



Social capital meets *guanxi*: Social networks and income inequality in China

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ABSTRACT

Social capital and the Chinese concept of *guanxi* (connections) can be used to explain changes in income inequality; however, their connotations differ. Previous studies identify social networks as an important factor influencing income inequality in China but ignore the distinction between social capital and *guanxi*. Using data from the Chinese General Social Survey, this study demonstrates that *guanxi* contributes to income inequality while social capital improves it. This conclusion still holds true after a series of robustness tests are conducted. Further results demonstrate that the effects of social capital and *guanxi* on income inequality are substitutable, and social capital can inhibit the role of *guanxi* in worsening income inequality. Thus, our results confirm that social capital contributes to improving income inequality, providing a new policy perspective for China to formulate income distribution policies.

1. Introduction

Economists and sociologists have long focused on the impact of social capital on income inequality. Previous studies have found that social capital can reduce poverty and improve income distribution (Knack & Keefer, 1997), whereas others have argued that the return on social capital is higher for people experiencing poverty, proposing that social capital is the capital of people experiencing poverty (Woolcock & Narayan, 2000). However, other studies have found that social capital fails to improve China's income inequality and exacerbates it (Cheng & Bian, 2014; Zhou, 2012). Subsequently, this study aims to explain the uniqueness of China's social networks and examine the actual contribution of social capital to Chinese income inequality. We believe that using the concept of social capital alone is insufficient to explain the relationship between social networks and income inequality in China because it overlooks an important issue unique to China, that is, the distinction between social capital and *guanxi*.

Social capital and *guanxi* are two commonly used concepts in the social sciences. *Guanxi* is a homegrown concept with Chinese characteristics, whereas social capital is a concept introduced by Western academics. Economists define social capital as "those persistent and shared beliefs and values that help a group overcome the free rider problem in the pursuit of socially valuable activities" (Guiso, Sapienza, & Zingales, 2006). Chinese sociologists define *guanxi* as a special particularistic emotional, social tie with the function of exchanging favors between actors (Bian, 2006). The definitions of social capital and *guanxi* both describe the role of social ties to some extent. Although the origins of the two concepts are different, social capital explores how social ties are connected, which shares some similarities with *guanxi* in Chinese society. Since the introduction of the concept of social capital in China, many scholars have used it to explain *guanxi*. Some studies have even considered social capital and *guanxi* as synonymous, using *guanxi* measurement

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methods to quantitatively analyze China's social capital. However, we believe that this approach is inappropriate. Although social capital and *guanxi* share similarities, their connotations and measurement methods differ entirely. Sociologists have questioned the merging of social capital and *guanxi* concepts, highlighting that this trend obscures many issues (Zhai, 2009). If this judgment holds, the respective impacts of social capital and *guanxi* on income inequality might also be obscured issues. For example, numerous studies on the effect of social capital on income inequality have equated social capital with *guanxi*. This is equivalent to the assumption that social capital and *guanxi* are synonymous; such assumptions have not been adequately explained in these studies. This type of research, which confuses social capital with *guanxi*, may have led to inaccurate conclusions.

Our paper attempts to solve the above problem. Specifically, based on distinguishing between social capital and *guanxi*, we examined the impact of social capital and *guanxi* on income inequality in China. We find that social capital helps improve China's income inequality, while *guanxi* worsens income inequality. Further examination demonstrates that the impact of social capital and *guanxi* on income inequality is substitutable; that is, social capital can restrain the role of *guanxi* in exacerbating income inequality in China. These conclusions address the misunderstandings surrounding social capital and offer academic support for China in formulating policies to improve income inequality.

The present study is closely related to the literature on the relationship between social capital and income inequality. There is considerable literature on how social capital affects residents' income, but limited quantitative studies focus on whether social capital affects income inequality. Grootaert (1999), one of the earliest researchers in this field, used the characteristics of rural social group membership to represent social capital and applied quantile regression methods to find that social capital reduced income inequality. Another study found that the distribution of social capital was more equitable than other capital, making it more advantageous for people experiencing poverty (Grootaert, Oh, & Swamy, 2002). Lin, Cook, and Burt (2001) indicate that the impact of social capital inequality on income mainly occurs through capital and return deficits. Cleaver (2005) examined the roles of these two channels and found that people experiencing poverty did not have an advantage in either capital or its returns; therefore, social capital would not improve income inequality. Cleaver's view is supported by several Chinese scholars, including Zhao and Lu (2010), Zhou (2012), Cheng and Bian (2014), Wu and Hu (2014), and Deng, Yang, and Sun (2020). However, these studies have mixed indicators that reflect *guanxi* when measuring social capital, overlooking the difference between social capital and *guanxi*.

Our study supports the literature on the effects of income inequality on social capital. Oto-Peralias and Romero-Avila (2017) conducted an empirical study based on blood donation data and found that income inequality has a strong negative impact on social capital. Fehr, Rau, Trautmann, and Xu (2020) conducted a similar study using a randomized controlled trial and reached the same conclusion. Cleaver (2005) found that income inequality exacerbates the accumulation of social capital among people experiencing poverty. He collected numerous cases from African countries, demonstrating that extreme poverty makes it difficult for people experiencing poverty to obtain sufficient social capital, which in turn widens the gap in social capital between the rich and poor, further exacerbating income inequality. While the evidence from these studies indicates that income inequality hampers social capital accumulation among people experiencing poverty, our findings on the pro-poor role of social capital provide a policy tool for addressing the issues raised by these studies.

Compared to previous studies, this study contributes to the literature in the following ways. First, it examines the impact of social capital and *guanxi* on income inequality separately rather than conflating the two concepts. Second, this study clarifies the misconceptions of previous studies that social capital in China may exacerbate income inequality, highlighting that the actual factor that worsens income inequality is *guanxi*, while social capital in China can still improve income inequality. Third, this study found that the functions of social capital and *guanxi* are substitutable, implying that the accumulation of social capital can suppress the negative effects of *guanxi* on income distribution. This study provides a new perspective for formulating income distribution policies in China.

The remainder of this paper is organized as follows. Section 2 introduces the distinction between social capital and *guanxi*. Section 3 discusses the theoretical predictions on the impact of Chinese social networks on income inequality. Section 4 presents the econometric model and data. Section 5 presents our estimation results. Section 6 concludes this paper.

2. Background

2.1. Social capital definition consistent with the concept of capital

Since Bourdieu (1986) introduced the concept of social capital, this concept has become popular in academia. Sociologists, economists, and political scientists have used this concept to study issues within their disciplines, resulting in different definitions of social capital. However, because social capital is named after the economic concept of capital, it should first be consistent with the concept of capital in economics. Solow (1995) criticized the concept of social capital, highlighting that if it is a form of capital, it should have characteristics such as measurability, accumulation, and depreciation and have a non-negative economic payoff. Moreover, it should be distinguishable from other types of capital (such as human capital).

Based on Solow (1995) standards, Guiso et al. (2006) define social capital as "those persistent and shared beliefs and values that help a group overcome the free rider problem in the pursuit of socially valuable activities." They further demonstrate how social capital is measurable, accumulable, depreciable, and has a non-negative payoff, and can be distinguished from human capital.

Beliefs and values originate in communities and can be transmitted to the next generation through formal education. Therefore, parents' education about their children's values can be considered an investment in social capital, whereas the loss or deterioration of values can be viewed as a depreciation of social capital. Beliefs and values can be measured based on survey data. This form of social capital is characterized by measurability, depreciation, and accumulation. As social capital is defined as overcoming the free rider problem in pursuing socially valuable activities, it ensures that it has a non-negative payoff. Moreover, because this form of social

capital generates shared values, trust, and norms only when community members share them, it is differentiated from human capital. Therefore, this study uses the definition of social capital proposed by Guiso et al. (2006).

2.2. Is *guanxi* a form of capital or social capital?

As mentioned previously, many studies regard *guanxi*, a unique concept in Chinese society, as synonymous with social capital. However, if measured using the criteria of social capital or capital, *guanxi* cannot be considered synonymous with social capital, nor can it be called capital.

The term *guanxi* is not unfamiliar to Chinese people, but its rich connotations are difficult to grasp. In this study, *guanxi* is defined as a special particularistic, emotional social tie with the function of exchanging favors between actors (Bian, 2006). Under this definition, blood and marriage ties are at the core of *guanxi*, while non-kinship ties can be upgraded to stable and intimate *guanxi* as the parties involved increase their favors and obligations. The latter requires considerable time and resources to establish, maintain, develop, and rebuild (Bian & Zhang, 2013). For example, important moments and occasions in Chinese culture, such as traditional and statutory holidays, weddings, birthday parties, and social dining, are considered important opportunities for constructing and maintaining *guanxi* (Bian, 2001).

Chinese sociologist Fei Xiaotong described *guanxi* in traditional Chinese society as “the differential mode of association,” which is a structure that distinguishes interpersonal relationships based on the degree of closeness and distance. In the differential mode of association, kinship relationships are at the core of *guanxi*, and in the periphery of kinship are non-kinship relationships such as classmates, neighbors, and fellow villagers. Kinship is more important than non-kinship, and the farther away a relationship is from kinship, the less important it is. That is, Chinese society is “formed from a stone thrown into a lake, each circle spreading out from the center becomes more distant and at the same time more insignificant” (Fei, 1992).

At first glance, *guanxi* and social capital are both relationships but are not synonymous. The game rules of social capital are universal to all. If someone wants to get resources through social capital, they must follow the rules and “get in line.” However, *guanxi* is “particularist” and cannot be universally applied to everyone, so there is no need for the game rules in social capital. For example, if someone in a *guanxi* network wants access to a resource, it depends on how close they are to the resource owner. That is to say, people with relatives and close non-relatives must be ranked before strangers, regardless of who comes first. We can use “cut in line” to express this resource allocation rule. If strangers also want to “cut in line,” they must improve their utilizable value and exchange resources with the resource owner to upgrade *guanxi* to access resources by “cutting in line.” In other words, the relationship based on social capital makes people accustomed to waiting in line, while the relationship based on *guanxi* makes people accustomed to cutting the line, which is the intuitive difference between social capital and relationship.

Thus, *guanxi* is not social capital; *guanxi* is not even capital. When examining the concept of *guanxi* in Chinese culture from the perspective of capital and social capital, it is difficult for *guanxi* to meet the requirements of the concept of capital. Although the construction of non-kinship ties requires time and resources, they possess the characteristics of accumulation and depreciation, and kinship relationships (especially blood relationships) are not (or do not need to be) accumulated and depreciated. Zhai (2009) highlights that individuals in Chinese society naturally live in networks that they cannot choose. In other words, when born into a particular family, they naturally possess a social network based on kinship relationships. Even when an individual has no intention of possessing this network, others are morally considered potential relationship resources, and whether they like it or not, they are also available for others to use. This means that the social network of Chinese people originating from their family is “impossible to join, impossible to quit, but can be escaped from” (Zhai, 2009). From this perspective, *guanxi* derived from kinship does not need to be accumulated, nor is it easy to depreciate. Rather, it naturally exists in individuals in Chinese society, which does not conform to the characteristics of accumulation and depreciation in the capital concept. As kinship relationships are at the core of the differential mode of association, this part of *guanxi* does not meet the requirements of the capital concept, making it difficult for the overall *guanxi* to be considered capital.

Furthermore, even non-kinship *guanxi* cannot be considered capital because it is difficult to measure. Sociologists acknowledge that the study of *guanxi* must discuss issues unique to Chinese interpersonal relations, such as *mianzi* (face-saving) and individual strategies, and that many problems cannot be addressed using quantitative research (Zhai, 2009).

In Table 1, we summarize the differences between social capital and *guanxi* in the treatment of measurability, accumulation, depreciation, non-negative payoff and how they differ from human capital. These demonstrate that social capital and *guanxi* are different in many ways.

In conclusion, it is important to recognize that *guanxi*, as a distinct concept in China, holds significant research value; however, it

Table 1
Differences between social capital and *guanxi* on characteristics of capital.

Characteristics of capital	Social capital	<i>Guanxi</i>
Measurability	Measured Based on Survey Data	Immeasurable
Accumulation	Education Investment	Non-accumulative(kinship) Accumulative(non-kinship)
Depreciation	Loss or Deterioration of Values	Non-depreciable(kinship) Depreciable(non-kinship)
Non-negative Payoff	Overcoming the Freer Rider Problem	Exchanging Favors
Distinguishable from Human Capital	Sharing among community members	<i>Guanxi</i> is not Capital

should not be equated with social capital or considered a form of capital. The failure to differentiate between the two in previous studies is an inappropriate oversight. This study examined the effects of *guanxi* and social capital on income inequality based on their differentiation.

3. Theoretical discussion

As mentioned above, social capital and relationships are not synonymous. Naturally, we would wonder if their impacts on income inequality could be different, which requires us to distinguish the directions of the effects of social capital and *guanxi* on income inequality. Logically, *guanxi* worsens income distribution, mainly because of the following reasons.

First, kinship determines the initial value of social resources an individual possesses. From the moment an individual is born, their family relationships and the social resources their relatives possess are already determined, which are exogenous factors unrelated to the individual's subjective efforts. As the social resources controlled by the previous generation are unevenly distributed, this inevitably leads to an unequal distribution of social resources among different individuals in the next generation. Thus, even if individuals from different social classes have the same number of relatives, income inequality will arise due to differences in the social resources controlled by their relatives. Of course, if this were the only factor, it would only demonstrate the intergenerational transmission of income inequality and not necessarily worsen income inequality.

Second, the amount of social resources derived from kinship relationships affects the quantity and returns on non-kin relationships. Sociologists have proposed various explanations of the role of *guanxi*. Some scholars believe that the fundamental characteristic of *guanxi* is instrumental resource exchange, which is the reason for the establishment and existence of *guanxi* (Walder, 1986). Others argue that *guanxi* is a long-term social exchange relationship in which instrumental resource exchange is only a means while maintaining, strengthening, and expanding emotional relationships is the goal (Lin, 2001). Regardless of this explanation, instrumental social resource exchanges cannot be avoided. In this case, the social resources an individual can obtain from birth from kinship relationships significantly affect the quantity and returns of their non-kin relationships. The wealthy class has more exchangeable resources, which allows them to establish more relationship networks with others in their social classes. As people in the wealthy class also possess more social resources, the returns from their relationship networks are relatively high. By contrast, people experiencing poverty have fewer exchangeable resources, making it difficult to establish sufficient relationship networks and limiting their interactions with people in the same impoverished class. In other words, *guanxi* may support nepotism and discriminate against those who do not have access to networks (Zhang & Li, 2003). Naturally, returns from the low-income class's *guanxi* networks are lower. Owing to the differences in exchangeable resources between social classes, the quantity and returns of non-kin relationships built by individuals in different classes also differ, increasing income inequality.

In short, *guanxi* exacerbates income inequality among different social classes. However, this is due to the effect of *guanxi* rather than that of social capital. Based on this analysis, the following hypothesis was derived:

Hypothesis 1. *Guanxi* exacerbates Chinese income inequality.

Next, let us discuss the role of social capital. Unlike *guanxi*, community organizations are not established through relationships based on kinship ties. Therefore, associations, cooperation, trust, reciprocity, and information channels established within these organizations can break the boundaries of family, social class, and resource ownership, providing opportunities for all social individuals who identify with certain beliefs and values to access social resources. Furthermore, if there is a high density of community organizations in a society, then culture, norms, and customs of mutual trust will be established throughout the society. This makes it easier for low-income individuals to access social resources from high-income classes through trust-dependent modes such as venture capital, providing opportunities for those with limited social resources to increase their income. That is, social capital can help overcome class barriers and provide more resources and opportunities for low-income classes. Based on this, the second hypothesis was derived:

Hypothesis 2. Social capital helps to improve Chinese income inequality.

If [Hypothesis 2](#) is supported by empirical analysis, it would imply that previous studies' arguments about social capital exacerbating income inequality may have confused *guanxi* with social capital, mistaking *guanxi* in [Hypothesis 1](#) for social capital in [Hypothesis 2](#).

Undeniably, *guanxi* and social capital coexist in today's society and serve as ways to connect social ties, which inevitably leads to mutual influence. Thus, is there a relationship between social capital and *guanxi*—one of substitution, complementarity, or irrelevance? Logically, irrelevance is impossible because any individual deciding on their mode of social connection must choose between them. Establishing the complementary relationship between the two is also difficult. Individuals will not necessarily enhance their trust in all members of society simply because they have sufficient *guanxi* resources. Likewise, people will not find it easier to obtain *guanxi* resources because they have participated in community organizations. A substitution relationship between social capital and *guanxi* is the most likely scenario. In other words, if someone obtains sufficient resources through *guanxi*, they may not be interested in a community that requires enthusiasm for public welfare.

Conversely, if an individual obtains sufficient resources and opportunities through social capital, their demand for *guanxi* is significantly reduced. The substitution effect of social capital on *guanxi* is particularly significant for low-income populations. Due to their lack of sufficient exchangeable resources, it is difficult to exchange resources through *guanxi*, whereas social capital can provide them with opportunities for upward mobility. Therefore, they must rely more on social capital (Collier, 2002). From this, the third hypothesis was derived.

Hypothesis 3. Social capital and *guanxi* have substitutional effects on income, with social capital mitigating *guanxi*'s role in exacerbating income inequality in China.

4. Models and data

4.1. Empirical strategy

To test these three hypotheses, we used the quantile regression method to estimate the impact of social capital and *guanxi* on Chinese income inequality. Quantile regression can depict the heterogeneous impact of explanatory variables on the dependent variable at different quantiles of conditional distribution; this method can be used to examine the factors affecting income inequality (Han, Liu, & Zhang, 2012). In this study, we used a semi-logarithmic model to establish a quantile econometric model as follows:

$$\ln Y_{ijt,q} = \beta_0 + \beta_{1,q} \text{pro}_{ijt,q} + \beta_{2,q} \text{member}_{ijt,q} + \theta_q X_{ijt,q} + \delta_{j,q} + \lambda_{t,q} + \varepsilon_{ijt,q} \quad (1)$$

where i represents individuals, j represents regions (provinces), t represents years, and q represents quantiles. We took $q = 0.1, 0.5,$ and 0.9 , representing the 10th, 50th, and 90th percentiles, respectively, to represent low-, middle-, and high-income groups. The dependent variable, $\ln Y_{ijt,q}$, represents the logarithm of individual annual income. The core explanatory variables, *pro* and *member*, represent *guanxi* and social capital, respectively. $X_{ijt,q}$ is a series of control variables, $\delta_{j,q}$ is the provincial fixed effect, $\lambda_{t,q}$ is the year fixed effect, and $\varepsilon_{ijt,q}$ is the random disturbance term.

The coefficients estimated in Eq. (1), $\beta_{1,q}$ and $\beta_{2,q}$, are of particular interest in this study. These two coefficients reflect the marginal contributions of social capital and *guanxi* to the income levels of individuals from different social classes. If the marginal contribution of a certain factor to the income of the low-income group is significantly larger than that of the middle- and high-income groups—that is, the regression coefficient of a certain factor at the 10th percentile is significantly larger than the regression coefficients at the 50th or 90th percentiles—then this factor improves income inequality; otherwise, it exacerbates income inequality. The dependent variable in Eq. (1) was the respondent's total income in the previous year, including labor income and property income. To ensure the comparability of income across different years, we used the consumer price index of each province with 2012 as the base year to deflate the income data and then took the logarithm of the deflated individual annual income plus one. It is important to note that the results obtained from the quantile regression were conditional distributions, which cannot measure the overall income inequality across the entire sample and can only measure the income inequality between different quantiles, given other conditions.

Social capital and *guanxi* were the primary explanatory variables in Eq. (1). Bian (2004) points out that network heterogeneity (e.g., the number of occupations in a crowd during Spring Festival visits) is the best single indicator for measuring *guanxi* in urban China. This indicator is suitable for measuring the *guanxi* defined in this paper. We have already pointed out in Section 2 that important moments and occasions in Chinese culture, such as traditional and statutory holidays, weddings, birthday parties, and social dining, are important opportunities for constructing and maintaining *guanxi* (Bian, 2001). The Spring Festival, mentioned by Bian (2004), is the most important festival in China. Visitors from different occupations during the Spring Festival demonstrate a more complex and maintained *guanxi*; that is, it demonstrates a greater number of *guanxi*. Following Bian (2004), we used the number of occupations in an individual's social network to measure *guanxi*. The specific question in the CGSS questionnaire was: *Do you know anyone engaged in the following professions?*

Zhou, Fan, and Shen (2014) believe that whether a member of an organization participates in organizational activities can be used to measure social capital. This indicator is suitable for measuring the social capital defined in this paper. We have already pointed out in Section 2 that social capital is the persistent and shared beliefs and values that arise from communities. Moreover, shared beliefs and values can only be generated from communities when community members share them. This means that the more often someone participates in community activities, the more social capital they have. Following Zhou et al. (2014), we used participation in community activities to measure social capital. The specific question in the CGSS questionnaire was: *In the past 12 months, how often did you participate in the following group activities?*

We controlled for factors that may influence personal income, including individual-level and family background-level control variables, as well as provincial and year-fixed effects. Individual-level control variables included sex, age, marital status, household registration (*hukou*), occupation, educational level, political affiliation, health status, and religious beliefs. In the score structure, 1 refers to males and 0 refers to females. The age is derived by calculation using birth date, and due to the reverse-U variation in income along with age, we have included the second-order term of age. The marriage status will be 1 if married; otherwise, it will be 0. Due to the fact that the household registration status can be changed through personal efforts, and to maximize the externality of variables, household registration is based on the household status at birth. The CGSS questionnaire contains the following question: *In what year was your non-agricultural hukou obtained?* If the answer is *since birth*, the urban *hukou* will be determined as 1; otherwise, 0 will be assigned. The occupation is categorized according to whether one is currently employed in a non-agricultural occupation, which would have a value of 1 if employed in such an occupation. Otherwise, it is assigned a value of 0. Educational attainment refers to the highest education level received by individuals, with specific assigned values from 1 to 13. The assignment will be 1 if the interviewee is a Chinese Communist Party member or 0 otherwise. A value between 1 and 5 is assigned for the state of health based on the answer to the question, *what is your current health status?* The assignment value is 1 if the individuals do not have any religious belief and 0 otherwise.

The family-level control variables included family status during childhood and family assets. The family status during childhood is based on a subjective rating of 1–10 points, with higher scores indicating a higher level of family status, based on the question *at which level did you think your family was at when you were 14 years old?* Household assets are measured by financial assets and real estate assets.

Among them, the question about financial assets is: *Is your family currently engaged in the following investment activities?* If the answer was yes, a value of 1 is assigned, or 0 otherwise. Property is measured by the number of properties owned by the individual's family.

We conducted tests for correlation and collinearity among variables, and the results demonstrated no severe collinearity issues among the explanatory variables.

4.2. Data source and descriptive statistics

We used data from the China General Social Survey (CGSS) conducted in 2012 and 2017 and constructed a mixed cross-sectional dataset. CGSS is a large database organized and implemented by the China Survey and Data Center at Renmin University of China. The database adopts a multi-stage stratified sampling design, with 125 counties, 500 subdistricts and towns, 1000 neighborhood committees and village committees, and 10,000 individuals selected nationwide. The final sampling unit includes a ratio of 5900 urban samples to 4100 rural samples. The 2012 CGSS contained 11,765 valid responses, while the 2017 CGSS contained 12,582 valid responses. The sample size was sufficient, and the data covered 29 provinces and cities in mainland China, excluding Tibet and Hainan. According to the research objectives, the raw data were processed as follows: 1) deleting samples with missing data and 2) performing 1% bilateral tail-trimming on continuous variables such as income, age, age squared, and the number of properties to reduce the impact of outliers on the regression results. Ultimately, 5172 and 3921 samples were obtained from the 2012 and 2017 CGSS, respectively, with a total sample size of 9093.

Table 2 reports the variables' summary statistics. In terms of *guanxi*, the average number of occupations known among acquaintances is four. In terms of social capital, 24.9% of the people in the sample participated in organizational activities as members. At the individual level, the sample consists of 50.1% males, with an average age of 57.9; 91.4% are married, 27.5% were born as non-agricultural household registrants, 40.4% are engaged in non-agricultural work, 87.8% have no religious beliefs, and 11.8% are members of the Chinese Communist Party. The average education level is 5, and the average self-rated health status is 3.5. At the family level, 8.6% of the respondents made financial investments, and each family owns an average of one house property.

5. Results and discussion

5.1. Quantile regression

We used quantile regression to examine the impact of social capital and *guanxi* on income in different quantiles; the results are illustrated in Table 3. Columns (1) to (3) illustrate the regression results for the 10th, 50th, and 90th percentiles, respectively. Columns (4) to (6) include family-level factors, such as family status, number of family properties, and family investment. The estimation results of control variables demonstrate that male, married, older, non-agricultural household registration, non-agricultural work, higher education level, Chinese Communist Party membership, higher health level, and number of family properties all bring higher income-enhancing effects to low- and middle-income groups, while family assets and family status during childhood bring higher income-enhancing effects to high-income groups. Religious belief has no significant impact on income for all groups. Nevertheless, the main role of control variables is to mitigate the bias of missing variables, and the size and direction of their coefficients only serve as a reference. We are more concerned about the impact of social capital and *guanxi* on different income groups.

Columns (1) to (3) demonstrate that the coefficients of *guanxi* are positive and significant at the 1% level for both the 50th and 90th percentiles, indicating that *guanxi* significantly increases the individual income of middle- and high-income earners. Contrastingly, the

Table 2
Descriptive statistics of variables.

Variable name	Variable meaning	Observations	Mean	Standard deviation	Minimum value	Maximum value
<i>logincome</i>	Logarithm of Per Capita Annual Income	9093	8.356	3.265	0	12
<i>pro</i>	Number of Occupations in Social Circle	9093	3.384	2.688	0	10
<i>member</i>	Participation in Organizational Activities	9093	0.249	0.432	0	1
<i>eat</i>	Frequency of Dining Out with Others	9093	2.371	1.215	1	5
<i>vote</i>	Participation in Voting	9093	0.476	0.499	0	1
<i>social</i>	Social Interaction Frequency	9093	2.717	1.066	1	5
<i>jhsy</i>	One-child Policy	9093	0.809	0.393	0	1
<i>gender</i>	Gender	9093	0.501	0.500	0	1
<i>age</i>	Age	9093	57.909	16.352	26	93
<i>age2</i>	Age Squared	9093	3620.766	1929.150	676	8649
<i>marriage</i>	Marital Status	9093	0.914	0.281	0	1
<i>hj</i>	Non-agricultural Household Registration	9093	0.275	0.446	0	1
<i>work</i>	Non-agricultural Work	9093	0.404	0.491	0	1
<i>edu</i>	Education Level	9093	5.001	3.105	1	14
<i>party</i>	Chinese Communist Party Membership	9093	0.118	0.323	0	1
<i>health</i>	Self-rated Health Status	9093	3.494	1.095	1	5
<i>religion</i>	No Religious Belief	9093	0.878	0.327	0	1
<i>fylevel</i>	Family Status	9093	3.098	1.850	1	10
<i>house</i>	Number of Family Properties	9093	1.100	0.539	0	3
<i>jrasst</i>	Family Investment	9093	0.086	0.280	0	1

Table 3
Quantile regression results.

Variables	(1)	(2)	(3)	(4)	(5)	(6)
	Q10	Q50	Q90	Q10	Q50	Q90
<i>pro</i>	0.015 (0.010)	0.041*** (0.005)	0.053*** (0.006)	0.015 (0.010)	0.037*** (0.006)	0.040*** (0.006)
<i>member</i>	0.151** (0.069)	0.108*** (0.033)	0.053* (0.032)	0.161** (0.072)	0.088*** (0.032)	0.054* (0.030)
<i>gender</i>	0.725*** (0.123)	0.405*** (0.028)	0.317*** (0.026)	0.718*** (0.129)	0.408*** (0.028)	0.330*** (0.025)
<i>age</i>	0.033*** (0.011)	0.018*** (0.007)	-0.026*** (0.006)	0.033*** (0.013)	0.015** (0.007)	-0.030*** (0.007)
<i>age2</i>	-0.0002* (0.00008)	-0.0001** (0.00005)	0.0002*** (0.00005)	-0.0001 (0.00008)	-0.0001* (0.00005)	0.0002*** (0.00005)
<i>marriage</i>	1.161*** (0.238)	0.516*** (0.070)	0.474*** (0.055)	1.113*** (0.190)	0.526*** (0.070)	0.420*** (0.055)
<i>hj</i>	0.171** (0.072)	0.262*** (0.032)	0.117*** (0.026)	0.204*** (0.072)	0.272*** (0.028)	0.094*** (0.025)
<i>work</i>	7.908*** (0.156)	0.740*** (0.031)	0.498*** (0.031)	7.910*** (0.175)	0.732*** (0.032)	0.483*** (0.033)
<i>edu</i>	0.098*** (0.017)	0.085*** (0.005)	0.074*** (0.005)	0.100*** (0.017)	0.084*** (0.005)	0.066*** (0.005)
<i>party</i>	0.383*** (0.095)	0.223*** (0.034)	0.159*** (0.038)	0.369*** (0.090)	0.191*** (0.041)	0.162*** (0.039)
<i>health</i>	0.080*** (0.025)	0.155*** (0.013)	0.071*** (0.013)	0.082*** (0.026)	0.154*** (0.014)	0.071*** (0.013)
<i>religion</i>	-0.015 (0.077)	0.072 (0.049)	-0.019 (0.044)	-0.020 (0.068)	0.081* (0.049)	-0.038 (0.039)
<i>fylevel</i>				-0.009 (0.013)	0.017** (0.007)	0.027*** (0.006)
<i>house</i>				0.120** (0.049)	0.131*** (0.027)	0.112*** (0.019)
<i>jrasset</i>				-0.175 (0.149)	0.066 (0.053)	0.152*** (0.045)
Constant	-1.850*** (0.456)	7.402*** (0.200)	9.989*** (0.202)	-1.929*** (0.464)	7.275*** (0.218)	9.944*** (0.213)
Province Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9093	9093	9093	9093	9093	9093

Note: The numbers in parentheses are bootstrap standard errors, and ***, **, and * represent significance levels of 1%, 5%, and 10%, respectively. Q10, Q50, and Q90 represent regression results at the 10th, 50th, and 90th percentiles, respectively. “Yes” indicates that the fixed effect has been controlled, and the same applies to the following tables.

coefficients of *guanxi* are insignificant at the 10th percentile. Therefore, *guanxi* exacerbates income inequality between low-, middle-, and high-income earners. Columns (4) to (6) demonstrate that the coefficients of *guanxi* remain significantly positive at the 1% level at the 50th and 90th percentiles while remaining insignificant at the 10th percentile. These results again indicate that *guanxi* widens the income gap between low-income earners and middle- and high-income earners, thus confirming Hypotheses 1.

Conversely, Columns (1) to (3) demonstrate that the coefficients of social capital were significantly positive at all three quantiles, with the coefficients at the 10th and 50th percentiles being larger than those at the 90th percentile and the largest coefficient being at the 10th percentile. This indicates that social capital has a higher income-enhancing effect for middle- and low-income groups, thereby improving income inequality between middle- and low-income earners and high-income earners. Columns (4) to (6) demonstrate that

Table 4
Quantile difference test results.

Variables	(1)		(2)		(3)	
	Q90-Q10		Q90-Q50		Q50-Q10	
	Coefficient difference	F-value	Coefficient difference	F-value	Coefficient difference	F-value
<i>Pro</i>	0.025**	5.08	0.003	0.22	0.022**	4.78
<i>member</i>	-0.107*	2.98	-0.034	0.98	-0.073	1.52
Control variables included	Yes		Yes		Yes	
Province Fixed Effects	Yes		Yes		Yes	
Year Fixed Effects	Yes		Yes		Yes	
Observations	9093		9093		9093	

Note: Q90-Q10, Q90-Q50, and Q50-Q10 represent the differences between the 90th and 10th percentiles, the 90th and 50th percentiles, and the 50th and 10th percentiles, respectively.

the coefficients of social capital remain significantly positive in all three quantiles, and the impact of social capital on the middle- and low-income groups is significantly greater than that on the high-income group. These results again indicate that social capital helps narrow the income gap between middle- and low-income earners and high-income earners, thus confirming Hypotheses 2.

The regression results in Table 3 infer that *guanxi* worsens income inequality, whereas social capital contributes to improving it. However, this regression cannot determine whether the marginal contributions of *guanxi* and social capital to income inequality are significant. To solve this problem, we used the bootstrap method proposed by Koenker and Hallock (2001) to test the coefficient differences at different quantiles. The results are summarized in Table 4, in which the coefficient difference represents the marginal contributions of *guanxi* and social capital to income inequality among different groups. A significant difference in the coefficient indicates that the variable significantly impacts the change in income inequality between these groups. If the coefficient difference is significantly positive, it indicates that the variable significantly widens the income gap between groups; conversely, it indicates that the variable significantly narrows the income gap between groups. Comparing the significance of the coefficient differences in Table 4, we can see that *guanxi* significantly widens the income gap between the high- and low-income groups and between the middle- and low-income groups, while social capital significantly narrows the income gap between the high- and low-income groups. These results align with the predictions made earlier and demonstrate the robustness of the conclusions in Table 3.

5.2. Discussion on endogeneity

The regression analysis described above may have endogeneity issues. For example, building and maintaining social networks incur high costs. Therefore, income level affects the number of occupations in one's social circle, which in turn affects income level. In addition, other variables may influence both participation in social organizations and income. This can result in reverse causality and self-selection problems. Furthermore, the data sources and empirical strategies used in this study also make it difficult to avoid omitted variables and sample selection bias issues, which may have caused some bias in the previous results.

We introduced instrumental variables for *guanxi* and social capital to mitigate endogeneity issues. For *guanxi*, Bentolila, Michelacci, and Suarez (2010) used the number of siblings as an instrumental variable for social relations among the French because siblings are a random natural phenomenon. As the number of children raised in a family is random in France, the more siblings one has, the more social relationships one has. However, this instrumental variable cannot be directly applied to China because the number of children raised in Chinese families is subject to the constraints of the one-child policy and is not random. Moreover, the number of children raised in Chinese families is influenced by family income, making it an unideal instrumental variable. In this study, we examined whether a person born after October 1980 was an instrumental variable for *guanxi*. Previous studies found that October 1980, as a breakpoint for the implementation of the one-child policy, led to a significant increase in the rate of only children (Qin, Zhuang, & Yang, 2018). This implies that individuals born after this breakpoint have fewer siblings than those born before and that siblings can bring more social relations. As the one-child policy can be considered an exogenous shock, this instrumental variable ensures exogeneity while retaining the correlation between siblings and social relations found in Bentolila et al. (2010).

For social capital, we used extraversion from the Big Five personality model as an instrumental variable and measured it through the frequency of social interactions. Previous studies have suggested that stable demographic variables, such as the Big Five personality traits, can serve as effective instrumental variables (Antonakis, Bendahan, Jacquart, & Lalive, 2010). In the Big Five personality model, extraversion reflects an individual's tendency to be outgoing. Therefore, individuals with these traits are more likely to participate in collective actions and can be considered to correlate with social capital. The social interaction frequency indicator was measured by the frequency of the item *socializing/visiting* in the questionnaire asking *in the past year, did you often do the following things in your free time?* Scores were assigned from 1 to 5, with higher scores indicating more frequent socialization or visits, which indicates more extraversion (Wu & Bi, 2018).

As quantile regression is not a linear regression model, the traditional two-stage least squares regression (IV-2SLS) is not applicable. Therefore, we employed the instrumental variable quantile regression (IVQR) proposed by Chernozhukov and Hansen (2008) for identification, which is robust under weak identification, partial identification, and even non-identification situations. Table 5 presents the results of the instrumental variable quantile regression. As the quantile increases, the positive impact of *guanxi* on income gradually increases and becomes significant at the 1% level. By contrast, the positive impact of social capital on income gradually decreases as

Table 5
Endogeneity discussion (instrumental variable quantile regression).

Variables	(1)	(2)	(3)
	IVQR10	IVQR50	IVQR90
<i>Pro</i>	0.015*** (0.001)	0.039*** (0.002)	0.040*** (0.000)
<i>Member</i>	0.167*** (0.005)	0.088*** (0.010)	0.051*** (0.003)
Control variables included	Yes	Yes	Yes
Province Fixed Effects	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes
Observations	9093	9093	9093

Note: IVQR10, IVQR50, and IVQR90 represent the instrumental variable quantile regression results at the 10th, 50th, and 90th percentiles, respectively.

the quantile increases and is significant at the 1% level. This result is consistent with the basic quantile regression results, further indicating that *guanxi* exacerbates income inequality, whereas social capital helps improve income inequality.

5.3. Robustness tests

5.3.1. Replacing the core explanatory variable

There are multiple measurement methods for *guanxi*, including occupational and dinner party networks, as well as various indicators in Chinese New Year's greetings (Zou, Ao, & Li, 2012). Following Zou et al. (2012), we used the *frequency of dining out with others* as another indicator of *guanxi* from the perspective of dinner party networks. In China, inviting guests to dinner is not usually just for the sake of eating. Individuals can establish their social networks through gatherings to achieve the purpose of exchanging resources. Therefore, *guanxi* can be measured by the *frequency of dining out with others*. The specific question in the CGSS questionnaire was: *How often do you go out to eat or drink with three or more friends or acquaintances (excluding your family members)?* We matched the results of CGSS2012 and CGSS2017 and assigned values ranging from 1 to 5. The higher the score, the more frequent the gatherings with others. Based on Li, Zhou, Jin, and Shi (2021), Putnam (1993), and Kwon, Heflin, and Ruef (2013), we used participation in the last neighborhood committee/village committee election voting as another indicator to measure an individual's social capital level. If the participant votes, the value was assigned 1; otherwise, it was assigned 0. Columns (1) to (3) of Table 6 demonstrate that after replacing the indicators of *guanxi* and social capital simultaneously, the coefficient of *eat* is the lowest at the 10th percentile, meaning that, compared to the low-income group, *guanxi* can provide higher returns for the middle and high-income groups. The coefficient of *vote* is significantly positive at the 10th percentile and negative at the other percentiles, with a significantly negative value at the 90th percentile. This implies that social capital increases the income of low-income groups and reduces that of high-income groups, thereby narrowing the income gap between groups.

5.3.2. Changing the research sample

Thus far, the regression results of this study have been based on the merged sample from 2012 and 2017. Here, we used only the 2017 residents as the research sample to examine the impact of *guanxi* and social capital on income at different percentiles. The regression results are illustrated in columns (4) to (6) of Table 6. The income-enhancing effect of *guanxi* on the low-income group was not significant; however, it significantly increased the income of the middle- and high-income groups. In contrast, social capital significantly increased the income of low-income groups but did not have a significant income-enhancing effect on middle- and high-income groups. The test results in Table 6 indicate that the results in Table 3 are robust.

5.3.3. Unconditional quantile regression

Some scholars have pointed out that conditional quantile regression has certain limitations. The estimation results of the conditional quantile regression depend on the distribution of the control variables in the sample, and the estimated coefficients may depend on the different quantiles of the disturbance term (Frölich & Melly, 2013). To avoid the aforementioned problems, we adopt the unconditional quantile regression (UQR) proposed by Firpo, Fortin, and Lemieux (2009) for robustness checks. The results are reported in Columns (1)–(3) of Table 7.

Although unconditional quantile regression can avoid the problem of regression estimation results depending on the distribution of control variables to a large extent, in order to further prevent other unobserved factors related to income from being captured by *guanxi* and social capital, the endogeneity problem under unconditional quantile regression needs to be addressed. Therefore, we adopt the method proposed by Powell (2020) for an instrumental variable unconditional quantile regression (IVUQR) to solve the endogeneity problem under unconditional quantile regression. The results are reported in Columns (4)–(6) of Table 7. These results are generally consistent with baseline regression. Moreover, in Columns (1)–(3), the income-enhancing effect of social capital on the low-income group becomes even greater, further increasing its role in reducing income inequality.

Table 6

Robustness test results: replacing core explanatory variables and changing research samples.

Variables	(1)	(2)	(3)	(4)	(5)	(6)
	Q10	Q50	Q90	Q10	Q50	Q90
<i>Eat</i>	0.078*** (0.026)	0.121*** (0.012)	0.106*** (0.013)			
<i>Vote</i>	0.119** (0.047)	−0.034 (0.027)	−0.082*** (0.027)			
<i>Pro</i>				0.003 (0.015)	0.042*** (0.008)	0.035*** (0.009)
<i>Member</i>				0.190** (0.088)	0.067 (0.054)	0.020 (0.045)
Control variables included	Yes	Yes	Yes	Yes	Yes	Yes
Province Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9093	9093	9093	3921	3921	3921

Table 7
Unconditional quantile regression results.

Variables	(1)	(2)	(3)	(4)	(5)	(6)
	UQR10	UQR50	UQR90	IVUQR10	IVUQR50	IVUQR90
<i>pro</i>	0.009 (0.007)	0.053*** (0.007)	0.022*** (0.005)	0.014*** (0.001)	0.038*** (0.003)	0.043*** (0.001)
<i>Member</i>	6.503*** (0.300)	0.105*** (0.025)	0.043*** (0.013)	0.177*** (0.007)	0.085*** (0.018)	0.060*** (0.005)
Constant	−0.009 (0.007)	9.292*** (0.031)	10.648*** (0.030)	−1.893*** (0.039)	7.300*** (0.081)	9.906*** (0.040)
Control variables included	Yes	Yes	Yes	Yes	Yes	Yes
Province Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9093	9093	9093	9093	9093	9093

Note: UQR10, UQR50, and UQR90 represent the UQR results at the 10th, 50th, and 90th percentiles, respectively. IVUQR10, IVUQR50, and IVUQR90 represent the IVUQR results at the 10th, 50th, and 90th percentiles, respectively.

5.4. Mechanism analysis

We examined the roles of social capital and *guanxi* in influencing income inequality, and the regression results indicate that *guanxi* exacerbates income inequality while social capital helps improve it. We wished to further examine the interplay between the two. Hypothesis 3 suggested that substitutability between social capital and *guanxi* was the most likely scenario. To test this hypothesis, we constructed an interaction term for social capital (measured by being a member of an organization and participating in its activities) and *guanxi* (measured by the number of occupations in one's social network). Considering that the positive impact of *guanxi* on the income of middle- and high-income earners is significantly higher than that of low-income earners, if social capital and *guanxi* have a substitutive effect on income inequality—that is, social capital can suppress the role of *guanxi* in exacerbating income inequality—then social capital should weaken the positive impact of *guanxi* on income in the middle- and high-income percentiles. Specifically, the coefficients of the interaction term *pro*×*member* in the quantile regression results should be significantly negative in the 50th or 90th percentiles, whereas the estimated coefficients of *pro* and *member* should be significantly positive in the 50th and 90th percentiles.

Columns (1) to (3) of Table 8 illustrate the regression results after including the interaction term between social capital and *guanxi* while controlling for provincial and year-fixed effects. Table 7 indicates that the coefficients of *pro*×*member* at the 50th and 90th percentiles are both significantly negative at the 5% level, and the coefficients of social capital and *guanxi* are both significantly positive at the 50th and 90th percentiles, significant at the 1% level. This suggests that the effects of social capital and *guanxi* on income have a substitutive relationship, and social capital has a negative moderating effect on the role of *guanxi* in exacerbating income inequality. In other words, social capital weakens the positive impact of *guanxi* on the income of middle and high-income earners, which leads to a decrease in income inequality. According to columns (4) to (6) in Table 8, after changing the fixed effects settings, controlling only for provincial fixed effects and not year-fixed effects, we still found consistent effects, thus verifying Hypothesis 3.

Furthermore, if a substitutive relationship exists between social capital and *guanxi*, then when we control for both social capital and *guanxi* variables in Eq. (1), their coefficients' absolute values and significance should decrease compared to when we control for only one of the variables. To test this mechanism, we modified the practice of including both social capital and *guanxi* variables in Eq. (1) and instead included either social capital or *guanxi* variables individually. Columns (1) to (3) of Table 9 illustrate the quantile regression results when only the *guanxi* variable was included, and columns (4) to (6) illustrate the quantile regression results when only the social capital variable was included. As Table 9 quantile regression controls for all variables in Columns (4) to (6) of Table 2, the regression results in Table 9 can be compared with those in Columns (4) to (6) of Table 2. A comparison of Table 8 with Table 3 illustrates that the absolute values and significance of the coefficients of the social capital and *guanxi* variables in Table 3 have significantly decreased compared to the regression results in Table 9. This again demonstrates the substitutive *weakening each other*

Table 8
Substitutability between social capital and *guanxi* I.

Variables	(1)	(2)	(3)	(4)	(5)	(6)
	Q10	Q50	Q90	Q10	Q50	Q90
<i>pro</i> × <i>member</i>	−0.006 (0.019)	−0.026** (0.010)	−0.020** (0.009)	0.005 (0.018)	−0.027*** (0.010)	−0.021** (0.010)
<i>pro</i>	0.018 (0.012)	0.047*** (0.007)	0.048*** (0.007)	0.012 (0.011)	0.049*** (0.007)	0.049*** (0.007)
<i>member</i>	0.183* (0.106)	0.196*** (0.056)	0.125*** (0.046)	0.039 (0.094)	0.172*** (0.048)	0.129*** (0.049)
Control variables included	Yes	Yes	Yes	Yes	Yes	Yes
Province Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	No	No	No
Observations	9093	9093	9093	9093	9093	9093

Table 9
Substitutive relationship between social capital and “guanxi” II.

Variables	(1)	(2)	(3)	(4)	(5)	(6)
	Q10	Q50	Q90	Q10	Q50	Q90
<i>pro</i>	0.022** (0.010)	0.041*** (0.006)	0.042*** (0.006)			
<i>member</i>				0.180*** (0.064)	0.131*** (0.032)	0.076** (0.030)
Control variables included	Yes	Yes	Yes	Yes	Yes	Yes
Province Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9093	9093	9093	9093	9093	9093

effect between social capital and *guanxi*, further validating [Hypothesis 3](#).

6. Conclusions

Social capital and *guanxi*, widely employed concepts in the social sciences, have the potential to elucidate variations in the extent of income inequality. However, owing to the lack of a clear distinction between these two concepts, their impact on income inequality has not been well explained. Based on the concept of social capital proposed by economists, this study theoretically explains the difference between social capital and *guanxi* and proposes three hypotheses regarding social capital, *guanxi*, and income inequality. On this basis, we used 2012 and 2017 CGSS data, adopted the quantile regression method to study the impact of social capital and *guanxi* on income inequality in China, and conducted corresponding robustness tests and extended analyses, reaching the following main conclusions.

First, *guanxi* exacerbates income inequality in China, while social capital helps improve it. The instrumental variable quantile regression reached the same conclusion, which remained valid after replacing indicators, changing research samples, and conducting unconditional quantile regression.

Second, the impacts of social capital and *guanxi* on income inequality are substitutable, and social capital can suppress the effect of *guanxi* on exacerbating income inequality. This implies that if individuals rely on social capital to obtain resources, their dependence on *guanxi* decreases.

This study provides a compelling explanation for the ongoing debate on whether social capital contributes to income distribution. It clarifies that social capital improves income distribution, suggesting that previous literature may have conflated social capital with *guanxi*, erroneously attributing income-distribution-worsening effects to social capital.

The conclusions of our study indicate that improving income inequality requires formal institutional arrangements and the support of informal institutions. To curb the negative impact of *guanxi* on income distribution, it is necessary to focus on enhancing the social capital of low-income groups. The government can encourage and foster various social organizations, such as community and resident mutual assistance organizations, and introduce corresponding support and guidance policies to guide the development of social organizations. Furthermore, the government should cultivate self-organizational awareness among low-income groups, encourage low-income individuals to actively participate in social organizations, and provide subsidies for their participation in social organizational activities. These measures will help low-income individuals obtain more resources and opportunities, thus contributing to improving income inequality in China.

This study has some possible limitations, and we leave these issues for future research. First, although the CGSS is one of the most widely used micro-databases in economic research in China, the sample size is still limited. Therefore, the results are sensitive to model specifications, and any attempts to generalize the results should be treated with caution. Second, the CGSS questionnaire provides only limited information, making measuring social capital and *guanxi* with simplified proxy variables necessary. These proxy variables do not accurately measure social capital and *guanxi*. Future measurements of social capital and relationships must be multifaceted and based on richer data from a wider range of perspectives. We hope these issues can be better addressed in future studies with more comprehensive datasets.

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Declaration of Competing Interest

None.

Data availability

Data will be made available on request.

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