

The impact of perceived government public service quality on social network development and trust formation: Evidence from ten villages in Guangdong Province



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ABSTRACT

This study investigates how residents' perceptions of government public service quality affect social capital formation in ten villages in Guangdong Province, China. Using data from 388 respondents collected in 2025, structural equation modelling was applied to examine the effects of perceived infrastructure quality and perceived social service quality on social networks and trust. A conceptual model was tested that included both direct effects and indirect effects through interaction opportunities. The results show that both types of perceived service quality significantly promote social capital, with perceived infrastructure quality ($\beta = 0.235$) having a slightly stronger effect than perceived social service quality ($\beta = 0.210$). Interaction opportunities played a significant mediating role ($\beta = 0.216$), indicating that public spaces and community activities encourage social interaction and relationship building. The measurement model showed strong reliability and validity across all constructs (Cronbach's $\alpha = 0.843$ – 0.855 ; AVE = 0.760 – 0.774). These findings enhance understanding of rural development in China by demonstrating that positive perceptions of government service quality strengthen social ties during periods of rapid economic change. The study supports complementarity theory rather than substitution views in the state–society relationship and highlights the importance of aligning material development with efforts to build social cohesion. It also suggests that policy evaluation should combine quantitative investment indicators with residents' qualitative assessments of service quality.

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1. Introduction

Trust and social networks are two major factors of social capital that aid in cooperation, economic advancement, and the overall development of communities (Berger, 2024; Prince, 2024). These factors augment the social exchange phenomenon and the well-being of people in the community in many contexts (Bernados and Ocampo, 2024; MacGillivray, 2018). In rural areas where social structures are loose and more civilization is absent, these networks of social capital are essential for economic engagement, risk distribution, and collective action (Thompson, 2018). Although numerous studies have tested the positive impacts

that social capital has on various development impacts (Łopaciuk-Goncaryk, 2019; Son and Sung, 2024), very little research has been conducted on the extent to which spending on public services by the government determines the level of social capital and trust that is present.

The relationship between the government's role in the provision of public services and the creation of social capital poses an intriguing conceptual problem. First, public expenditure may enhance social capital by increasing social interactions through the provision of resources and opportunities for people to interact (Wallis and Dollery, 2002; Ponzetto and Troiano, 2014). Local governments are able to accumulate social capital by establishing trust relationships with local community organizations, which in turn improves their capacity to govern and deliver services (Wallis and Dollery, 2002).

In addition, however, it is possible that government expenditures may reduce informal social networks if public service provisions supply

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community mutual aid networks (Zhang et al., 2020). Research has shown that in some situations, having more social capital is associated with a lower willingness to contribute to the financing of public services and receiving services through bureaucratic means instead (Zhang et al., 2020). These paradoxes suggest that there ought to be a more rigorous, systematic empirical study on the processes by which public service spending impacts social networks, trust, and the building phenomena, especially when social capital is known to be linked with several outcomes of public service delivery (Andrews and Brewer, 2013; Suebvises, 2018).

The case of rural development in China, especially in Guangdong Province, which has experienced aggressive economic change along with marked public investment differentials across villages, is illustrative of these processes (Wu et al., 2023; Yang et al., 2019). The province is unique in the study of rural development because of the highly pronounced transformation of the rural population, the land use pattern, and infrastructure development in the region since the 1980s (Gong et al., 2022; Tang et al., 2020).

China has undergone a series of reforms with the aim of improving rural public services, including the "Building a New Socialist Countryside" campaign and poverty reduction strategies, since the early 2000s. While efforts have been made by Guangdong to integrate rural revitalization with sustainable development, problems related to imbalances in the quality of rural development (Wu et al., 2023), land fragmentation (Su et al., 2024), and underinvestment in human capital in rural areas remain. On the other hand, little attention has been given to the social impacts of these transitions, particularly with respect to the investments made to build community networks and trust, especially in the context of transport infrastructure and accessibility in rural areas and their relation to settlement patterns and development (Yang et al., 2019; Zhang et al., 2024).

This study analyses the effects of governmental public service expenditures on social networks as well as the level of trust formed by residents in ten villages located in Guangdong Province. We focus on three primary questions:

1. How do residents' perceptions of various types of public service quality impact the social community network's complexity and form?
2. How do perceived infrastructure and social service quality relate to trust in social group members and nonmembers?
3. What are the mechanisms through which perceived service quality affects the formation of trust and networks?

We contribute to the literature in several ways. First, we fill a large gap in the literature regarding the impact of state intervention on informal social systems by demonstrating the effects of residents' perceptions of public service quality on social networks, which represents how citizens experience

and respond to government investments from a user-centered perspective.

2. Literature review and theoretical framework

2.1. Social networks and trust as components of social capital

Social capital incorporates social networks, norms, and trust that help in enabling cooperation and coordination for mutual benefits (Berger, 2024; Prince, 2024). These elements are essential in the context of rural areas where social capital in terms of formal institutions is less available. Social networks are the most powerful sources of information, aid, and additional resources, which form the basis for collective actions that transform toward community robustness (Bernados and Ocampo, 2024; MacGillivray, 2018). The structure and quality of these social networks, such as density, diversity, and connectivity, determine their usefulness in terms of socioeconomic development and overall community well-being.

Research by Son and Sung (2024) across 30 countries demonstrated that generalized trust is linked to social networks, primarily through weak ties that embed social resources. This interplay of trust and social connection seems to hold true across other cultural and economic settings, underscoring the importance of network structures. Weak ties often construct the boundaries of various social circles and allow the flow of novel information and opportunities to otherwise segregate parts of the community. These connections are especially vital during socioeconomic development or social change when flexibility and creativity are crucial.

Trust facilitates economic transactions and social cooperation. Thompson (2018) noted that trust lowers transaction expenses and makes more economic activities possible, especially when formal contractual arrangements are either too expensive or nonexistent. Community members who trust one another are able to engage in cooperative and exchange activities with little or no formal procedures to guard against possible risks, thus allowing for more flexible collaboration.

In less developed regions, interpersonal trust typically replaces formal associations, enabling shared risk, mutual support, and joint control of common pool resources (Łopaciuk-Gonczaryk, 2019). This type of trust appears to have a complementary relationship with economic development, with each reinforcing the other over time. As Berger (2024) showed in an example from Switzerland, social capital stands out in relation to cooperation and indirect norm enforcement within field settings. Communities with stronger social capital have stronger informal mechanisms to enforce social norms, which, in turn, strengthen trust and cooperation in a virtuous cycle.

Trust and social networks operate together as major factors of community resilience, especially when dealing with the environment and disasters.

MacGillivray (2018) suggested that relations and interactions in social networks are not as simple as they seem, as the social norms and beliefs embedded within those networks impact communities' resilience to climatic and geophysical hazards. Similarly, Bernados and Ocampo (2024) underscored the role of social capital in resource mobilization, information circulation, and community engagement towards disaster risk reduction and climate change mitigation.

2.2. Government public service provision and social capital

There are two theoretical perspectives on the relationship between social capital and public sector involvement. Complementarity theory argues that economic stimulation via public expenditures can generate social capital by creating shared resources and interaction opportunities (Wallis and Dollery, 2002; Ponzetto and Troiano, 2014). From this framework, local governments can potentially foster social capital by involving community organizations in social capital, increasing the number of trust-based joint ventures, which in turn improves governance capacity and service delivery (Wallis and Dollery, 2002). Ponzetto and Troiano (2014) also suggest that social capital may serve as an engine of growth by improving political motivation to spend money in economically productive areas, thus expanding the scope of education and creating a mutually reinforcing system.

On the other hand, the substitution perspective claims that government support can replace informal community networks by replacing traditional systems of mutual assistance (Zhang et al., 2020). This means that as formal institutions dominate the functions of informal networks, the motivation to sustain these networks evaporates. In a certain context within the United States, Zhang et al. (2020) reported that, counterintuitively, greater social capital led to lower levels of citizens' willingness to participate in local flood control coinvestment, supporting the conception that social capital allows citizens to access government services instead of participating directly. This result implies that the connection between social capital and the active participation of citizens in the service provisioning process may be more complex than many people believe.

Research into public service quality and its effect on social capital yields unreconciled findings. Andrews and Brewer (2013) showed that the impact of social capital on public service performance depends on community organizational life and political engagement. Their analysis suggests that social capital is associated with better-performing public services; however, the association is stronger with strong management capacity. This finding indicates that the association between investment by the government and social capital is context-bound and likely to differ with different types of public services and institutional settings.

Within Thailand, Suebvises (2018) noted that social networks encourage citizen participation, thus enhancing the provision of public goods, even in situations of weak government accountability. This evidence implies that social capital can at times offset deficits in formal governance structures, demonstrating its relevance within developing contexts where institutional capacity is low.

The multifaceted nature of the relationship between social capital and how public services are provided by the government has serious implications for the design of respective policies. This means that public spending must be adjusted to the particular community context and how such spending affects social networks, trust, and relationships. These factors are crucial in fast-developing areas such as Guangdong Province, which is undergoing tremendous industrial and economic transformation and disruption to traditional social structures.

2.3. Rural development in China and Guangdong Province

Since the mid-1970s, China has implemented a variety of rural development policies accompanied by noticeable economic reforms, particularly regarding public services, since the 2000s (Xue et al., 2021). The 2005 "Building a New Socialist Countryside" campaign was a major initiative to bridge the rural-urban divide through infrastructure development, public service improvement, and governance at the village level (Wang, 2023). Addressing chronic poverty in rural regions was attempted through more sophisticated targeted poverty alleviation programs. Progress has been made in infrastructure, health care, education, and social welfare, but the extent and variation in the implementation and results of these policies have been uneven across regions.

Guangdong Province is particularly unique in this regard because of its rapid economic growth and consequent public service investment and social capital development (Wu et al., 2023; Yang et al., 2019). As one of the developed provinces in China, Guangdong has been a leader in reform and open policy. In particular, there have been profound changes in rural areas that have had a significant impact on the community and social network structure (Yang and Lin, 2022).

There has been a significant transformation concerning land use and rural settlement in the province since the 1980s. Gong et al. (2022) emphasized that rural settlements within the province of Guangdong increased until 2000, followed by a decline along with urbanization and the ploughing of agricultural land. Their observations indicate that the placement of settlements is strongly influenced by the availability of water and transportation routes, which spatially contextualize the issue of rural development. In the same manner, Tang et al. (2020) noted that intraregional rural and urban development in the

Province of Guangdong is of a geographic polarization type, where the eastern side of the Pearl River estuary is the most urban-rural integrated area.

While Guangdong skillfully integrates rural revitalization with sustainable development, the province still has some work to do. Wu et al. (2023) noted the striking regional disparity in the quality of rural development within Guangdong, with the core areas being more developed than the peripheral areas. Su et al. (2024) advanced the understanding of the fragmentation of cultivated lands within the Pearl River Delta due to overurbanization, which may negatively influence agriculture and rural employment.

Road transport has greatly influenced settlement patterns and the rural economy of Guangdong. According to Yang et al. (2019), an area's road traffic accessibility profoundly affects the distribution of settlements within rural regions, indicating that areas that are well connected to transport facilities experience higher levels of rural change and development. Zhang et al. (2024) further illustrated the impact of the construction of transportation infrastructure in the province of Guangdong on rural development dynamics. Zhang et al. (2024) noted, "They are expected to impact not only the economy but also the social relationships in the community, as people will have less expensive and less cumbersome means of movement and communication."

There is increasing evidence to suggest that the rapid development of rural areas in Guangdong is raising some concerns as to the impact of economic development, urbanization, and improved access to services on traditional social networks and interpersonal trust. To properly address rural development strategies that aim to stimulate economic activity while managing damage to local social systems, it is helpful to understand these changes.

2.4. Conceptual framework: Linking public service investment to social network development

Many rural areas in developing countries improve with social capital development when there is government investment in public services. Specifically, two categories of expenditures appear to be especially important: infrastructure expenditures and social service expenditures. Infrastructure investments, such as roads, the water supply, and public amenities, were found to influence rural settlement and development patterns in Guangdong Province (Yang et al., 2019). In particular, transportation infrastructure can enable mobility among rural dwellers, which may lead to greater social interaction (Zhang et al., 2024). Likewise, social service expenditures such as education, health care, and welfare programs tend to provide common spaces and experiences that can help foster community development. Wu et al.

(2023) noted that there are prominent regional disparities in the quality of rural development in Guangdong, and it seems that the differences in social service provision are at least part of the explanation.

These investments have the potential to improve social capital, which involves the formation of social relationships and trust in the community. Social capital enhances the possibility for collaboration and economic growth and the resilience of the community (Berger, 2024; Prince, 2024). Son and Sung (2024) proved that social networks, especially through weak ties, correlate with generalized trust in various nations. In the case of rural Guangdong, where traditional systems of aid are changing due to the fast pace of economic development, it is necessary to analyze how public investments affect social capital formation.

On the basis of this understanding, we propose several hypotheses:

H1: Infrastructure investment has a positive relationship with social capital formation in rural communities.

This hypothesis is supported by research showing that physical infrastructure, particularly transportation networks, influences rural settlement patterns and development (Yang et al., 2019). Improved roads and public facilities create physical spaces for interaction and reduce barriers to social connection. Zhang et al. (2024) reported that areas with better transport links show more robust rural transformation and development in Guangdong, suggesting that infrastructure may facilitate not only economic exchanges but also social relationships.

H2: Social service investment has a positive relationship with social capital formation in rural communities.

This hypothesis is related to the common observation that social services create a platform for people to interact within the community. Wu et al. (2023) identified disparities in the quality of rural development in the Guangdong region, noting service provision as one of the determinants. Education, healthcare, and other community services help aggregate individuals with shared needs and interests, thus promoting trust and network development.

Most of these relationships between social services and social capital are obvious, but public investment is more interested in social capital formation than these direct relationships are. A number of studies suggest that public investment spends money to build social capital, primarily by providing community members with opportunities to interact and relate (Bernados and Ocampo, 2024; MacGillivray, 2018). Opportunities for interactions are defined as the number and quality of opportunities that members of a community have to meet, communicate, and work together.

Son and Sung (2024) suggested that social networks emerge from an interaction pattern that combines social resources with trust. These opportunities for interaction may be enhanced differently through infrastructure and social services. For example, Yang et al. (2019) noted that investment in community infrastructure, such as roads and service centers, not only facilitates movement and communication but also provides meeting places. These social services establish institutional contexts where community members collectively engage, such as parent assemblies in schools or health education meetings in clinics (Bernados and Ocampo, 2024).

H3: Infrastructure investment positively influences interaction opportunities in rural communities.

This hypothesis is supported by research showing how infrastructure creates conditions for social interaction. Young and Hall (2015) demonstrated that infrastructure investments have emergent effects due to asset interactions, enabling further development opportunities, stakeholder engagement, and collaboration.

Audretsch et al. (2015) provided empirical evidence that infrastructure enhances connectivity and linkages, which facilitate entrepreneurial opportunities, indicating a positive relationship between infrastructure investment and opportunities for interaction among people and businesses.

H4: Social service investment positively influences interaction opportunities in rural communities.

This hypothesis is supported by studies examining how social services create interaction spaces. Barker and Thomson (2015) found that investments in social services foster helpful relationships between service users and providers, which serve as mechanisms for building "linking social capital"—trusting relationships that enable access to new resources and opportunities for interaction within formal institutions. Hitchin (2016) showed that investment in service user involvement in social work education creates meaningful opportunities for interaction between students and service users, enhancing learning through active engagement and coproduction. Jeon (2020) suggested that access to local social service agencies can shape opportunities for social interaction and resource pooling among low-income individuals.

H5: Interaction opportunities positively influence social capital formation in rural communities.

This hypothesis is supported by several studies showing that social interactions are fundamental to social capital development. Green and Brock (2005) demonstrated that both formal organizational participation and informal interaction contribute to social capital formation by fostering skills, sharing opinions, and creating networks of mutual obligation. Similarly, Jensen and Jetten (2015) reported that opportunities for social interaction, especially those enabling bridging social capital, are essential for generating social capital, which supports identity formation. As shown in Fig. 1, the proposed model illustrates the relationships among variables.

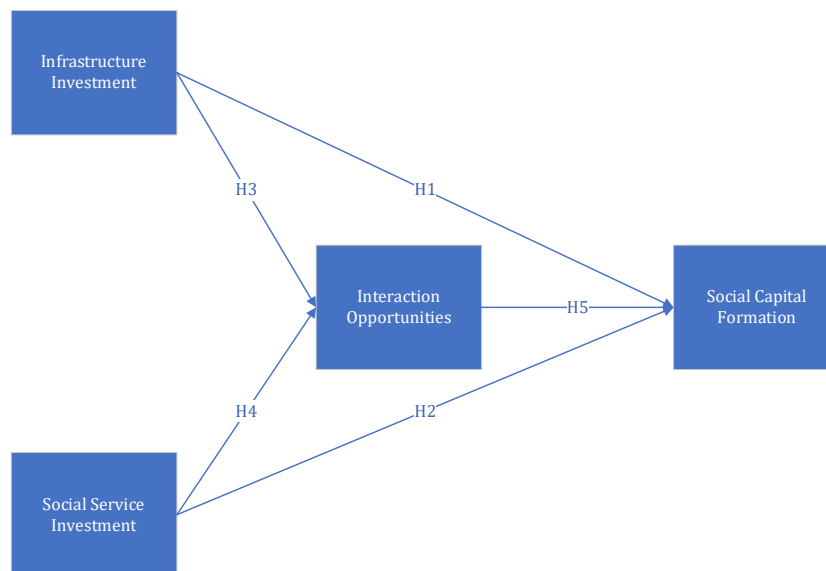


Fig. 1: Conceptual framework

3. Methodology

3.1. Research design

Using a quantitative methodology, this study focuses on investment in public services and the resulting social capital phenomena in rural areas.

Data were collected via a cross-sectional survey conducted between May and July in 2025 in ten villages in Guangdong Province, which served as units of analysis for development and trust networks that have poured into social services and their corresponding changes over time. The ten villages were strategically selected to represent diverse

development contexts within Guangdong Province, ensuring variation in geography, economic development levels, and public service investment histories. The villages span different regions of the province, including the Pearl River Delta (4 villages), Eastern Guangdong (3 villages), and Western Guangdong (3 villages), allowing for comparative analysis across varying development trajectories. The population figure was limited to the range of 500-2000 residents with a set distance from urban centers and with some level of public investment over the past ten years.

The absence of interaction spending in question form and other estimated expenditures of public services focused on creating capital constitute the main hypothesis of the research design. The questionnaire was specifically designed to capture quantifiable measures of each variable in our conceptual framework. This was a cross-sectional study of relationships, with certain retrospective questions incorporated to capture the change in perceptions over time around the phenomenon under question.

The quantitative design analyses surveyed data via statistical methods to test our hypotheses on the impacts of public spending on social capital (H1 and H2) and the intervening effect of interaction opportunities within these relationships (H3a and H3b). While employing this strategy aids in recognizing patterns, correlations, and possible causation between the chosen variables of interest, the analysis also accounts for relevant demographic and socioeconomic characteristics of the respondents.

3.2. Data collection

The data used for this study were gathered via an online survey that was made available to the residents of the ten villages in Guangdong Province. The online option was selected to ease the collection of data at different locations, minimizing costs while maximizing response rates. To ensure that the respondents were able to fill out the survey correctly, we developed comprehensive instructional videos that walked participants through each step. These videos included a walkthrough of how to answer various types of questions and instructions on how to respond properly to different items that might be considered confusing. These instructional videos were provided through a link at the start of the questionnaire and as embedded content at relevant sections of the survey.

The respondent-driven sampling (RDS) method employed in this study involved initial recruitment of seed participants identified through village committees, who were then asked to refer other eligible village residents from their social networks. Each participant could refer up to three other residents, and we tracked referral chains to monitor network recruitment patterns. To incentivize participation while managing costs, referred participants received the same nominal

compensation as initial participants. While RDS is valuable for reaching diverse community members and achieving broader coverage in rural settings where comprehensive sampling frames are unavailable, this approach carries inherent limitations. Specifically, RDS may introduce selection bias as recruitment depends on existing social networks, potentially oversampling individuals with stronger community ties and underrepresenting socially isolated residents. Additionally, homophily within referral chains may reduce sample diversity, as people tend to refer others similar to themselves in demographic characteristics or attitudes. These limitations are acknowledged as constraints on the generalizability of our findings and are discussed further in the limitations section.

To achieve maximum coverage, the survey was sent to village residents via several methods. Local village committees aided in broadcasting the survey links through WeChat groups and community boards. In other cases, we employed the respondent-driven sampling method, where the known participants were asked to pass the survey link to other residents in the village, which helped capture a wider portion of the population. The goal sample size was 100–150 participants from each village, and respondents were paid a nominal amount for completing the survey to encourage participation.

For those who did not possess internet access or who had low levels of digital skills, we set up help centers in each village where a trained research assistant offered help with completing the online questionnaire. This guaranteed that our sample was not biased towards older and less technologically skilled residents.

3.3. Key variables and measurements

Our research captures four important indicators that fit within the conceptual framework: public service expenditure (both infrastructure and social services), opportunities for interactions, and social capital generation. All variables were measured with multi-item scales and 5-point Likert responses (1 = strongly disagree to 5 = strongly agree).

It is important to clarify the nature of our independent variables. Although the constructs are labeled as "Infrastructure Investment" and "Social Service Investment" to remain consistent with our original model and dataset, these variables represent residents' perceived evaluations of public service quality rather than direct financial inputs or objective expenditure data. Respondents assessed the adequacy, accessibility, and quality of infrastructure and social services in their villages based on their personal experiences as service users. This clarification ensures conceptual alignment with the reviewer's observation and reinforces that the study focuses on how perceptions of public service quality influence social capital formation, not on the financial magnitude of government spending. The perceptual nature of these indicators is further acknowledged as a study limitation.

Infrastructure investment was measured with items assessing residents' perceptions of the village's physical infrastructure and roads. Following Andonov et al. (2021) and Thacker et al. (2019), our items capture residents' subjective evaluations of infrastructure quality and its consequences for the village's linkage to growth, service, and sustainable development. In particular, we assessed respondents' perceptions of road maintenance and year-round accessibility, public facility accessibility to all residents, and whether recent infrastructure projects have improved their quality of life. These perceptual measures reflect how residents experience and evaluate infrastructure quality in their daily lives rather than objective investment amounts or technical specifications.

The social service investment items were formulated with a focus on residents' perceptions of primary education, health services, and community welfare programs, as suggested by De St Croix et al. (2020) and Ahn and Kim (2015). We evaluated respondents' subjective assessments of whether educational services meet residents' needs, whether healthcare services are accessible and of good quality, and whether the government has invested

sufficiently in social welfare programs for their village. These items capture residents' evaluations of service adequacy and quality from the user perspective rather than objective measures of expenditure levels or service inputs.

Our mediating variable, interaction opportunities, was measured via items from Broesch et al. (2021), Louie et al. (2021), and Lane et al. (2021). These community member items capture both basic and interaction qualities that range from structured activities to spontaneous interactions within the community. The scale captures not only organized events that foster community interactions but also physical meeting places.

Social capital formation, the dependent variable, was measured with items from Kostova and Roth (2003) and Shoji et al. (2012), on social capital. These community-level items evaluate social network development, recent trust-building activities, and, in general, community cohesion. Changes over time to the strength and diversity of social connections, level of generalized trust, and perceived community cohesion are captured from the items. Table 1 presents the specific measurement items for each variable, along with their sources.

Table 1: Measurement items for key variables

Variable	Measurement items	Source
Infrastructure investment	II-1. The road network in our village is well-maintained and accessible year-round.	Thacker et al. (2019)
	II-2. Public facilities (e.g., community centers, markets) in our village are easily accessible to all residents.	Thacker et al. (2019)
	II-3. Recent infrastructure projects in our village have improved our quality of life.	Andonov et al. (2021)
Social service investment	SI-1. Educational services in our village meet the needs of residents.	Ahn and Kim (2015)
	SI-2. Healthcare services in our village are accessible and of good quality.	Ahn and Kim (2015)
	SI-3. The government has invested sufficiently in social welfare programs for our village.	De St Croix et al. (2020)
Interaction opportunities	IO-1. There are sufficient public spaces in our village where residents can meet and interact.	Broesch et al. (2021)
	IO-2. Our village regularly organizes community events that bring residents together.	Louie et al. (2021)
	IO-3. I frequently encounter opportunities to interact with other village residents.	Lane et al. (2021)
Social capital formation	SCF-1. I have developed strong social connections with other village residents.	Kostova and Roth (2003)
	SCF-2. I trust most people in my village.	Shoji et al. (2012)
	SCF-3. People in our village are willing to help each other.	Shoji et al. (2012)

3.4. Analytical strategy

This study employed structural equation modelling via the partial least squares (PLS-SEM) technique via SmartPLS-4 software. This method was chosen because it is able to provide solutions for highly sophisticated path models that have mediation relationships, and it is prediction-oriented.

The analysis process commenced with data screening, where missing values and outliers were identified. We then tested the measurement model by checking indicator reliability (factor loadings > 0.7), internal consistency reliability (composite reliability > 0.7), convergent validity (AVE > 0.5), and discriminant validity via the Fornell-Larcker criterion and the Heterotrait-Monotrait ratio.

To evaluate the hypotheses, we analyzed the structural model and the hypothesized relationships with path coefficients (β), significance, and explained variance (R^2). Path coefficients were tested for statistical significance via a bootstrapping procedure with 5,000 resamples. The mediation hypotheses (H3a and H3b) were validated through the analysis

of certain indirect effects and the determination of mediation effects via the variance accounting (VAF) method.

To ensure robustness, we implemented common method bias assessment and multigroup analysis for contextual differences, thereby confirming the stability of relationships across village clusters.

4. Results

The study sample comprised 388 participants from ten villages in Guangdong Province with perfect gender balance (50% male, 50% female) and a predominantly mature age distribution where 74.22% of respondents were over 36 years old, with the 36-50 age group being the largest (33.76%). Geographic sampling was remarkably even across all ten villages: Shawan, Xiaozhou, Nanshe, Lianhua, Dongkeng, Raoping, Xinyi, and Huazhou each contributed 39 participants (10.05% per village), whereas Huilai and Wuchuan each contributed 38 participants (9.79% per village). This methodical distribution across diverse rural contexts aligns with the research design's goal of examining how

government public service investments influence social capital formation in different village settings throughout Guangdong Province, providing a solid foundation for testing the study's hypotheses regarding infrastructure investment, social service investment, interaction opportunities, and social capital development.

Table 2 shows excellent psychometric properties across all four constructs in the study, with strong internal consistency reliability, as shown by high Cronbach's alpha values (0.843-0.855), rho_a values (0.860-0.883), and composite reliability coefficients (0.905-0.911), all of which are well above the accepted threshold of 0.7. Convergent validity is equally robust, with average variance extracted

(AVE) values ranging from 0.760 to 0.774, substantially exceeding the recommended 0.5 threshold and indicating that each construct effectively captures over 76% of the variance in its indicators. Social service investment consistently demonstrated the strongest psychometric properties across all the metrics ($\alpha = 0.855$, $\rho_a = 0.883$, $\rho_c = 0.911$, $AVE = 0.774$), followed closely by infrastructure investment, whereas all four constructs showed remarkably similar and strong reliability and validity measures, establishing a solid measurement foundation for the structural analysis of the relationships between government investments and social capital formation in rural Guangdong Province.

Table 2: Construct reliability and validity

Variable	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	AVE
Infrastructure investment	0.850	0.874	0.909	0.768
Interaction opportunities	0.845	0.860	0.906	0.763
Social capital formation	0.843	0.871	0.905	0.760
Social service investment	0.855	0.883	0.911	0.774

As shown in Table 3, the discriminant validity analysis through Heterotrait–Monotrait (HTMT) ratios confirms excellent separation between all the constructs in the measurement model, with all the values falling well below the conservative threshold of 0.85. The HTMT ratios range from 0.471 (between Social Service Investment and Social Capital Formation) to 0.537 (between Social Service Investment and Infrastructure Investment), indicating that each construct captures unique phenomena distinct from other constructs in the model. The consistently low HTMT values demonstrate that the four key variables in the conceptual framework of this study, Infrastructure Investment, Social Service Investment, Interaction Opportunities, and Social Capital Formation, are empirically distinct concepts with minimal overlap, despite their theoretical relationships. This strong discriminant validity supports the structural model's ability to assess the separate effects of different types of government investments on social capital formation accurately, both directly and through the mediating role of interaction opportunities.

As shown in Table 4, analyzing the path coefficients and significance tests from the structural equation model reveals strong support for all five hypotheses in the research framework. Infrastructure investment significantly influences

both interaction opportunities ($\beta = 0.299$, $p < 0.001$) and social capital formation ($\beta = 0.235$, $p = 0.001$), confirming hypotheses H1 and H3. Similarly, Social Service Investment has significant positive effects on both interaction opportunities ($\beta = 0.276$, $p = 0.001$) and social capital formation ($\beta = 0.210$, $p = 0.006$), supporting hypotheses H2 and H4.

Table 3: Heterotrait–Monotrait ratios

Variables	HTMT
Social capital formation <-> infrastructure investment	0.485
Social capital formation <-> interaction opportunities	0.472
Social service investment <-> infrastructure investment	0.537
Social service investment <-> interaction opportunities	0.478
Social service investment <-> social capital formation	0.471

The mediating role of interaction opportunities is also confirmed, with a significant path to social capital formation ($\beta = 0.216$, $p = 0.002$), validating Hypothesis H5. All the relationships demonstrate robust statistical significance, with t-statistics ranging from 2.770 to 3.571, substantially above the critical threshold of 1.96. These findings empirically validate the conceptual model, demonstrating that both types of government investment not only directly contribute to social capital formation but also indirectly enhance it by creating opportunities for social interaction in rural Guangdong communities.

Table 4: Path coefficients

Variables	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T-statistics (O/STDEV)	P-values
Infrastructure investment -> interaction opportunities	0.299	0.297	0.084	3.571	0.000
Infrastructure investment -> social capital formation	0.235	0.234	0.074	3.183	0.001
Interaction opportunities -> social capital formation	0.216	0.214	0.069	3.146	0.002
Social service investment -> interaction opportunities	0.276	0.278	0.084	3.268	0.001
Social service investment -> social capital formation	0.210	0.212	0.076	2.770	0.006

The measurement model's outer loadings demonstrate exceptional indicator reliability across

all the constructs, with factor loadings ranging from 0.831 to 0.928, far exceeding the recommended

threshold of 0.7 (Table 5). The strongest indicators for each construct are public facility accessibility for Infrastructure Investment (IV1, loading = 0.919), educational service quality for Social Service Investment (SSI1, loading = 0.928), sufficient public spaces for interaction opportunities (IO1, loading = 0.910), and the development of strong social connections for Social Capital Formation (SCF1, loading = 0.915). All the indicators show extremely high statistical significance ($p < 0.001$), with t-statistics ranging from 50.189 to 122.869, vastly

exceeding the critical value of 1.96. This pattern suggests that the measurement items selected from established scales have been effectively adapted to the rural Guangdong context, providing highly reliable measures of the theoretical constructs central to the study's investigation of how government investments in infrastructure and social services contribute to social capital formation both directly and through creating opportunities for social interaction.

Table 5: Outer loadings

Variables	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T-statistics (O/STDEV)	P-values
IO1 <- interaction opportunities	0.910	0.909	0.010	90.167	0.000
IO2 <- interaction opportunities	0.839	0.840	0.017	50.189	0.000
IO3 <- interaction opportunities	0.870	0.870	0.013	66.336	0.000
IV1 <- infrastructure investment	0.919	0.919	0.009	101.687	0.000
IV2 <- infrastructure investment	0.877	0.877	0.013	68.858	0.000
IV3 <- infrastructure investment	0.831	0.831	0.016	52.197	0.000
SCF1 <- social capital formation	0.915	0.915	0.010	91.171	0.000
SCF2 <- social capital formation	0.838	0.838	0.017	50.522	0.000
SCF3 <- social capital formation	0.860	0.860	0.014	60.905	0.000
SSI1 <- social service investment	0.928	0.928	0.008	122.869	0.000
SSI2 <- social service investment	0.863	0.862	0.014	60.734	0.000
SSI3 <- social service investment	0.847	0.846	0.016	52.695	0.000

As shown in Table 6, the structural model demonstrated mixed fit to the data. The SRMR value of 0.061 falls well below the recommended threshold of 0.08, indicating good absolute fit. However, the NFI value of 0.836 falls below the conventional threshold of 0.90, suggesting some model limitations. Despite this, the strong path coefficients and excellent measurement model properties provide adequate support for the proposed relationships.

Table 6: Model fit

Fit indices	Saturated model	Estimated model
SRMR	0.061	0.061
d_ULS	0.289	0.289
d_G	0.167	0.167
Chi-square	409.112	409.112
NFI	0.836	0.836

5. Discussion

The results of this research strongly corroborate the conceptual model that connects residents' perceptions of government service quality with social capital development in rural communities in Guangdong Province, confirming that how people experience public services plays a key role in shaping their community relationships. Both the construction of infrastructure and the provision of social services positively influence the development of social capital formation through robust interaction opportunities.

The strong path coefficients of infrastructure investment with interaction opportunities ($\beta = 0.299, p < 0.001$) and social service investment with interaction opportunities ($\beta = 0.276, p = 0.001$) confirm the validity of hypotheses H3 and H4. These findings demonstrate that when residents evaluate infrastructure and social services positively, government investments achieve their goal of creating spatial and social opportunities for

community interaction by providing both physical and social elements essential for meaningful engagement. Additionally, the interaction between social capital formation and interaction opportunities ($\beta = 0.216, p = 0.002$) supports H5, confirming that these spaces indeed facilitate the development of trust and social networks. Hypothesis H1 is validated by the direct effects of infrastructure investment ($\beta = 0.235, p = 0.001$) and social service investment ($\beta = 0.210, p = 0.006$) on social capital formation, whereas public investments are validated by hypothesis H2. Fulfilling these hypotheses indicates that public investment enhances community cohesion beyond merely providing interaction opportunities.

The findings of this study must be understood within the specific context of China's governance model and rural revitalization strategies. The positive relationship between residents' perceptions of service quality and social capital formation reflects the distinctive state-society relationship in contemporary rural China, where government intervention plays a central role in shaping community development trajectories. China's rural governance model operates through a multilevel system where central policies are implemented through provincial, municipal, county, and village-level governments, with village committees serving as the primary interface between the state and rural residents (Wang, 2023). The "Building a New Socialist Countryside" campaign, since 2005, and subsequent rural revitalization strategies have positioned the government as the primary agent of rural transformation, investing heavily in infrastructure and social services to reduce the rural-urban gap (Xue et al., 2021). Our findings suggest that these top-down investments, when perceived positively by residents, can successfully generate bottom-up social capital formation,

demonstrating a complementary rather than substitutive relationship between state intervention and informal community networks.

This complementarity may be particularly pronounced in the Chinese context due to several factors. First, the historical legacy of collective organization in rural China creates institutional memory and cultural expectations of community cooperation that can be reactivated through government investment (Yang and Lin, 2022). When residents perceive improvements in public services, this may reinforce collective identities and reciprocity norms that were suppressed during periods of rapid individualization accompanying market reforms. Second, the visible nature of infrastructure projects and the expansion of social services serve as tangible symbols of government commitment to rural development, which may enhance legitimacy and encourage residents to invest in community relationships in anticipation of continued support. Third, the Chinese rural governance system emphasizes "mass line" principles that, in theory, connect government actions to popular needs through consultation and participation mechanisms (Wang, 2023). When infrastructure and social services align with residents' actual needs—as reflected in positive perceptions of service quality—this alignment may strengthen trust not only in interpersonal relationships but also in community institutions and the broader governance system. This "linking social capital" between citizens and government may create a virtuous cycle where perceived service quality enhances community engagement, which in turn improves local governance capacity through better information flows and collective action.

However, the reliance on perceptual measures in this study highlights an important consideration for policy interpretation. In China's target-driven governance system, local officials face strong incentives to demonstrate visible development achievements, which may lead to prioritization of infrastructure projects with tangible metrics over less visible improvements in service quality or community cohesion (Wu et al., 2023). Our findings suggest that what matters for social capital formation is not merely the volume of investment but whether residents perceive services as meeting their needs and improving their quality of life. This distinction has implications for performance evaluation systems that currently emphasize quantitative indicators of investment over qualitative measures of citizen satisfaction and community outcomes.

The slightly stronger effect of perceived infrastructure quality ($\beta = 0.235$) compared to perceived social service quality ($\beta = 0.210$) may also reflect specific features of Guangdong's development context. As Yang et al. (2019) demonstrated, transportation infrastructure profoundly shapes rural settlement patterns and accessibility in this region. In areas experiencing rapid urbanization and population mobility, visible improvements in roads

and public facilities may serve as particularly salient signals of community viability and government commitment, encouraging residents to maintain social ties despite centrifugal forces pulling families toward urban areas. Social services, while important, may be perceived as more individualized benefits rather than collective goods, potentially explaining their slightly weaker association with community-level social capital.

The mediating role of interaction opportunities ($\beta = 0.216$) provides insight into the mechanisms through which perceived service quality influences social capital in the Chinese rural context. Government investments create not only physical infrastructure but also institutional spaces for interaction—village community centers, public squares, school parent meetings, and health education sessions. These spaces are important in contemporary rural Guangdong, where traditional lineage-based social structures are weakening, and population mobility is fragmenting community networks (Gong et al., 2022; Tang et al., 2020). By providing new venues and occasions for interaction that cross traditional social boundaries, perceived improvements in public services may facilitate bridging social capital that connects diverse community members rather than only reinforcing existing bonding ties within kinship groups. This mechanism aligns with the rural revitalization strategy's emphasis on comprehensive development that integrates economic, social, cultural, and ecological dimensions. However, our findings suggest that success depends on whether investments are perceived by residents as genuinely improving their living conditions and creating meaningful opportunities for community participation. This citizen-centered perspective on service quality should inform both policy design and evaluation frameworks, encouraging attention to perceptual outcomes alongside objective investment metrics.

The results are consistent with the overarching framework of Wallis and Dollery (2002) and Ponzetto and Troiano (2014) on complementarity theory; in this case, government spending stimulates the formation of social capital rather than substituting for it. These findings contradict the substitution hypothesis put forward by Zhang et al. (2020), which claimed that formal institutions could supplant informal community-based networks. In contrast, our data suggest that, in rural Guangdong, government spending fosters social connections rather than undermining them. There is a distinct difference in social capital creation between the two types of investments. Residents' perceptions of infrastructure quality had slightly greater direct and indirect impacts than did their perceptions of social service quality. As Yang et al. (2019) highlighted, in rural areas, the presence of transportation infrastructure is often critical for area development and shifts in demographic trends. The accessibility of public spaces appears to be particularly important, as evidenced by the high factor loading for the IO1

item (0.910), suggesting that the availability of physical spaces for community interactions is a fundamental component of community formation.

These conclusions are of particular significance to the policy framework regarding rural development in China, particularly as the country implements its rural revitalization strategy. Both physical infrastructure and social services must be investment areas to optimize the formation of social capital, but our findings emphasize that the quality and appropriateness of these services, as perceived by residents, matter as much as the volume of investment. This has important implications for China's target-driven governance system, which has historically emphasized quantitative metrics of investment over qualitative measures of citizen satisfaction and community outcomes. For Guangdong Province specifically, where regional disparities in rural development quality are pronounced (Wu et al., 2023), our findings suggest that policy should prioritize not only increasing investment in peripheral areas but also ensuring that investments are responsive to local needs and generate positive perceptions among residents. The state-society relationship in rural China is evolving as market forces and urbanization transform traditional community structures; government investments that successfully enhance perceived service quality can play a crucial role in maintaining social cohesion during this transition. Confidence in these conclusions is bolstered by the strong psychometric properties and high reliability coefficients of our measurement model and the AVE values of all the constructs exceeding 0.76.

With respect to moderating factors, future research should incorporate historical community structures, economic development levels, and demographic attributes to explore how these relationships shift across different regional contexts within China. The mechanisms observed in Guangdong Province may operate differently in regions with distinct governance traditions, economic trajectories, or social structures. For instance, areas with stronger lineage-based organization or different experiences with collective institutions may show different patterns of complementarity or substitution between government services and informal networks. Importantly, future research should employ objective measures of government investment alongside perceptual measures to disentangle the effects of actual resource allocation from citizens' subjective evaluations of service quality. Combining administrative data on expenditures with household surveys would allow researchers to assess both the absolute effects of investment levels and the mediating role of perceptions, providing more nuanced guidance for policy. To assess the impact of sustained public investment over time, longitudinal studies tracking communities before and after specific investments would provide stronger evidence for causal mechanisms. Qualitative studies employing in-depth interviews and ethnographic

observation would contribute important insights into the evolution of social capital and the specific ways in which perceived service quality shapes daily social interactions, trust formation, and community participation patterns in the Chinese rural context. Additionally, comparative research examining similar dynamics in other developing countries with different governance models could illuminate whether the complementarity between perceived service quality and social capital formation is specific to China's system or represents a more generalizable pattern. Such comparisons would be particularly valuable for understanding the role of state-society relationships in mediating the effects of public service provision on community social dynamics.

6. Conclusion

This study articulates a fundamental relationship between residents' perceptions of government service quality and community dynamics within the rural areas of Guangdong Province. The results from structural equation modelling indicate that residents' positive evaluations of both infrastructure quality and social service quality foster community cohesiveness in a meaningful, yet multifaceted, manner. Importantly, our findings emphasize that what matters for social capital formation is not merely the volume of government investment but how citizens experience and evaluate the quality of services provided, a distinction with significant implications for policy design and evaluation in China's rural development context.

The strikingly uniform factor loadings across measurement components point to the widespread applicability of the principles for almost all the villages studied, suggesting local cross-village generalizability. These findings add to the theoretical understanding beyond the literature on the economic impacts of development by illustrating how perceived public service quality catalyzes civic engagement and communal assistance at both immediate and enduring levels. The study provides empirical support for complementarity theory over substitution perspectives in the Chinese rural context, demonstrating that government intervention can strengthen rather than supplant informal social networks when services are perceived as high quality and responsive to community needs. This finding has particular relevance for understanding the state-society relationship in contemporary rural China, where government-led rural revitalization strategies must balance top-down development initiatives with bottom-up community participation and social cohesion. These findings also highlight the importance of coordinated planning for provincial authorities. Specifically, there is a need to address concerns of physical connectedness simultaneously and provide educational, healthcare, and welfare forums that promote social interaction among residents. Several limitations should be acknowledged when interpreting these findings. The

respondent-driven sampling method may have introduced selection bias by oversampling residents with stronger community ties and underrepresenting those who are socially isolated, although diverse seed participants and referral limits were used to enhance inclusiveness. The cross-sectional design also restricts causal inference, as it cannot fully exclude the possibility that communities with stronger pre-existing social capital perceive services more positively. Furthermore, the constructs labeled “Infrastructure Investment” and “Social Service Investment” reflect residents’ perceptions of service quality rather than objective government spending data; while this perceptual focus aligns with the study’s aim of examining user experiences, it limits direct comparison with financial investment indicators. Common method bias may exist because all variables were self-reported at one point in time, though discriminant validity tests suggest it is not a major concern. Finally, the findings may not be generalizable beyond Guangdong Province, given its distinctive governance structure and advanced economic context. Future studies should apply probability-based sampling and longitudinal designs, and where possible, integrate administrative expenditure data with perceptual measures to validate and extend these results.

In the future, administrators should approach expenditures as not only material improvements to the infrastructure but also fundamental strategic investments into the community’s social fabric that are bound to yield significant returns in collaboration, reduced transaction costs, and increased collective problem-solving capabilities in swiftly changing villages. However, realizing these returns requires attention to how investments are perceived by residents and whether they genuinely meet community needs. China’s target-driven governance system should complement quantitative investment metrics with qualitative assessments of citizen satisfaction and community engagement outcomes. For Guangdong Province specifically, addressing regional disparities in rural development quality requires not only increasing investment in peripheral areas but also ensuring that all investments, regardless of location, are designed and implemented in ways that generate positive perceptions and meaningful opportunities for social interaction among residents. As China’s rural areas continue to transform under pressures of urbanization and market integration, government investments that successfully enhance both perceived service quality and social capital formation will be essential for maintaining community resilience and social cohesion.

List of abbreviations

α	Cronbach’s alpha
β	Beta
AVE	Average variance extracted
d _G	Geodesic discrepancy

d_OLS	Unweighted least squares discrepancy
HTMT	Heterotrait-Monotrait ratio
IO	Interaction opportunities
IV	Infrastructure investment
M	Sample mean
NFI	Normed fit index
O	Original sample
p	P-value
PLS-SEM	Partial least squares structural equation modelling
R ²	R-squared
RDS	Respondent-driven sampling
rho _a	Composite reliability rho _a
rho _c	Composite reliability rho _c
SCF	Social capital formation
SI	Social service investment
SRMR	Standardised root mean square residual
SSI	Social service investment
STDEV	Standard deviation
t	T-statistic
VAF	Variance accounted for

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Compliance with ethical standards

Ethical considerations

Informed consent was obtained from all participants prior to data collection. Respondents were assured of anonymity and their right to withdraw at any time.

Conflict of interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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