' and close kin's expectations that are particular for his or her gender and ordinal position in the sibship. Our analyses have shown that female firstborn children are more likely to suffer from mother's absence or the existence of very young siblings than female secondborn children. The reason for this may not just be that parents are particularly unlikely to allocate resources to one daughter rather than the other. We argue that unique role expectations for male and female firstborns in Chinese families legitimate their respective advantage and disadvantages in sibling competition for educational investment. While male firstborn children enjoy a superior position in the sibling competition — the existence of younger siblings has no effect on their schooling — female firstborn children's schooling can easily be harmed by newborn children in the family, because they are expected, and may very well expect themselves, to sacrifice for others in the family.

While our study emphasizes the importance of gender-specific cultural norms on family dynamics of resource distribution, we concur with Parish and Willis that it oversimplifies matters to explain Chinese family dynamics with patriarchal values only (1993). Our results show that, even in the early period of development in Taiwan, elder sisters do not benefit their brothers' educational attainment under all circumstances. This means that it is not always the strategy for families under budget constraints to push elder sisters to the labor market in exchange of younger brothers' schooling. We have shown that the effect of having an elder sister has to be understood in the context of Chinese families where the eldest son has superior status. An elder sister benefits some younger brother more than the other, depending on their ordinal positions.

Furthermore, we find that daughters are not always and equally undesirable. Female firstborns are likely to be invested more in education when the next sibling is male, rather than female. Patriarchy explanations will not predict any difference in parents' degree of reluctance in investing in daughters' education. Our finding suggests parents' decisions on educational investment in sons versus daughters are

dynamic. We argue that the extent to which a daughter will receive parents' investment in education depends on the sibling matrix of both the gender and birth order dimensions, as well as how far the actual case is from the parents' implicit "quotas" for boys and girls in the family.

The other evidence from our study to dispute a simple patriarchy-based explanation of family dynamics is that, except for the male firstborn, having younger siblings dilute resources from both male and female children. Nevertheless, our study also demonstrates a greater liability of having a younger brother than a younger sister, consistent with findings from previous research in the United States (Steelman and Powell 1989, 1990). Our explanation is that during the period our respondents grew, boys on average spent more years than girls in school and therefore cost more family resources. This finding also partially supports that in a developing context, material resources of a family play a more critical role than the intellectual climate within the family in educational attainment. Given than in the period of our study boys attended school for two more years on average than girls, being surrounded by better educated siblings, that is, brothers, would lead to higher educational achievement, if the intellectual climate counts. Although we are unable to distinguish in our analyses whether parents invest more in boys' education over girls because of conditional altruism or patriarchal values, our results demonstrate that gender composition of siblings makes some differences to individual educational attainment, especially if we also take birth order into account.

It is worth noting that in Parish and Willis's study on Taiwan, they find same-sex siblings to be stronger competitors than opposite-sex siblings for family resources, but our findings reveal different patterns. We argue that this is because the competition among siblings is rather complicated and the effect of gender needs to be considered with the relative birth order between competing siblings. For example, our findings show that siblings of either sex are hardly capable of competing with a male firstborn child. In contrast, despite greater harm of having a younger brother than a younger sister, same-sex siblings are very threatening to female firstborn children's educational opportunities if they come right after them. Our study calls attention to the complexity of family dynamics and sibling competition.

In summary, our study has demonstrated that the distribution of resources within the family is

rarely even, and the dynamics of the distribution have great impact on individual outcomes in Taiwan. Given the relatively large family size and limited family budgets, parents commonly have to strategize their allocation of material resources among children. We believe that these findings can be generalized to other developing contexts, especially those which have seen the beginning of a fertility decrease, a sign that families become more conscious about their investment in children's quality.

More crucially, our study provides an important insight to existing literature on sibling configuration: research in the relevant field needs to bring in the cultural context and take into account the meanings of birth order for different genders. Like the competition in the society at large, the competition at home is not always fair and unobstructed by ascription. On top of siblings' different timings to be born into a family, cultural and gender norms also influence siblings' starting positions in the competition. This research has demonstrated the need of treating birth order as ascribed status granted by the cultural context. Measuring birth order as a linear function captures only the temporal meaning of it, and helps at most determine the pattern of resource distribution over the family cycle.

To elaborate, gender and seniority, when the culture permits, both have implications for relative power and status. This should not be neglected in the relevant research on sibling structures and educational outcomes. Our study in the context of Chinese culture exemplifies this point by showing that the roles of male and female firstborns significantly affect their relative leverage in the sibling competition. Thus, we urge future research on sibling configuration and educational outcomes to not only taking into account the cultural meanings of gender and birth order, but also simultaneously examine the sibship matrix formulated by gender and birth order, rather than treating them as separate, independent factors, in order to understand power relations among siblings that affect their dynamics of competition.

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Table 1: Definitions and Measurement of Variables

Variables	Definitions and measurement
Dependent Variable:	
Years of schooling	Years of schooling completed, based on the highest educational level reported
Independent Variables:	
Birth cohorts	In three categories: prior 1946, 1946-1955, and from 1956 onward
Father's education	Reported years of schooling completed by father
Mother's education	Reported years of schooling completed by mother
Ethnicity	Based on father's ethnic identity, divided into four categories: Fukienese, Hakka, Mainlanders, and Aborigines
Father's absence	Dummy variable based on the reported year of father's death, if applicable; equal to 1 if father died before the firstborn child in the family turned age 15
Mother as homemaker	Dummy variable based on the report from respondents of the PSFD survey that the mother was a homemaker when the respondent was 16 years old
Father's employment status	Divided into 6 categories: nonfarm self-employment without hiring others, nonfarm self-employment hiring other workers, dependent, wage employment in the private sector, government employment, family enterprise employment, and farmers
Father's socio-economic status	Calculated from 3-digit codes of father's occupation when respondents of the PSFD survey were 16 years old, based on the 1988 ISEI scale
Mother's socio-economic status	Calculated from 3-digit codes of mother's occupation when respondents of the PSFD survey were 16 years old, based on the 1988 ISEI scale
Sibship size	Total number of siblings based on the report of the PSFD respondents, invariant for all children in the family
Number of younger siblings	Calculated based on the total number of siblings in the family and one's own ordinal position among siblings, variant depending on one's own birth order; this variable is further divided into number of younger brothers and number of younger sisters in some models to test the effects of gender composition of siblings
Age gap between first two children	Age difference between the first- and secondborn children in the family, measured in year; it is possible to have zero in value if the two children were born in the same year
Average age spacing	The mean of age differences between each pair of consecutive siblings in the family, measured in year; when not all siblings' ages are available, the variable is still estimated based on data of ages of live and reported siblings, as a proxy for parents' strategy for spacing childbirths
Gender of elder sibling(s)	Female equal to 1, dummy variable indicating the firstborn's gender for secondborn children; two dummy variables are included for third-born children indicating the first and second children's gender, respectively
Gender of next sibling	Female equal to 1, dummy variable indicating the gender of the sibling immediately following oneself

Table 2: Descriptive Statistics for Variables

	Firstborn				Secondborn				Thirdborn			
	Male (N=917)		Female (N=948)		Male (N=932)		Female (N=936)		Male (N=832)		Female (N=860)	
	mean (%)	S.D.	mean (%)	S.D.	mean (%)	S.D.	mean (%)	S.D.	mean (%)	S.D.	mean (%)	S.D.
Years of schooling	9.23	(4.73)	7.31	(4.94)	9.50	(4.63)	7.56	(4.82)	10.02	(4.45)	8.32	(4.58)
Birth cohort												
Prior 1946	44.7%		42.1%		34.4%		34.5%		22.1%		23.5%	
1946-1955	39.6%		38.8%		41.6%		39.3%		38.6%		40.1%	
1956+	14.8%		17.9%		23.7%		25.4%		37.6%		34.2%	
Parents' education												
Father's education (years)	4.65	(4.49)	4.62	(4.58)	4.78	(4.58)	4.43	(4.48)	4.82	(4.52)	4.62	(4.53)
Mother's education (years)	2.63	(3.70)	2.62	(3.71)	2.66	(3.71)	2.54	(3.68)	2.61	(3.71)	2.75	(3.72)
Ethnicity												
Aboriginals	1.7%		1.8%		1.6%		1.9%		1.1%		2.1%	
Taiwanese	76.7%		76.1%		77.1%		75.7%		75.8%		77.0%	
Hakka	11.2%		12.1%		11.4%		12.1%		11.3%		12.2%	
Mainlander	9.7%		9.6%		9.4%		9.6%		11.4%		8.0%	
Father died before eldest 15	4.3%		3.7%		4.6%		3.4%		3.1%		3.2%	
Mother was a homemaker	54.6%		50.7%		51.3%		53.7%		54.6%		53.8%	
Father's employment status												
Nonfarm solo self-employed	11.9%		10.4%		10.2%		12.0%		10.0%		12.4%	
Nonfarm employer	9.1%		8.9%		9.9%		7.8%		9.1%		9.1%	
Dependent employee	12.0%		11.6%		11.1%		12.8%		12.3%		11.7%	
Employee of government	16.2%		17.1%		18.5%		14.6%		20.2%		14.1%	
Family worker	0.5%		0.3%		0.5%		0.3%		0.6%		0.3%	
Missing employment status	7.9%		7.9%		8.8%		7.3%		5.8%		8.4%	
Farmer	42.4%		43.8%		41.1%		45.2%		42.1%		44.0%	
Parents' socio-economic status												
Father's ISEI score	32.90	(14.58)	33.46	(15.32)	33.65	(15.05)	32.54	(14.78)	33.49	(14.87)	33.01	(15.05)
Mother's ISEI score	27.05	(11.06)	27.15	(10.87)	27.03	(10.92)	26.97	(10.82)	27.03	(10.46)	27.37	(11.26)
Number of siblings	4.34	(1.97)	4.49	(1.98)	4.18	(1.97)	4.65	(1.95)	4.39	(1.87)	4.73	(1.82)
Brothers	2.15	(1.38)	2.27	(1.26)	2.09	(1.38)	2.32	(1.29)	2.18	(1.33)	2.38	(1.28)
Sisters	2.18	(1.50)	2.22	(1.62)	2.09	(1.47)	2.34	(1.58)	2.21	(1.48)	2.35	(1.55)
Average age spacing (years)	3.08	(1.67)	3.19	(1.86)	3.21	(1.79)	3.04	(1.73)	3.06	(1.60)	2.96	(1.30)

Note: The frequency distribution of each variable is based on maximum valid cases. Hence, the total number of cases may vary.

Source: PSFD Survey, Taiwan, 1999 and 2000 (RI & RII Samples)

Table 3: OLS Regression Coefficients of Educational Attainment, by Gender and Birth Order

	Firstborn						Secondborn		Thirdborn	
	Male			Female			Male	Female	Male	Female
	Model 1A	Model 1B	Model 1C	Model 2A	Model 2B	Model 2C	Model 3	Model 4	Model 5	Model 6
adj-R^2	.449	.451	.454	.562	.564	.565	.458	.542	.433	.505
N	898	917	917	932	948	948	932	936	832	860
(Constant)	5.433 (.71)**	5.502 (.74)**	5.731 (.73)**	3.311 (.63)**	3.727 (.66)**	3.902 (.66)**	4.867 (.65)**	2.779 (.65)**	6.135 (.74)**	4.610 (.70)**
birth cohort (prior 1946)										
1946-1955	1.623 (.28)**	1.599 (.28)**	1.090 (.25)**	3.004 (.26)**	2.935 (.26)**	2.938 (.26)**	1.689 (.28)**	2.200 (.27)**	1.439 (.32)**	1.847 (.30)**
1956+	2.357 (.42)**	2.327 (.42)**	1.934 (.32)**	3.635 (.35)**	3.543 (.35)**	3.522 (.35)**	2.151 (.36)**	3.582 (.33)**	2.481 (.35)**	2.868 (.34)**
Parent's education										
Father's education (years)	.316 (.04)**	.329 (.04)**	.325 (.04)**	.228 (.04)**	.232 (.04)**	.232 (.04)**	.311 (.04)**	.216 (.04)**	.215 (.04)**	.231 (.04)**
Mother's education (years)	.182 (.04)**	.170 (.04)**	.186 (.04)**	.203 (.04)**	.203 (.04)**	.200 (.04)**	.131 (.04)**	.251 (.04)**	.133 (.04)**	.212 (.04)**
Father's education missing	1.475 (.60)*	1.443 (.60)*	1.284 (.60)*	.840 (.55)	.719 (.54)	.751 (.54)	1.786 (.56)**	1.493 (.58)*	1.491 (.62)*	.760 (.57)
Mother's education missing	-.920 (.65)	-1.079 (.64)+	-1.023 (.64)	.621 (.66)	.715 (.65)	.673 (.65)	-1.389 (.65)*	.241 (.62)	-.899 (.69)	1.283 (.69)+
Ethinicity										
Aboriginals	-1.370 (.91)	-1.283 (.92)	-1.243 (.91)	.688 (.85)	.886 (.82)	.879 (.82)	-1.310 (.91)	-.247 (.80)	-2.387 (1.14)*	-1.658 (.78)*
Hakka	.738 (.38)+	.762 (.38)*	.782 (.38)*	.815 (.35)*	.837 (.34)*	.842 (.34)*	1.228 (.37)**	.529 (.34)	1.173 (.38)**	.687 (.35)*
Mainlander	1.110 (.46)*	1.175 (.45)**	1.188 (.45)**	1.396 (.41)**	1.329 (.40)**	1.336 (.40)**	1.119 (.42)**	.685 (.43)	.789 (.42)+	1.208 (.46)**
Family structure										
Father died before 15	.244 (.69)	.254 (.68)	.240 (.68)	-.076 (.66)	-.160 (.65)	-.162 (.64)	.862 (.63)	.224 (.68)	-.968 (.75)	-.029 (.72)
missing dummy	-.008 (.44)	-.193 (.43)	-.229 (.43)	-.693 (.36)+	-.594 (.36)+	-.596 (.36)+	-.315 (.38)	-.251 (.39)	-.491 (.45)	-.303 (.38)
Mother is a housewife	.165 (.48)	.104 (.48)	.075 (.47)	1.551 (.44)**	1.528 (.43)**	1.551 (.43)**	.699 (.45)	.847 (.45)+	.350 (.50)	1.468 (.46)**
Father's employment status (dependent employment)										
Nonfarm solo self-employed	1.012 (.47)*	1.035 (.47)*	1.083 (.47)*	.422 (.45)	.398 (.45)	.350 (.45)	1.046 (.48)*	.983 (.42)*	.860 (.49)+	.215 (.45)
Nonfarm employer	1.143 (.54)*	1.213 (.54)*	1.250 (.53)*	1.226 (.50)*	1.191 (.49)*	1.197 (.49)*	1.683 (.52)**	1.314 (.50)**	1.308 (.53)*	.922 (.51)+
Employee of government	1.958 (.49)**	1.990 (.49)**	1.938 (.48)**	.751 (.43)+	.741 (.43)+	.744 (.43)+	1.393 (.46)**	.946 (.44)*	1.571 (.44)**	.427 (.49)
Family worker	-2.022 (1.61)	-2.000 (1.61)	-1.851 (1.61)	.403 (1.94)	.480 (1.93)	.571 (1.93)	-1.504 (1.57)	.509 (1.94)	-.570 (1.54)	-.709 (1.94)
Missing employment status	-1.566 (1.87)	-1.463 (1.88)	-1.406 (1.88)	-.537 (1.14)	-.719 (1.08)	-.661 (1.08)	-1.756 (1.85)	-.785 (1.02)	-.167 (1.32)	-2.064 (1.33)
Farmer	-.043 (.36)	-.030 (.35)	-.061 (.35)	-.992 (.32)**	-.986 (.32)**	-.970 (.32)**	.388 (.33)	-.484 (.32)	-.299 (.37)	-.564 (.32)+
Parent's socio-economic status										
Father's socio-economic status	.017 (.01)	.016 (.01)	.014 (.01)	.016 (.01)+	.016 (.01)+	.017 (.01)+	.025 (.01)*	.040 (.01)**	.025 (.01)*	.017 (.01)+
Father's occupation missing	.317 (1.05)	.329 (1.05)	.297 (1.05)	-.699 (.91)	-.704 (.90)	-.622 (.90)	2.199 (.96)*	.669 (.94)	.106 (1.02)	.094 (.93)
Mother's socio-economic status	.001 (.02)	.002 (.02)	.004 (.02)	.036 (.01)**	.037 (.01)**	.037 (.01)**	.022 (.01)	.024 (.01)+	.030 (.02)+	.032 (.01)*
Mother occupation missing	-1.332 (1.84)	-1.407 (1.84)	-1.236 (1.84)	-.654 (1.57)	-.537 (1.57)	-.593 (1.56)	-.183 (1.50)	-.810 (1.98)	-1.244 (1.83)	6.322 (2.36)**
Number of siblings (numbers)	-.084 (.07)	-.082 (.07)		-.116 (.06)+	-.155 (.06)*					
Number of younger brothers			-.089 (.10)			-.284 (.09)**	-.248 (.10)*	-.297 (.09)**	-.230 (.11)*	-.377 (.10)**
Number of younger sisters			-.064 (.09)			-.070 (.08)	-.191 (.09)*	-.090 (.08)	-.170 (.10)+	-.337 (.09)**
Next sibling female	-.110 (.24)	-.088 (.23)	-.079 (.27)	-.596 (.22)**	-.577 (.22)**	-.763 (.24)**				
Eldest female							.449 (.23)*	-.121 (.22)	.130 (.24)	.438 (.22)+
Secondborn female									.226 (.24)	.342 (.23)
Age between first and second	.022 (.06)			-.090 (.05)+						
Average age spacing		-.002 (.08)	-.035 (.08)		-.159 (.06)*	-.163 (.06)*	-.067 (.07)	-.008 (.07)	-.163 (.08)*	-.271 (.09)**

Note: Figures in parentheses are standard deviations. **P<0.01, *P<0.05, +P<0.1.

Source: The PSFD Survey, Taiwan, 1999 & 2000.

Table 4: Sibling Effects on Educational Attainment by Gender and Birth Order

Sibling Effects on educational attainment	Firstborn		Secondborn		Thirdborn	
	Male	Female	Male	Female	Male	Female
Model 7:						
Effect of Sibship size	-.071	-.193**	-.213**	-.205**	-.183*	-.311***
Model 8:						
Effect of having:						
one additional younger brother	-.068	-.231*	-.243*	-.300**	-.233*	-.344**
one additional younger sister	-.060	-.171*	-.183*	-.099	-.134	-.271**
Model 9:						
Effect of next sibling being female	-.088	-.577**	-.041	.224	-.300	-.223

Notes: Other independent variables included in Model 7 and 8, while not presented here, are birth cohort, ethnicity, parent's education and SES, father's employment status, father's absence, homemaking mother, and average age spacing between siblings. Model 9 includes the same variables as Models 1B and 2B, but for the analyses on secondborn children families with fewer than three children were excluded. Similarly, families with fewer than four children were excluded when applying Model 9 to thirdborn children. ***P<0.001, **P<0.01, *P<0.05, †P<0.1. Source: The PSFD Survey, Taiwan, 1999 & 2000.