



Sibling Networks and Risky Portfolio Breadth in Urban China

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Abstract: Sibling networks may provide close-family support while also creating potential claims on household resources. Using 8893 urban households from the 2021 China Household Finance Survey, this paper relates the household head's number of siblings to risky financial participation and the number of risky or investment asset categories held. A compact conceptual framework organizes the interpretation by treating household portfolio breadth as a buffer-preservation choice under income, liquidity, and family-obligation constraints. The preferred specifications condition on household, head, socioeconomic, province, and birth-cohort characteristics. Sibling count is negatively associated with both risky financial participation and risky or investment asset-category breadth. The association remains visible across alternative cohort controls, high-sibling treatments, and model-family checks. It is more pronounced among households with higher assets, higher income, and higher education, where participation and category breadth are more feasible financial margins. Sensitivity analysis assesses omitted variable selection under stated assumptions. Supplementary transfer indicators document financial connections within families. The estimates should be read as observational conditional associations rather than causal effects.

Keywords: household finance; sibling networks; risky financial participation; portfolio breadth; China household finance survey; urban China

1. Introduction

A persistent fact in household finance is that many families stay outside risky financial markets. Access alone does not imply participation, and households that do participate often hold only a small set of broad asset categories. These margins matter because they determine how households take financial risk, preserve liquidity, and build wealth over the life cycle.

Campbell [1] frames household finance around the use of financial instruments, asset allocation, borrowing, refinancing, and risk management in environments with important frictions. Those frictions include long planning horizons, nontraded human capital, illiquid housing, borrowing constraints, tax complexity, and fixed costs of participation. Gomes [2] surveys life cycle portfolio choice and emphasizes variation in participation and asset allocation by age, human capital, housing, background risk, borrowing constraints, and household heterogeneity. This literature motivates treating risky financial participation and portfolio breadth as substantive household finance outcomes, not as simple byproducts of current wealth.

A related literature studies why households enter risky markets at different rates. Guiso et al. [3] document large differences in stockholding across Europe and emphasize wealth, education, and information costs. Hong et al. [4] connect sociability to equity-market entry, while Brown et al. [5] show that local investment environments are related to individual stockholding. Together, these studies suggest that portfolio choices are shaped partly by information flows and social surroundings. Legenzova and Leckè [6] further relate family financial discussion to investment literacy among adult investors on peer-to-peer lending platforms.

Chinese household-finance evidence reaches a similar conclusion. Using CHFS 2011, Liang and Guo [7] show that both social interaction and internet access are associated with stock ownership, with online access partly



substituting for interpersonal channels. Jiang et al. [8] relate broader networks to Chinese households' risky-asset decisions through information and insurance channels. Li et al. [9] extend this point to a wider risky-financial-market participation margin rather than direct stockholding alone.

Participation alone is too narrow for the question in this paper. Calvet et al. [10] show that portfolio data contain information beyond an entry indicator. Polkovnichenko [11] and Goetzmann and Kumar [12] further show that households and investors differ in the breadth and composition of risky holdings even after they enter financial markets. This motivates a category-count outcome that records the range of broad risky or investment assets held by the household.

Recent China based work also points in this direction. Li et al. [13] examine digital inclusive finance and residents' asset allocation, showing that digital finance is linked to risky asset allocation and household participation in financial markets. Liu et al. [14] study information diversity and portfolio diversification and relate information environments to participation in stock, fund, and insurance markets as well as diversification. Dong [15] uses CHFS 2017 and 2019 data to study household portfolio diversity and finds that digital finance is associated with more diversified portfolios, especially among households with urban registration, higher education, and higher income. Xie et al. [16] use asset portfolio diversity as one channel connecting financial capability to household economic resilience. This evidence supports the use of a survey based asset category count as a transparent measure of risky portfolio breadth, while leaving aside claims about optimal diversification, financial sophistication, investment quality, or welfare.

Sibling ties introduce a family-network margin into this broader portfolio question. One view predicts a positive association because siblings can transmit information, provide informal insurance, and reduce the perceived cost of taking financial risk. A competing view predicts a negative association because larger sibships may be tied to thinner family resources, stronger liquidity needs, and more caution toward assets that are risky or less liquid. The urban CHFS 2021 evidence shows a negative association, although this alone does not distinguish the underlying channels. Households with more siblings participate less in risky financial assets and hold fewer risky or investment asset categories. Section 2 motivates this pattern with a constrained allocation perspective, drawing on household portfolio constraints in Alzuabi et al. [17].

Sibling ties are close family relationships, not ordinary peer links. They can carry financial information, informal insurance, and emergency help. They can also bring obligations, claims on resources, and demand for liquid resources. For that reason, theory does not give a single expected sign for the relationship between sibling networks and risky portfolio breadth.

The positive view of family networks is rooted in classic work on informal risk sharing. Kotlikoff and Spivak [18] model the family as an incomplete annuities market and show how family ties can partly substitute for missing formal insurance. Townsend [19] studies risk and insurance in village India and provides a benchmark for understanding the smoothing of idiosyncratic shocks through informal arrangements. Fafchamps and Lund [20] show that risk sharing often works through relatives and friends through gifts and informal loans rather than through complete community wide insurance. This line of work suggests that close family networks can help households manage risk when formal markets are incomplete.

China-based work on sibling structure provides a closer benchmark. Zhou [21] links male sibling ties to household saving and financial-market behavior, emphasizing informal risk pooling and shared parental support costs. Wu and Zhao [22] use urban CHFS 2011 data to relate the household head's sibship size to equity-market outcomes, interpreting their instrumental-variable estimates through an intrafamily insurance channel. Niu et al. [23] exploit sibling-gender composition to study brother-based insurance among urban residents and find stronger equity-market exposure when background risk is high. This evidence shows why sibling ties may relax risk-bearing constraints and encourage market entry.

The same family structure can also be linked to resource dilution and obligations. Keister [24] shows that additional siblings are associated with lower adult wealth ownership, consistent with parental resources being shared among more children. Lersch [25] provides more recent evidence that larger sibship size is associated with lower adult wealth attainment even after accounting for family background. These findings imply that sibling count can carry information about family origin resources as well as about potential informal support. Cheng et al. [26] relate childhood adversity to adult portfolio decisions, reinforcing the distinction between current resources and earlier family circumstances.

Other China-focused evidence points to the cost side of family networks. Wu and Li [27] show that support for parents responds to parental income and medical expenses, implying that health shocks can become claims on adult children. Rosenzweig and Zhang [28] connect coresidence and housing arrangements to saving and intergenerational support in urban China. Imrohoroglu and Zhao [29] emphasize family transfers when public

old-age support is limited, while Zhu and Xie [30] describe the tradeoff between financial help and coresidence. Xu [31] shows that transfers across generations vary with income, timing, and risk. These studies make clear that family ties can insure households while also absorbing liquidity. Ye and Zhao [32] also relate traditional family values to household asset allocation in China. Family commitments need not reduce risky investment, however, as Gu and Arends-Kuenning [33] associate plans for children's higher education with greater risky asset holding.

Recent research on social networks and financial vulnerability makes the same ambiguity explicit. Chen et al. [34] discuss informal support and financial-literacy channels, and Zhang et al. [35] show that social ties can help in bad times but may also require costly relationship maintenance. Sibling networks therefore combine potential information benefits with possible liquidity obligations. Toney and Bogan [36] examine siblings' mental health difficulties and household portfolio allocations, while Toney and Hamilton [37] study economic insecurity among relatives and wealth disparities in the United States. These studies motivate attention to financial risks beyond the resident household.

The analysis below focuses on whether the cost side of sibling networks is visible in a broader asset-category outcome. The paper does not assume that siblings necessarily expand financial-market engagement. Instead, it tests whether larger family-of-origin networks are associated with a narrower set of risky or investment holdings. This shift matters because much of the China-based sibling literature centers on informal insurance and equity-market entry. In the 2021 urban CHFS sample, the observed pattern goes the other way: sibling count is negatively associated with both holding any risky or investment asset and holding a broader set of such assets. The framework in Section 2 formalizes this contrast by separating support from claims on liquidity.

The empirical analysis uses urban households from the 2021 China Household Finance Survey, with the household as the unit of observation. The main explanatory variable is the household head's number of siblings, referred to below as sibling count. The outcomes capture two aspects of risky portfolio breadth. The first records whether the household holds at least one main risky or investment financial asset category. The second counts how many such categories are held. The four categories are equity, bonds, funds, and financial wealth management products. The count is a survey based measure of breadth across risky or investment asset categories, not a measure of optimal diversification, investment quality, or welfare.

Section 2 develops a constrained allocation perspective through a simple conceptual framework. Risky portfolio breadth is represented as an observed asset category margin, and the household is described as preserving a financial buffer subject to income, balance sheet, and family obligation constraints. Sibling count enters only as a scalar measure of family of origin network size. It clarifies how support benefits and resource claims can imply different portfolio responses without imposing a negative relationship. It provides a static motivation for the empirical analysis.

The baseline regressions ask whether sibling networks are associated with broader or narrower engagement with risky or investment assets. The estimates point to a negative relationship. In the preferred urban specification, one additional sibling is associated with a 0.73 percentage point lower probability of risky financial participation and 0.014 fewer risky or investment asset categories, with $N = 8893$. These magnitudes correspond to about 4 percent and 5 percent of the respective outcome means. The association remains negative under alternative age and cohort controls, high sibling count treatments, household weights, and nonlinear model family checks. Both baseline estimates are statistically significant with province-clustered standard errors. The weighted estimates retain the negative sign and are significant at the 10 percent level.

The heterogeneity patterns help discipline the interpretation. The negative association is most visible among households with greater financial participation scope, especially those with higher assets, higher income, and higher education. In these groups, risky financial participation and category breadth are more likely to be feasible household choices. Supplementary analysis examines how sibling count relates to transfers within families and how the portfolio estimates change when transfer indicators enter the model.

The contribution is to move the sibling-network question beyond direct stockholding. Compared with earlier urban-China evidence on siblings and equity investment, the paper uses a later CHFS wave and studies a wider set of risky and investment asset categories. It also measures a family-of-origin network through sibling count rather than using current household size. The documented negative association is strongest among households with more scope to adjust their financial participation.

The remainder of the paper first introduces the conceptual framework, then describes the CHFS sample and empirical specification. It then reports the main estimates, robustness checks, heterogeneity evidence, and interpretation before concluding.

2. Materials and Methods

2.1. Conceptual Framework for Portfolio Breadth

The framework below uses constrained allocation logic only as an organizing device. In household finance, Alzuabi et al. [17] provide a closer portfolio choice analogue by linking borrowing constraints and background risk to allocation across asset risk categories. The setting here is different. The decision maker is a household, the observed outcome is asset category breadth, and the relevant constraint is tied to family network claims and liquidity concerns. The framework expresses this household allocation problem compactly before the paper turns to reduced form estimation. It provides a static motivation for the empirical analysis.

2.2. Asset Category Breadth

Let household h face the four broad risky or investment asset categories observed in the survey: Equity, bonds, funds, and financial wealth management products. Define

$$\mathbf{a}_h = (a_{h1}, a_{h2}, a_{h3}, a_{h4}), \quad (1)$$

where $a_{hk} = 1$ if household h holds asset category k , and $a_{hk} = 0$ otherwise. Thus $\mathbf{a}_h$ is a vector, whereas participation and category breadth are scalar outcomes. The observed category count is

$$D_h = \sum_{k=1}^4 a_{hk}. \quad (2)$$

Risky financial participation is

$$P_h = \mathbf{1}\{D_h > 0\}. \quad (3)$$

Thus P_h records entry into the risky or investment asset set, while D_h records asset category breadth. The count is discrete and survey based. It is not treated as optimal diversification, welfare, or investment quality. Its role is narrower: it records whether financial engagement extends beyond a single broad asset category. Because nonparticipants have a zero count, a lower mean can reflect lower participation rather than narrower holdings among participants.

2.3. Sibling Network Size, Support, and Claims

Let S_h denote the household head's sibling count. In the empirical analysis, S_h is a scalar proxy for the size of the household head's family of origin network. It does not observe network structure, tie strength, transfers, or information flows.

A sibling network can affect the household financial environment through two channels. Let $B_h(S_h)$ denote support, information, and informal insurance associated with sibling ties. Let $K_h(S_h)$ denote claims on resources, reciprocal obligations, and liquidity pressure associated with sibling ties. The net contribution can be written as

$$N_h(S_h) = B_h(S_h) - K_h(S_h). \quad (4)$$

The sign of the marginal net contribution depends on

$$N'_h(S_h) = B'_h(S_h) - K'_h(S_h). \quad (5)$$

If $B'_h(S_h) > K'_h(S_h)$, the net contribution increases with sibling count. If $K'_h(S_h) > B'_h(S_h)$, the net contribution decreases with sibling count. These derivatives are not estimated. The notation only separates the two economic forces that make the expected sign ambiguous.

2.4. Financial Buffers and Portfolio Breadth

Let X_h collect observed household states, including demographics, household structure, income, consumption, assets, debt, and local conditions. Let Ω_h denote a household financial buffer. A simple representation is

$$\Omega_h(d, S_h, X_h) = \ell_h(X_h) + y_h(X_h) - m_h(X_h) - o_h(S_h) - q_h(d, S_h, X_h). \quad (6)$$

Here $\ell_h(X_h)$ denotes liquidity and balance sheet buffers, $y_h(X_h)$ denotes income capacity, and $m_h(X_h)$ denotes ordinary expenditure needs. The term $o_h(S_h)$ represents expected family obligations associated with sibling

network size. The term $q_h(d, S_h, X_h)$ represents liquidity and exposure costs associated with holding d risky or investment asset categories. Support may ease the liquidity costs represented by q_h , while o_h and q_h summarize expected family claims.

The associated static feasibility set is

$$\mathcal{F}_h = \{(d, S_h, X_h) : \Omega_h(d, S_h, X_h) \geq 0\}. \quad (7)$$

The set is conceptual. CHFS does not directly observe all shocks, transfers, obligations, or expected family claims. The role of $\mathcal{F}_h$ is to discipline the interpretation of the empirical specification. It connects the household state variables used in the regressions to the idea that households may preserve balance sheet capacity when family network claims and risky asset exposure are salient.

2.5. Comparative Statics

Because D_h is discrete, the comparative statics are written for a latent portfolio breadth index z_h . Let z_h summarize the household's desired breadth of risky or investment asset engagement. For this local illustration, extend the support and claim terms to $\tilde{B}_h(z, S_h, X_h)$ and $\tilde{K}_h(z, S_h, X_h)$, allowing both to vary with financial engagement. Consider the reduced objective

$$J_h(z, S_h, X_h) = V_h(z, X_h) + \tilde{B}_h(z, S_h, X_h) - \tilde{K}_h(z, S_h, X_h) - \Lambda_h(z, S_h, X_h). \quad (8)$$

The function $V_h(z, X_h)$ is the benefit from broader risky or investment engagement. The function $\Lambda_h(z, S_h, X_h)$ is a residual cost of liquidity pressure and risky asset exposure not already represented by $\tilde{K}_h$. The extended support and claim terms now enter the marginal decision alongside these costs.

Assume an interior solution and twice continuously differentiable functions near that solution, with

$$J_{zz}(z_h^*, S_h, X_h) < 0. \quad (9)$$

This strict second order condition permits local comparative statics. No sign is imposed on the cross derivatives with sibling count. The first order condition is

$$V_z + \tilde{B}_z - \tilde{K}_z - \Lambda_z = 0. \quad (10)$$

Implicit differentiation gives

$$\frac{\partial z_h^*}{\partial S_h} = \frac{\Lambda_{zs} + \tilde{K}_{zs} - \tilde{B}_{zs}}{V_{zz} + \tilde{B}_{zz} - \tilde{K}_{zz} - \Lambda_{zz}}. \quad (11)$$

All derivatives in the last expression are evaluated at the interior solution. Desired engagement falls locally if the increase in marginal claims and costs exceeds the increase in marginal support benefits, and rises under the opposite ordering. Using a local continuous extension of sibling count, this comparison shows how support benefits and resource claims can lead to different portfolio responses.

Figure 1 summarizes the organizing framework linking sibling network size, support and claim components, household states, financial buffers, and observed portfolio breadth. The arrows illustrate possible contributions rather than estimated effects.

2.6. Data, Sample, and Key Variables

The empirical setting is the urban sample of the 2021 China Household Finance Survey. Urban households are the focus because risky and investment assets are more frequently observed in urban financial environments. The household is the observation unit throughout the analysis.

The main analytical sample requires valid information on sibling count, the two portfolio outcomes, baseline household and head characteristics, province, and birth cohort. This complete sample contains 8893 urban households. In the baseline specification, household heads reporting ten or more siblings are excluded so that the estimates use the central support of the sibling count distribution. Robustness checks later consider all valid sibling counts and top coded high values. The sibling threshold excludes 42 of 8935 otherwise eligible households, or 0.47 percent. The excluded heads are older and less educated on average and have lower median household income, as shown in Appendix Table A3.

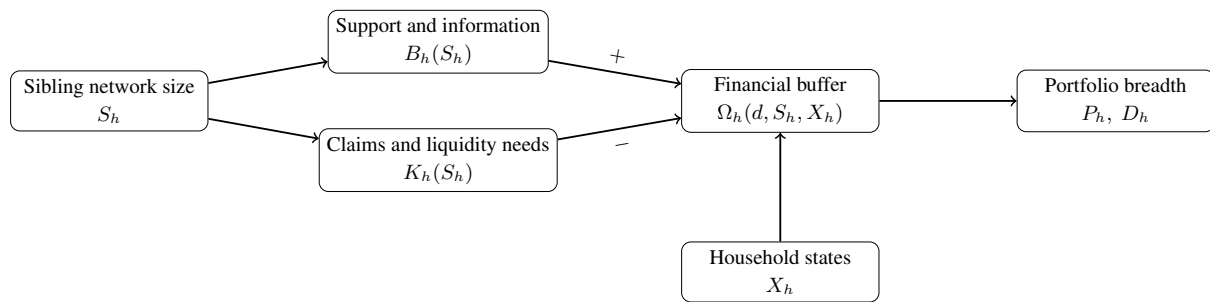


Figure 1. Sibling network size, household financial buffers, and observed portfolio breadth.

The key explanatory variable is S_h , the household head's number of siblings. The questionnaire asks for the numbers of living brothers and sisters, excluding the respondent. The analysis sums these two counts and requires the respondent to be the household head. A zero count identifies no living siblings and does not establish lifetime only-child status. It is used as a one-dimensional measure of the household head's family-of-origin network and is separate from the number of people currently living in the household. Their sample correlation is 0.0091. Economically, this margin may proxy for support, information, resource dilution, reciprocal obligations, and liquidity needs.

The two outcomes are P_h and D_h . The first, risky financial participation, equals one when the household holds at least one of the main risky or investment financial asset categories. The second is the number of risky or investment asset categories held. The four categories are equity, bonds, funds, and financial wealth management products, with equity combining public stock and nonpublic equity holdings. The category count records whether household engagement extends beyond a single asset type. Housing has a consumption role and a different liquidity profile and is outside this financial asset definition. Informal lending and peer-to-peer claims are also excluded. Risk varies within these categories, so breadth is not a measure of total portfolio risk.

This category count is intentionally simple. It is a survey based measure of breadth across broad risky or investment asset categories. It is not a measure of optimal diversification, investment quality, financial sophistication, or welfare. Its value in this paper is that it provides an observed category breadth margin that can be interpreted alongside household stability and family network size.

The preferred specification includes controls for household head age, age squared, gender, marital status, education, health status, household size, hukou status, and transformed measures of household income, consumption, assets, and debt. In the framework, these controls proxy for household states X_h . Province and birth cohort fixed effects are included in the preferred estimates.

Table 1 summarizes the low level of risky and investment market engagement in the sample. The mean of risky financial participation is 0.185, meaning that fewer than one in five households hold at least one of the four core categories. The mean category count is 0.286, showing that most households hold none of these assets and that portfolio breadth remains limited in the analytical sample.

2.7. Empirical Specification

The empirical specification relates household head sibling count to the two observed outcomes,

$$Y_{hpc} \in \{P_h, D_h\}, \quad (12)$$

where h indexes households, p indexes provinces, and c indexes birth cohorts. The baseline regression is

$$Y_{hpc} = \alpha + \beta S_h + X_{hpc}\gamma + \lambda_p + \theta_c + \epsilon_{hpc}. \quad (13)$$

The parameter β summarizes the conditional association with S_h . The control vector X_{hpc} contains head-level variables, household structure, hukou status, and transformed measures of income, consumption, assets, and debt. The province effects λ_p account for persistent local differences in financial-market access and regional conditions. The birth-cohort effects θ_c account for cohort-level differences in fertility, life-cycle position, and exposure to financial markets.

Table 1. Summary statistics.

Variable	N	Mean	SD	Min	Max
Risky financial participation	8893	0.185	0.388	0	1
Number of risky or investment asset categories	8893	0.286	0.673	0	4
Sibling count	8893	2.676	1.907	0	9
No living siblings	8893	0.126	0.332	0	1
Age	8893	56.955	14.554	18	98
Female	8893	0.458	0.498	0	1
Married or partnered	8893	0.777	0.416	0	1
Education	8893	3.949	1.751	1	9
Health status	8893	2.540	0.966	1	5
Household size	8893	2.743	1.386	1	16
Nonagricultural or unified resident hukou	8893	0.689	0.463	0	1
Household income (IHS)	8893	11.009	3.356	−16.112	16.807
Household consumption ($\ln(x + 1)$)	8893	11.036	0.831	7.204	14.899
Household assets ($\ln(x + 1)$)	8893	13.256	1.782	0.000	17.840
Household debt ($\ln(x + 1)$)	8893	2.914	5.067	0.000	16.138

Notes. Sibling count uses the household-head respondent record in CHFS. It counts living siblings. No living siblings does not identify lifetime only-child status. Head characteristics are reported for age, female, married or partnered status, education, health, and hukou. Education and health are ordinal scales. Education records the highest level attended, rather than years of schooling or the highest qualification completed. Household income is transformed by inverse hyperbolic sine. Consumption, assets, and debt use $\ln(x + 1)$, where x is the corresponding nonnegative household total. The female, married or partnered, and hukou variables are binary indicators, so means are shares.

For risky financial participation, the equation is estimated as a linear probability model, so β is reported in probability point units. For the asset category count, the equation is estimated by OLS, and β measures the conditional difference in the number of risky or investment asset categories held. Standard errors are clustered by province across 29 provinces. Linear-model confidence intervals and tests use 28 degrees of freedom, while nonlinear-model inference uses the normal approximation. Available community identifiers have not been verified as primary sampling units, so this does not reconstruct the complete survey design. Province fixed effects do not replace clustered inference.

The coefficient β should be read as a reduced form conditional association. It is not a structural estimate of $B'_h(S_h)$, $K'_h(S_h)$, $o_h(S_h)$, $q_h(d, S_h, X_h)$, or $\Lambda_h(z, S_h, X_h)$. A negative estimate may reflect claims and liquidity considerations or persistent differences in the family of origin. It does not imply random assignment of sibling count and does not identify a single economic mechanism.

To examine whether the sibling gradient depends on the linear specification, we also estimate the category count by Poisson pseudo-maximum likelihood with the same baseline controls [38]. Its exponential conditional mean provides a complementary specification for this nonnegative outcome, for which most households report zero holdings.

3. Results

3.1. Main Results

Table 2 presents the main estimates. Column 1 shows the unconditional relationship between sibling count and the two portfolio outcomes. Column 2 adds the baseline household and head controls. Column 3 further includes province and birth-cohort fixed effects and is the preferred specification. The same complete analytical sample is used throughout the table, with $N = 8893$.

The preferred column shows a negative coefficient for both outcomes. One additional sibling is associated with a 0.73 percentage point lower probability of risky financial participation. Relative to the participation mean of 0.185, this is about 4.0 percent of the mean. For the category-count outcome, the corresponding estimate is 0.014 fewer risky or investment asset categories, or about 5.0 percent of the 0.286 mean. The estimates are small in absolute size but meaningful relative to the limited participation observed in the urban sample. They are also modest relative to standard resource contrasts in the same regressions. An interquartile increase in transformed assets is associated with 8.18 percentage points higher participation and 0.141 more categories. Appendix Table A2 also reports income and education contrasts.

Table 2. Main regression results.

	(1)	(2)	(3)
Panel A. Risky financial participation			
Sibling count	−0.0238 *** (0.0039)	−0.0097 *** (0.0021)	−0.0073 *** (0.0018)
Observations	8893	8893	8893
R-squared	0.014	0.210	0.231
Panel B. Category count			
Sibling count	−0.0428 *** (0.0072)	−0.0178 *** (0.0038)	−0.0143 *** (0.0031)
Observations	8893	8893	8893
R-squared	0.015	0.205	0.226
Baseline controls	No	Yes	Yes
Province fixed effects	No	No	Yes
Birth cohort fixed effects	No	No	Yes

Notes. The table reports the coefficient on sibling count. The sibling measure comes from the household-head respondent record. Each column uses $N = 8893$. Panel A estimates a linear probability model for risky financial participation. Panel B estimates OLS for the category-count outcome, which counts risky or investment asset categories held. Parentheses contain standard errors clustered by province across 29 clusters. Linear-model inference uses a t distribution with 28 degrees of freedom. R-squared is shown for each specification. Column 3 is the preferred specification. *, ** and *** indicate $p < 0.10$, $p < 0.05$ and $p < 0.01$, respectively.

In the notation of the empirical framework,

$$\hat{\beta}_P = -0.0073, \quad \hat{\beta}_D = -0.0143. \quad (14)$$

Both estimates are negative. Conditional on the included household characteristics and fixed effects, households with larger sibling networks display lower risky financial participation and narrower risky portfolio breadth. The estimates do not show that an additional sibling mechanically changes investment behavior. They show that, among observationally comparable urban households, sibling count is negatively associated with the two observed portfolio breadth margins.

The sequence of columns is useful for interpretation. The bivariate association in Column 1 is larger in magnitude because it combines sibling count with differences in family background, demographics, resources, and local environments. Adding the baseline controls in Column 2 reduces the coefficients, which suggests that observed household and head characteristics account for part of the raw association. Column 3 further accounts for regional financial market conditions and cohort differences through province and birth cohort fixed effects. The coefficients remain negative after these adjustments.

One interpretation is that claim and liquidity considerations are more visible on this margin. Sibling networks may provide information and informal support, but they may also be associated with resource dilution, reciprocal obligations, and stronger liquidity needs. Table 2 does not separate these components. It documents the baseline reduced form pattern that higher sibling count is associated with lower risky financial participation and narrower risky portfolio breadth among CHFS 2021 urban households.

3.2. Robustness Checks

The preferred specification already includes household and head controls as well as province and birth-cohort fixed effects, but three concerns remain. First, sibling count varies strongly across fertility cohorts. Second, very large reported sibships may represent unusual family backgrounds or measurement noise. Third, the survey weights imply a population-weighted estimand that differs from the unweighted baseline. Table 3 examines these concerns by changing cohort controls, high-sibling handling, and weighting.

Table 3. Robustness checks.

Check	Participation	N	Category Count	N
Baseline specification	−0.0073 *** (0.0018)	8893	−0.0143 *** (0.0031)	8893
Five-year birth cohort FE	−0.0073 *** (0.0018)	8893	−0.0142 *** (0.0030)	8893
Age-group FE	−0.0069 *** (0.0018)	8893	−0.0137 *** (0.0030)	8893
All valid sibling counts	−0.0076 *** (0.0016)	8935	−0.0139 *** (0.0028)	8935
Sibling count top coded at 9	−0.0076 *** (0.0017)	8935	−0.0141 *** (0.0031)	8935
Sibling count at or below the 99th percentile	−0.0073 *** (0.0018)	8853	−0.0148 *** (0.0031)	8853
Household weighted baseline	−0.0073 * (0.0040)	8893	−0.0131 * (0.0073)	8893

Notes. Entries are sibling-count coefficients. The baseline includes the controls and province and birth-cohort fixed effects used in Column 3 of Table 2. In the top-coded check, observations with 10 or more siblings remain in the sample and are assigned 9. Participation is risky financial participation. Category count is the number of risky or investment categories held. Parentheses contain standard errors clustered by province across 29 clusters, with t inference using 28 degrees of freedom. The 99th-percentile threshold is eight in the all-valid sample, and all ties at eight are retained. The age-group check replaces the age polynomial and birth-cohort effects. The weighted row uses CHFS household weights as analytical weights and reports the unweighted N. It is not a full survey-design estimator. *, ** and *** indicate $p < 0.10$, $p < 0.05$ and $p < 0.01$, respectively.

Table 3 shows that the direction of the negative association is not sensitive to these alternatives. Changing the age and cohort adjustment leaves the estimates close to the baseline. Treating high sibling counts differently, by using all valid sibling counts, top coding the count at 9, or retaining counts at or below the observed 99th percentile of 8, also leaves the sign negative. The last rule does not exclude exactly one percent of households because sibling counts are discrete. The household weighted specification produces the same sign and a similar broad magnitude. The weighted estimates are significant at the 10 percent level, with $p = 0.080$ for participation and $p = 0.083$ for category count.

Taken together, Table 3 addresses three direct concerns about specification dependence. The negative direction is not tied to one cohort adjustment, one rule for extreme sibling counts, or one weighting choice. These checks support treating the negative reduced form association as a stable empirical pattern in the urban sample. They do not test dynamic stability and do not identify a structural mechanism.

The probit and Poisson estimates in Appendix Table A1 provide further evidence of a negative sibling gradient. The probit average marginal effect for participation remains negative. For category breadth, the Poisson average marginal effect is -0.007492 categories, with $p = 0.0446$. Estimating OLS on the same 8875 households gives a coefficient of -0.014143 , close to the preferred estimate. The negative association therefore extends to a nonlinear specification of the expected category count.

Appendix Table A4 replaces the continuous count with an indicator for no living siblings. The coefficients are positive but imprecise, with $p = 0.880$ for participation and $p = 0.726$ for category count. This binary comparison does not establish an advantage for the zero-sibling group or equivalence between the groups. It describes a different feature of the data from the continuous sibling gradient and cannot be interpreted as a comparison of lifetime only children with other heads.

3.3. Heterogeneity by Participation Capacity

The heterogeneity analysis asks which households display the negative association most clearly. This matters because portfolio breadth is not an equally relevant margin for all households. Low-asset, low-income, or low-education households may already be outside risky markets, leaving D_h near zero. For households with more resources or education, participation is more feasible and the category count is more likely to capture an active portfolio decision. Age also captures differences in investment horizons and potential family responsibilities.

Let Z_h denote a subgroup indicator, such as above median assets, above median income, or higher education. The pooled interaction specification behind the subgroup comparison can be written as

$$Y_{hpc} = \alpha + \beta S_h + \eta Z_h + \delta_H S_h Z_h + X_{hpc} \gamma + \lambda_p + \theta_c + \epsilon_{hpc}. \quad (15)$$

The interaction coefficient δ_H is used only to test whether the sibling gradient differs across subgroups. It is not interpreted as a structural parameter. The split sample estimates in Table 4 report the corresponding subgroup gradients, and Panel E reports the pooled interaction estimates with confidence intervals and p values. Assets, income, and education remain in the control vector to account for differences in resources and education within each group.

Table 4. Heterogeneity.

Subsample	Participation	N	Category Count	N
Panel A. Household head age median split				
At or below median head age	−0.0125 *** (0.0033)	4676	−0.0223 *** (0.0051)	4676
Above median head age	−0.0021 (0.0025)	4217	−0.0054 (0.0040)	4217
Panel B. Household assets median split				
At or below median household assets	−0.0003 (0.0020)	4447	−0.0027 (0.0028)	4447
Above median household assets	−0.0105 *** (0.0032)	4446	−0.0187 *** (0.0062)	4446
Panel C. Household income median split				
At or below median household income	−0.0021 (0.0017)	4447	−0.0043 (0.0028)	4447
Above median household income	−0.0109 *** (0.0028)	4446	−0.0207 *** (0.0045)	4446
Panel D. Household head education median split				
Lower education group, median split	−0.0006 (0.0017)	4528	−0.0016 (0.0025)	4528
Higher education group, median split	−0.0120 *** (0.0037)	4365	−0.0226 *** (0.0057)	4365
Panel E. Pooled interaction estimates				
Higher group minus lower group				
Head age	$\delta_H = 0.0126$ [0.0043, 0.0210] $p = 0.004$	8893	$\delta_H = 0.0203$ [0.0062, 0.0345] $p = 0.006$	8893
Household assets	$\delta_H = -0.0090$ [−0.0178, −0.0001] $p = 0.047$	8893	$\delta_H = -0.0170$ [−0.0323, −0.0017] $p = 0.031$	8893
Household income	$\delta_H = -0.0119$ [−0.0180, −0.0058] $p < 0.001$	8893	$\delta_H = -0.0253$ [−0.0365, −0.0142] $p < 0.001$	8893
Head education	$\delta_H = -0.0082$ [−0.0159, −0.0006] $p = 0.035$	8893	$\delta_H = -0.0160$ [−0.0276, −0.0045] $p = 0.008$	8893

Notes. Entries are sibling-count coefficients. Participation is estimated with an LPM, and category count is estimated with OLS. All models include the baseline controls plus province and birth-cohort fixed effects. Parentheses contain standard errors clustered by province across 29 clusters, with t inference using 28 degrees of freedom. Panel E reports interaction coefficients, 95% confidence intervals and p values. Pooled models include group main effects and common control slopes. For education, one redundant category indicator is omitted while retaining the full set of education effects. Median thresholds are 58 years, assets CNY 678,500, income CNY 63,607 and education category 3. *, ** and *** indicate $p < 0.10$, $p < 0.05$ and $p < 0.01$, respectively.

Table 4 shows that the negative association is more pronounced among households with heads at or below the

median age, above median assets, above median income, and higher education. The pooled interactions for age, assets, income, and education are significant at the 5 percent level for both outcomes. For assets, $p = 0.047$ for participation and $p = 0.031$ for category count. The thresholds and confidence intervals are reported in the table.

This pattern helps discipline the interpretation of portfolio breadth. Higher asset, higher income, and higher education households are more likely to have access to risky financial products and to face a real choice over portfolio breadth. Differences in participation capacity provide a common basis for interpreting the subgroup gradients.

Table 4 shows that the negative sibling gradient is generally more pronounced where P_h and D_h are more likely to be active household choices. Lower resource households may have little room to narrow portfolio breadth because many already hold no risky or investment asset category. Higher resource households have more room to decide whether to participate and how broad their risky or investment asset holdings should be.

3.4. Supplementary Analysis

Appendix Table A5 examines how strong selection on unobserved household characteristics would have to be to account for the negative sibling gradient, following Oster [39]. On the original sample of 8893 households, the adjusted coefficients under equal proportional selection remain negative at -0.003169 for participation and -0.007140 for category count. Under the benchmark reported in the table, reducing these coefficients to zero would require selection on unobserved characteristics to be 1.74 and 1.97 times as strong as selection on the additional observed controls, respectively.

The household allocation framework also directs attention to the financial exchanges that accompany sibling ties. Appendix Table A6 examines transfers to and receipts from siblings outside the household roster during the preceding year. Among heads with at least one living sibling, an additional sibling is associated with a 1.10 percentage point increase in the probability of making a transfer and a 0.57 percentage point increase in the probability of receiving one, conditional on the baseline controls. Siblings thus appear in these exchanges both as providers of assistance and as recipients of household resources. These financial connections beyond the resident household give observable content to the two roles of family ties considered in the framework.

The portfolio relationship remains when these reported exchanges enter the regression. On the common sample of 8749 households, including both transfer indicators changes the participation coefficient from -0.007012 to -0.007422 and the category-count coefficient from -0.013570 to -0.014411 . The slightly larger magnitudes indicate that the recorded annual transfers do not account for the negative sibling gradient. The evidence therefore connects larger sibling networks with both a greater likelihood of financial exchange and differences in portfolio breadth that remain after conditioning on these exchanges.

4. Discussion

The financial-buffer notation helps interpret the estimates. Sibling networks may offer assistance, but they may also expose households to expected family claims. Information and informal insurance can lower entry costs, while eldercare, housing help, medical shocks, and emergency transfers can increase the value of liquid balance-sheet capacity. These considerations connect family networks with household liquidity choices.

This reading fits the broader household finance literature. Financial participation is commonly related to wealth, education, risk preferences, information, and access to financial products. The evidence in this paper suggests that family network structure is also part of the household balance sheet environment. Sibling count may capture a family of origin network position that is associated with how households weigh liquid resources and balance sheet buffers.

An alternative explanation is persistent disadvantage in the family of origin. Parental resources, education, fertility preferences, and rural or urban origin can be related to both sibling count and adult financial choices. Current household registration does not reconstruct parental-generation residence or migration history. Cohort controls likewise do not remove differences in parental circumstances within a cohort. Greater current assets, income, or education do not rule out different earlier resource trajectories. The subgroup results therefore cannot separate a current claims channel from omitted family background, and the sensitivity calculation remains conditional on its selection assumptions.

The heterogeneity results refine this interpretation. The negative association is generally more pronounced among households with greater financial participation scope. These households are more likely to access risky financial products and to choose among several risky or investment categories. Their portfolio breadth is therefore more likely to reveal an active financial adjustment margin. For lower resource households, risky market participation is often already limited, so the category count has less room to move.

The findings suggest that financial guidance should consider family commitments alongside a household's own

income and assets. Maintaining accessible liquidity may matter when relatives share financial risks. Their practical relevance is to the circumstances considered when discussing suitable financial products and liquidity needs.

The results also show where the evidence could be sharpened. More detailed measures of sibling transfers, support obligations, information flows, and expected family claims would allow the support and claim components to be separated more directly. Panel data would also help trace how family network obligations and household portfolio breadth adjust over time. The present evidence is most informative about the cross sectional portfolio breadth pattern in urban CHFS 2021 households, where the negative sibling gradient is repeated across several specifications but modest relative to standard resource contrasts.

5. Conclusions

This paper studies sibling networks and risky portfolio breadth among urban households in China. It develops a simple static household allocation framework in which sibling count measures family of origin network size and risky portfolio breadth captures an observed asset category margin. The framework links a household finance question to a buffer preservation problem. Households decide whether to enter risky or investment financial markets and how many broad risky or investment categories to hold while facing income conditions, balance sheet capacity, family obligations, and liquidity needs.

Using CHFS 2021 urban household data, the analysis shows that sibling count is negatively associated with risky financial participation and with the number of risky or investment asset categories held. The preferred estimates are modest in absolute size but visible relative to the low participation rates in the sample. The negative direction persists across alternative age and cohort controls, alternative treatments of high sibling counts, household weights, and model family checks.

The heterogeneity results sharpen this reading. The negative association is generally more pronounced among higher-asset, higher-income, and higher-education households, where risky financial participation and category breadth are more feasible choices.

The paper contributes to household finance research by showing that sibling networks are related not only to stock market participation, but also to broader risky portfolio breadth. It also shows that the family network margin can appear differently across households with different levels of financial participation scope. For research on Chinese household finance, the results suggest that family circumstances warrant attention alongside individual resources when interpreting portfolio choices. Future research using panel data, richer measures of family transfers, or complementary research designs can examine how these support and claim components are formed and how they affect household financial decisions over time.

Author Contributions

Y.L.: conceptualization, methodology, formal analysis, data curation, writing—original draft preparation, writing—review and editing. L.S.: supervision, methodology, writing—review and editing. All authors have read and agreed to the published version of the manuscript.

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Institutional Review Board Statement

This study uses secondary, de-identified data from the 2021 China Household Finance Survey. The authors did not collect new human-subject data and did not have access to personally identifiable information. Therefore, separate ethics approval was not required for this study.

Informed Consent Statement

Not applicable. This study uses secondary, de-identified survey data and did not involve new human-subject data collection by the authors.

Data Availability Statement

The data used in this study are from the 2021 China Household Finance Survey. Access to the data is subject to the terms and procedures of the China Household Finance Survey. Replication materials can be made available by the corresponding author where permitted by data-use restrictions.

Conflicts of Interest

The authors declare no conflict of interest.

Use of AI and AI-Assisted Technologies

During the preparation of this work, the authors used OpenAI Codex and ChatGPT to improve the language and readability of the manuscript. After using these tools, the authors reviewed and edited the content as needed and take full responsibility for the content of the published article.

Appendix

Table A1. Model family robustness checks.

Outcome and Model	Reported Estimand	Estimate	Clustered SE	p-Value	N
Panel A. Risky financial participation					
LPM main model	Coefficient	−0.0073 ***	(0.0018)	<0.001	8893
Probit robustness	Average marginal effect	−0.0044 **	(0.0019)	0.024	8875
Panel B. Category count					
OLS main model	Coefficient	−0.0143 ***	(0.0031)	<0.001	8893
Ordered logit robustness †	Latent index coefficient	−0.0414 **	(0.0173)	0.017	8893
PPML robustness	Log-mean coefficient	−0.0262 **	(0.0130)	0.045	8875
PPML robustness	Average marginal effect	−0.0075 **	(0.0037)	0.045	8875
OLS on PPML sample	Coefficient	−0.0141 ***	(0.0031)	<0.001	8875

Notes. The LPM and OLS entries reproduce the main specifications as reference rows. Probit and ordered logit provide model-family checks using the baseline controls and the same fixed-effect structure. The probit entry is the average marginal effect of sibling count. The ordered-logit entry is the latent-index coefficient and is retained with a qualification. † Stata reports 18 completely determined observations and warns that the standard errors are questionable. Its standard error, p value and stars should therefore be interpreted cautiously. The probit sample reflects Stata's maximum-likelihood sample after perfectly predicted cells are removed. Parentheses contain standard errors clustered by province across 29 clusters. Linear models use t inference with 28 degrees of freedom, and nonlinear models use normal inference. PPML is estimated with `ppmlhdfc` using an exponential conditional mean; the outcome need not follow a Poisson distribution. Zero outcomes are included, without a separate model for structural zeros. PPML converges in seven iterations after removing 18 separated observations and no singletons. Its average marginal effect is the sample average derivative. The overall Wald test is unavailable because the full cluster covariance matrix is rank deficient. The same-sample OLS row uses the 8875 PPML observations. *, ** and *** indicate $p < 0.10$, $p < 0.05$ and $p < 0.01$, respectively.

Table A2. Relative economic magnitudes.

Comparison	Estimate	Standard Error	p
Panel A. Participation in percentage points			
One additional sibling	−0.734	0.176	<0.001
Income interquartile increase	−0.130	0.249	0.607
Assets interquartile increase	8.180	0.768	<0.001
University versus junior secondary	26.112	2.587	<0.001
Panel B. Asset category count			
One additional sibling	−0.0143	0.0031	<0.001
Income interquartile increase	0.0013	0.0041	0.751
Assets interquartile increase	0.1412	0.0148	<0.001
University versus junior secondary	0.4528	0.0517	<0.001

Standard errors are clustered by province across 29 clusters. Linear-model inference uses a t distribution with 28 degrees of freedom. All comparisons use the full main model and its 8893-household estimation sample. Income and assets increase from the 25th to the 75th percentile in their transformed scales, by 1.5679 and 1.9868 respectively. The education comparison is highest attended university bachelor level against junior secondary, with other controls held fixed. The contrasts describe relative conditional associations and are not causal effects.

Table A3. Households excluded by the sibling-count threshold.

Characteristic	$S < 10$	$S \geq 10$
Observations	8893	42
Mean age	56.95	62.50
Mean education category	3.95	3.36
Mean household income, CNY	103,292	90,551
Median household income, CNY	63,607	55,552
Mean household assets, CNY	1,696,929	1,674,048
Median household assets, CNY	678,500	720,723

Of 8935 households with valid sibling counts and complete outcomes and controls, 42 have ten or more siblings and are excluded from the main sample. Their share is 0.470%. Education is an ordinal category, not years of schooling. These comparisons are descriptive and do not identify parental rural or urban origin.

Table A4. No living siblings as an alternative measure.

Outcome	Coefficient	p	N
Participation	0.0015 [0.0101]	0.880	8893
Category count	0.0075 [0.0211]	0.726	8893

Standard errors are clustered by province across 29 clusters. Linear-model inference uses a t distribution with 28 degrees of freedom. The indicator for no living siblings replaces the continuous sibling count in the full specification. The reference group has at least one living sibling. The contrast does not identify lifetime only-child status. Brackets beneath coefficients contain standard errors.

Table A5. Sensitivity to selection on unobservables.

Quantity	Participation	Category Count
Panel A. Coefficient movement and explanatory power		
Restricted coefficient	−0.0153	−0.0278
Restricted R^2	0.0964	0.0955
Full coefficient	−0.0073	−0.0143
Full R^2	0.2309	0.2263
Panel B. Proportional-selection sensitivity		
$R_{\max}$	0.3002	0.2942
Adjusted coefficient at $\delta_O = 1$	−0.0032	−0.0071
δ_O required for a zero coefficient	1.740	1.969
Observations	8893	8893

The restricted model includes living sibling count, age, age squared, sex, province and birth cohort. The remaining controls enter the full model. R^2 is measured on the original outcome scale and $R_{\max} = \min\{1, 1.3R_{\text{full}}^2\}$. The always-included controls are excluded from proportional selection under the assumption that they are uncorrelated with the unobserved component. The reported adjusted coefficient follows the Oster root-selection rule. These are sensitivity calculations under maintained assumptions, not causal estimates or confidence bounds.

Table A6. Exploratory evidence from transfers between siblings.

Panel A. Sibling Count and Transfer Occurrence				
Direction	Coefficient	SE	p	N
To siblings	0.0110	0.0025	< 0.001	7702
From siblings	0.0057	0.0018	0.004	7694

Table A6. Cont.

Panel B. Portfolio Models on a Common Sample				
Regressor	Participation		Category count	
	Without transfers	With transfers	Without transfers	With transfers
Sibling count	−0.0070 [0.0019]	−0.0074 [0.0018]	−0.0136 [0.0033]	−0.0144 [0.0032]
	$p < 0.001$	$p < 0.001$	$p < 0.001$	$p < 0.001$
Transfer to siblings		0.0188 [0.0139]		0.0378 [0.0265]
		$p = 0.188$		$p = 0.165$
Transfer from siblings		0.0180 [0.0162]		0.0383 [0.0270]
		$p = 0.278$		$p = 0.167$
Observations	8749	8749	8749	8749

Standard errors are clustered by province across 29 clusters. Linear-model inference uses a t distribution with 28 degrees of freedom. Panel A is estimated among heads with at least one living sibling and an observed transfer indicator. Panel B uses 8749 households with both indicators observed. All regressions include the full controls. Transfer indicators refer to the preceding year and siblings outside the household roster. Outgoing transfers are subject to a CNY 100 threshold, unlike incoming transfers. Relationship and timing definitions differ from the sibling count. Brackets in Panel B contain standard errors. The estimates are exploratory associations and do not establish mediation.

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