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RECEIVED 30 August 2023

ACCEPTED 27 December 2023

PUBLISHED 11 January 2024

CITATION

Li Y (2024), The collective action dilemma and its solution in the governance of urban community public space—an empirical analysis from Tianjin.

Front. Built Environ. 9:1284139.

doi: 10.3389/fbuil.2023.1284139

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The collective action dilemma and its solution in the governance of urban community public space —an empirical analysis from Tianjin

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The governance of community public space is one of the most concerned issue of people's livelihood, and its effectiveness determines the residents' living experience and even the stability of the grassroots political authority. In order to explore the factors of the effectiveness of community public space governance and the path to enhance the effectiveness of community public space governance, this analysis combines the influencing factors with the three stages of identification, management and confirmation in public value management theory, and constructs an indicator system for measuring and analyzing the effectiveness of community public space governance. The fsQCA3.0 is used to analyze the data of 300 residents in Tianjin, China, after which several aims that affect the effectiveness of community public space governance are obtained. The results show that the paths of "resident trust, property management is authoritative" and "customer oriented, democratic consultation" that bring higher governance efficiency have a consistency of 0.874761 and a coverage of 0.480994, which explains well what combination of antecedent factors should be present in communities with high public space governance effectiveness. Based on this, in order to improve the governance efficiency of community public space, improving residents' living experience and promote the modernization of China's urban construction, the government, property management company, owners' committee and neighborhood committee should increase investment in enhancing policy support, establishing service concepts, introducing technology and equipment, enhancing residents' trust and establishing dispute coordination agencies.

KEYWORDS

community public space, collective action dilemma, public value management, qualitative comparative analysis, empirical study

1 Introduction

Since American sociologist Perry proposed the concept of "neighborhood unit," the importance of spatial environment for community governance has been increasingly valued. The public space of a community essentially belongs to the public pond resources jointly owned by community residents, including material elements, public elements, subjective elements and social elements (Jiang and Guo, 2022). The governance of community public space means the production, distribution and

consumption of public space resources, and the limited nature of public space resources brings about competitiveness, so the dilemma of collective action and free riding behavior frequently occur in the governance process. The management of traditional commercial community is relatively closed and community public spaces are often paid for by owners in the form of shared areas, including parks, green spaces, roads, convenience facilities and even parking lots within the community. The ownership and enjoyment of public spaces belong to the community owners and citizens outside the community cannot freely enter or use the community public space. The closed management in commercial and unit residential areas can effectively protect the rights and interests of residents in various aspects such as road use, leisure, fitness and property safety within the community. Therefore, it has been highly praised for more than 30 years since the popularity of commercial housing communities in the 1990s. However, with the continuous advancement of urbanization, the level and types of citizens' needs are constantly increasing, and there are also frequent contradictions in the use of parking spaces, roads, green spaces and other public spaces within the community. In 2016, the State Council issued the "Several Opinions of the Central Committee of the Communist Party of China and the State Council on Further Strengthening the Management of Urban Planning and Construction," which clearly pointed out that "the block system should be promoted for new residential buildings, and in principle, closed residential communities should no longer be built. Completed residential communities and unit courtyards should gradually be opened up to achieve the public use of internal roads" (*The Central People's Government of the China, 2016*). The introduction of this regulation initiates the pace of opening up resources such as public spaces within residential areas to the outside world, but the management problems are also becoming more and more prominent, the contradiction between the national level of support and the social level of the wait-and-see has also made the governance of public space in the urban community has become more and more complex and urgent practical problems.

In order to solve the problem of effective utilization of public space under the trend of community openness, the academic community has discussed the spatial boundaries and efficiency of community public space governance. Some people support the continued promotion of closed residential areas, while others support the gradual opening of residential spaces to the outside world and ultimately towards open communities. From the perspective of the effectiveness of community governance and the scarcity of resources, the former believes that the separation of physical space boundaries inside and outside the community can effectively protect various internal resources of the community, so that governance activities from property companies, owners' committees or neighborhood committees can obtain more support from residents, that means closed residential areas can effectively protect the rights and interests of owners within the community in the current situation of widespread imbalance in internal and external resources. The latter, from the perspective of urban road network density and accessibility, points out that the existence of closed communities has formed various T-shaped roads and cut off roads. While providing roads, greenery, and other resources to the internal owners of the community, these resources are not fully utilized during leisure time, which also

has a negative impact on the long-term planning of urban public spaces. Therefore, it is necessary for community to open up roads to the outside world. In the governance of public space within a community, the governance entities represented by neighborhood committees, property management companies and owners' congresses often find it difficult to reach consensus on the definition, use and benefits of community public space, resulting in extremely low utilization efficiency of community public space. In the collective action field of the community, it is necessary to conduct in-depth theoretical discussions on whether public resources within the community should be shared with external members of the community and how to achieve good governance of community public space.

Based on the debate on the boundaries and governance effectiveness of public space in community governance, this analysis attempts to propose the following research questions from the perspectives of public value management and spatial governance: 1) How to measure the effectiveness of community public space governance? 2) What are the paths that influence the effectiveness of community public space governance? 3) How to improve the efficiency of community public space governance?

2 Literature review

2.1 Governance of community public space

The historical transformation from the planned economy to the Socialist market economy after the founding of the People's Republic of China has also greatly changed the form of community. At the moment when cities are rapidly industrializing and entering the post industrialization, the community form shows a development trajectory from the unit courtyard to the commercial housing community and then to the open community. Community governance innovations such as party building leadership, technological support and digital empowerment have provided feasible references for the modernization of grassroots governance in China (*Wang et al., 2022*). However, the rapid development of urbanization has led to disorderly urban expansion, fragmented community space and increasing commercialization. At the same time, the public demands of residents have greatly increased the carrying pressure of community space, so the phenomenon of overcrowding in community space is very serious and community conflicts occur frequently (*Yang and Liu, 2014*). Community conflicts refer to conflicts between residents and organizations based on immediate interests (*Min, 2010*), generally including economic interests, political rights or cultural values. Among them, conflicts of interest represented by material interests are the most widespread (*Yang, 2010*). Given the characteristics of community public space governance, some scholars have proposed that the implementation of collective action by residents should be facilitated in three basic ways, building resident identity to enhance residents' sense of community belonging, accumulating social capital to cultivate residents' awareness of rules, fulfilling rule commitments to achieve effective supervision (*Zhang, 2015*).

The governance of public space includes regulating how to use space, managing invested resources and maintaining the operation

of space (de Claudio and Matthew, 2009). However, the changes in urban and rural community space have changed these elements. In traditional rural governance, ancestral halls, wheat fields and markets serve as public spaces where rural members can communicate, alleviate anxiety, gather consensus and promote trust (Zhang, 2019). With the rapid development of urbanization, a large number of transitional communities have emerged from rural areas to cities. These communities face spatial adaptation in production, life and social relations. From differentiated spatial environments and high collective identity to standardized spatial environments and low collective identity, transitional communities face great challenges in terms of spatial form and governance models (Ding, 2023; Xu, 2019). In the reconstruction of the physical space and social space of the unit community, the grassroots government can carry out governance innovation in three ways. The first way is the coexistence of rational weak control and legal strong control in informal space control, the second way is the coexistence of market-oriented and non-profit paths in property management model innovation, and the third way is to build a collaborative governance space from “dispersion” to “reorganization” (Du and Chen, 2019).

2.2 Debate on whether community form is open or closed

In China, both the unit residential communities and the commercial housing communities are mostly closed communities, with a small number of old residential areas in a semi open management state. The focus of a closed community is to maintain the quality of the use of internal resources within the community. Through closed walls, a relatively independent community space is formed, ensuring the comfort and convenience of the living environment for the owner group within the community. The reason for this trend is that various public service delivery methods such as resource sharing, cost sharing and public-private-partnerships gradually blur the boundary between public and private spaces, which leads the commonality of public spaces to be eroded by modernization constantly (Johnson and Troy, 2013). However, the enclosed residential space not only occupies a large amount of public resources, but also brings about the division of urban public space, which in turn brings a series of transportation and social problems (Song and Chen, 2013). In addition, with the neighborhood relationships are becoming increasingly unfamiliar, community residents have poor self-organizing abilities, making it difficult to meet the diverse needs of residents at the individual level through self-organization. Closed management can also lead to property companies systematically depriving residents of their right to choose easily.

Open communities transform the organizational structure of “street areas and large closures” into a structural form of “small closures and large openness” through the sharing of community public space with external residents, enabling the integration of community construction and urban construction in terms of spatial layout, functional positioning and service provision (Wang, 2013). The advantages of an open community mainly lie in the cooperation and sharing of community and urban resources through the opening

of physical space, maximizing the efficiency of resource utilization. The opening of community public spaces has brought about many problems, such as the excessive use of public resources within the community by external entities, and the increase in governance costs caused by the overlapping scope of community and external public activities, which have greatly tested the ability of open community governance.

2.3 Relationship networks in community space governance

Bourdieu, a sociologist, argued that “field” refers to a network of objective relationships between various locations (Huakande, 2004). David Harvey introduces the concepts of urbanization, space and social justice (Lefebvre, 1992), and then Henri Lefebvre analyzed the relationship between public space and human care and pointed out that “space is permeated with social relations, which are not only supported by social relations, but also produce social relations and are produced by social relations” (Lefebvre, 2008). The reason why social space governance is linked with community relationship network is that as a typical urban governance field, the internal public space of a community reflects the adjustment of internal and external relations and the balance of power in the process of distribution and governance. Therefore, space practice can be seen as the process of individual construction of social action, and relationship network is the intermediary and result of space practice (An, 2020). With the transformation from unit communities to commercial communities in China and the reform of the housing system, the interest and power structures of community residents have shown fragmented characteristics (Qiang and Ge, 2013). The connection and expansion of the internal and external relationship network of communities have made it inevitable for communities to move from closed to open (Mao and Xiang, 2023).

The interaction between physical space and social space in communities reflects the transition from closed to open communities is not only an opening of physical space, but also an opening of social relationships. In this process, there must be psychological and emotional barriers for residents. With the opening of community space, the public values created by various community public resources in the governance process, such as service value, spatial value and relationship value, are also facing problems such as distorted value expression and aggregation mechanisms, interest hoarding and ineffective collaboration (Ding and Xu, 2019). Both in terms of relationship networks and the maintenance of public values, communities are facing great obstacles from being closed to being open.

2.4 Evaluation of existing studies

Previous studies have explored the difficulties in the governance of public spaces in urban and rural communities, incorporating physical space and social relationship networks into the analysis of community space governance, and thus providing comprehensive recommendations for improving the effectiveness of community public space governance. The exploration of future community

forms in theoretical field has shown a consistent trend of development from closed communities to open communities and from community system to block system. In the field of practice, China's government advocated the community from closed to open, but in the promotion of the popularization of the process to the developers and residents are still faced with great resistance. Although existing research has explored the public values and social relationships in community public space governance, and has reached a relatively consistent understanding of the form of open communities, there are currently many difficulties in the process of communities transitioning from closed to open. The difficulties are not only physical spatial planning issues, but also urgent issues such as how to enhance residents' psychological identity and share community governance costs and risks through reshaping public values. This analysis attempts to study these problems and provide a theoretical explanation from the perspective of public value management, in order to provide a model reference for the effective governance of community public spaces.

3 Research design

3.1 Research method selection

Social science research is mainly aimed at solving the two sets of relationships of "causality" and "correlation." Traditional qualitative research has a small sample size, usually selecting individual cases or a few cases as the research object. Although such research can deeply describe the process of sample changes and development, due to the subjectivity and quantity limitations of sample selection, statistical inference cannot be made. Quantitative research emphasizes explaining the development and changes of things through scientific sampling of large samples. Although its explanation of reality is highly reliable at the statistical level, it lacks a deep understanding of the samples and is difficult to provide a deep explanation of causal mechanisms. When studying social science issues involving small and medium-sized samples, the qualitative comparative analysis method (QCA) can combine the advantages of the first two, focusing on both the process and differences. The qualitative comparative analysis method analyzes the non-linear relationship between variables from the perspective of set theory and Boolean algebra. Its set thinking can explain the combination of conditions that lead to the appearance or non-appearance of results, and is very suitable for explaining the causal relationship between multiple independent variables and a single dependent variable in small and medium-sized sample cases. The solutions of QCA include three types, complex solution, parsimonious solution and intermediate solution. Complex solution only simplifies cases that exist in reality, while parsimonious solution simplifies all logical residuals as if they exist in reality to produce the simplest path. Intermediate solution only simplifies cases by using easy counterfactual from the logical residuals, which refers to the logical combination that is considered important based on theoretical and practical knowledge, although not present in

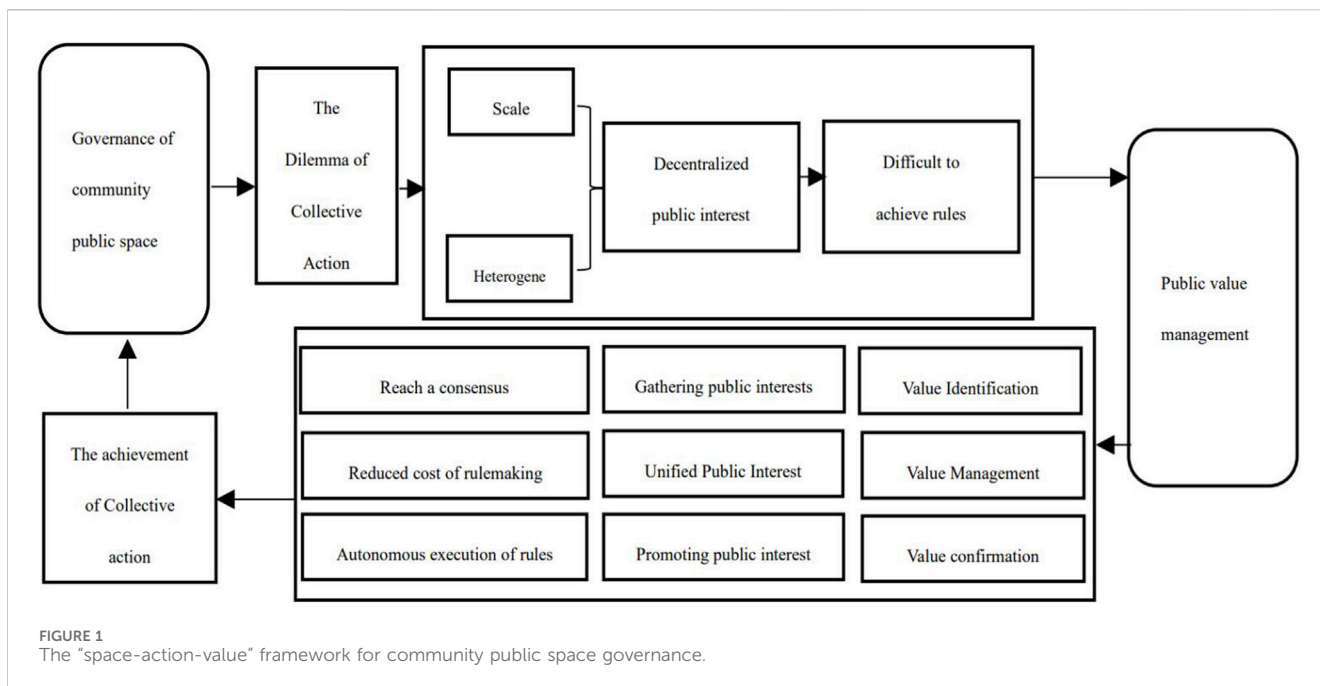
the collected cases. Usually, an intermediate solution is used for analysis, which not only overcomes the problem of insufficient sample size coverage resulting in a large number of logical residuals, but also combines reality to avoid oversimplification of paths.

Although most of the existing studies have verified the correlation and covariance of each factor on the governance effectiveness of public space in urban communities from the aspect of empirical analysis of large samples, the causality test of a single factor is difficult to make a reasonable explanation for the changes in the governance effectiveness of communities under the complex and changing community governance environment. Considering that the effectiveness of community governance of public space is affected by multiple factors at the same time, and that a single factor is not the decisive factor leading to good or bad governance, this analysis chooses the method of qualitative comparative analysis to explore which factors jointly affect the effectiveness of governance of public space.

3.2 Cases selection

The cases used for comparative analysis must have sufficient similarity in specific dimensions, that is, there must be sufficient background and features shared between cases, which is the first factor to consider in case selection. The second standard in case selection is heterogeneity and diversity, which means that both positive and negative cases should be included (Rihaux and Larkin, 2017).

Tianjin is one of the earliest coastal open cities in northern China, and has taken the lead in urban development concepts nationwide. Since China began to implement open communities in 2016, Tianjin began to implement a new community planning pilot program featuring "narrow roads and dense networks, open and vibrant communities" in 2017, which encourages older neighborhoods and newly built commercial neighborhoods to open up their community roads to alleviate the traffic pressure on urban roads. At present, Tianjin City under the 16 districts, according to China's local governance capacity evaluation system, the 16 districts of the security capacity, regulatory capacity, financial capacity, participation in the ability to be measured separately, resulting in the Heping District, Nankai District, Hexi District for the first echelon; compared to the above three districts, Hebei District, Hongqiao District, Hedong District for the second echelon; in addition to the city outside of six districts of the Binhai New District, Wuqing District, Beichen District, Jinghai District, Xiqing District, Jizhou District and other districts are the third echelon. Therefore, in the selection of case samples, this analysis selects one community that operates well and one community that operates poorly in Heping District (the traditional core area), Hongqiao District (the new core area) and Binhai District (the subcenter of city) of Tianjin for questionnaire distribution. The criteria of whether the community is running well or not are based on the results of the annual evaluation of neighborhoods in each district in 2022 issued by the Tianjin Municipal Bureau of Civil Affairs.



3.3 Theoretical framework construction and variables selection

3.3.1 Framework construction

The main research question of this study is how to improve the governance effectiveness of urban community public space, so it is necessary to define the governance of community public space firstly. In a broad sense, community public space governance can be understood as all governance activities taken around the allocation, construction, use and management of community public space, such as site selection, construction, operation, etc. Narrowly speaking, community public space governance only refers to the governance activities taken around the use and occupation of space within the established public space of the community, such as the allocation of parking spaces and the use of entertainment facilities (Zhang, 2020). This analysis adopts the concept of community public space governance in a narrow sense, which conducts research from the perspective of internal management such as the use, occupation, benefits and maintenance of existing public spaces in the community.

Community public space belongs to public pond resources internally and private goods externally. To achieve effective governance, it is necessary for internal members of the community to reach consensus on resource use and benefits based on a unified understanding. However, in the process of governance, the size of community members and the heterogeneity of residents often lead to difficulties in unifying public interests related to the use and benefits of community resources or extremely high costs of achieving rules. Especially in open communities where high mobility of community members and blurred community boundaries make the size and heterogeneity of community members using public space larger, it is more likely to generate a dilemma of consensus in the use and occupancy of public space.

Urban community is a living community formed by people based on blood, geography, religion and other factors, in which people have a relatively consistent value identity and can actively promote and provide convenience to each other (Tönnies, 2010), so it is necessary to have common interests and unified values in this process. The public value management (PVM) theory proposed by Mark Moore explains the causes of the collective action dilemma in community public space governance from the perspective of the unity of public values and the enhancement of public interests. PVM advocates for the collection, unity and enhancement of public values from three aspects, value identification, value management and value confirmation, which can promote consensus building in community public space governance, reduce the cost of rulemaking and ultimately achieve autonomous execution of rules. Based on the above analysis, this study constructs a theoretical analysis framework of "space-action-value" from the perspective of PVM and collective action achievement (see Figure 1).

3.3.2 Variables selection and measurement

Based on the research question, this analysis requires defining and measuring the dependent variable "efficiency of community public space governance" and the independent variable "influencing factors of community public space governance efficiency."

Regarding the research on the effectiveness of community public space governance as a dependent variable, scholars have proposed four basic dimensions of governance interfaces, namely interface area (identification of governance objects), interface span (selection of governance subjects), interface level (design of governance mechanisms) and interface density (distribution of governance elements) (see Table 1) (Han and Li, 2022). Some scholars have also proposed the "contact governance" model based on the analysis framework of "purpose-subject-element," in which the concrete physical space, public resources, public activities and public authority are the four dimensions for evaluating the effectiveness

TABLE 1 The four dimensions of governance interface.

Basic dimension	Description	Key content	Measurement dimension
Interface area	Governance Object Identification	Size of the governance unit/extent of governance and capacity of its boundaries/interfaces	Length, width, height, breadth, scope, scale, capacity
Interface span	Selection of governance subject	Governance margins/division of authority and responsibility/division of labor/cooperation and conflict	Number of departments, number of laws and regulations, number of other social agents
Interface level	Governance mechanism design	Upper and lower hierarchical relationships/rationalization of process design/hierarchy of elements	Chain of command, operational processes, information transfer links, working links
Interface density	Distribution of governance elements	Imaginary and real nature of the interface/connections and relationships of the subjects/frequency and intensity of multilateral interactions	Frequency of interaction, concentration, centrality, compactness, distance, intensity

Source: Self-made by the author.

TABLE 2 Indicator system for governance of community public space.

Role of variable	Primary indicator		Secondary indicator	Variable description
Dependent Variable	Governance Effectiveness (Y)		Y1: Space utilization efficiency	Efficiency index: Frequency, accessibility and convenience of space use
			Y2: Space Occupancy Effectiveness	Equity index: Whether there is private occupancy and how efficient it is
			Y3: Space gain effectiveness	Efficiency and Equity index: Whether there are benefits and how reasonable the distribution of benefits is
			Y4: Space maintenance effectiveness	Effectiveness index: Whether there is routine maintenance and how effective it is
Independent Variable	Public Value Management X)	Value recognition	X1: Measuring Public Opinion	Availability of permanent channels for gauging public opinion
			X2: Stating needs	Availability of permanent channels for the expression of claims
			X3: Expressing preferences	Availability of diversified facilities and services
		Value management	X4: Collaborative management	Whether property, neighborhood councils and boards are cooperating in governance
			X5: Conflict coordination	Availability of a permanent dispute mediation body
			X6: Coherence of authority and responsibility	Are the Rights and Obligations of Residents Reasonable Whether the rights and obligations of property companies are reasonable
		Value recognition	X7: Results consistent with expectations	Whether the goal of good governance of public space is achieved
			X8: Value creation and loss	Whether the public interest of the residents of the neighborhood is promoted
			X9: Citizen satisfaction	Are residents generally satisfied
	Type of Community		X10: Degree of openness	Open community or gated community

Source: Self-made by the author.

of rural public space governance (Yan and Zhang, 2020). The concrete physical space includes ancestral halls, tea houses, theaters, village entrances, water wells and nearby grinding plates, markets, etc. Public resources include both rural endogenous resources and externally endowed resources, such as village collective assets, homestead approval rights and public property.

Public activities include weddings and funerals, cultural and artistic activities, social activities and dragon or lion dances. Public authority can be recognized as values, customs, village rules and agreements that transcend individual power and are recognized by the public, or rural capable individuals recognized through personal prestige and charisma.

TABLE 3 The design of questionnaire question.

Number	Content	Corresponding variable
1	What type of community do you live in?	X10
2	How often do you use public fitness and leisure facilities, public green Spaces, public parking Spaces and other public Spaces in the community?	Y1
3	Do you find it convenient to use these public Spaces and facilities?	
4	Is there any private occupation of public space in your community?	Y2
5	Do you think the public space in your community is properly divided and used?	
6	Is there any benefit in the use of public space such as elevator advertising space rental and parking space rental in your community?	Y3
7	Is the income gained from the use of public space in your community by charging parking fees, renting elevator advertising space, etc. publicized to the owners and used for the development of the community?	
8	How often does your community maintain public areas such as public green Spaces, public fitness and leisure facilities?	Y4
9	Does your community conduct public opinion evaluation on public space governance issues such as parking management, elevator maintenance, and green space maintenance?	X1
10-a	Is there a feedback channel about public space in your community?	X2
10-b	Can you give some examples of the channels for public opinion feedback provided by the community?	
11-a	Does your community provide personalized and diverse public facilities and services for residents of different ages?	X3
11-b	Can you give an example of what personalized and diversified public facilities and services the community provides?	
12	Do the property company, the neighborhood committee and the owners' committee in your community negotiate to handle community public affairs?	X4
13	Is there a permanent resident dispute mediator or institution in your community?	X5
14	In the daily management of your community, is the division of labor between the neighborhood committee, the industry committee and the property company reasonable?	X6
15	Do you agree that your community has improved the living experience of its residents through the management of public Spaces?	X7
16	What do you think of the effectiveness of public space maintenance and governance in your community?	X8
17	Are you generally satisfied with the daily management of the community?	X9

Source: Self-made by the author.

Regarding the independent variables that affect the effectiveness of community public space governance, scholars currently mainly summarize the reasons for conflicts in community public space governance from the perspective of community collective action achievement, including residents' identity and sense of belonging (Zhang, 2015), rule restrictions and trust (Robert, 1995), rule enforcement supervision and interest expression channels (Sampson et al., 2002). According to the neighborhood effect, the characteristics of residential areas can also have a direct impact on residents' attitudes and behaviors (Zhang, 2007).

Based on the above viewpoints, from the perspective of the three core pursuits of public management, namely efficiency, effectiveness and equity, this analysis collects data on the use, possession, income and maintenance of community public space to measure the dependent variable of "governance effectiveness of community public space." In addition, existing studies pointed out that different levels of community openness can affect the effectiveness of community public space governance. Therefore,

variable X10 is added to jointly form an indicator system that gauges the effectiveness of community public space governance (see Table 2) (Wu, 2020).

3.4 Questionnaire design and data validation

3.4.1 Questionnaire design

The construction of questionnaire items needs to be based on existing indicator explanations. According to the indicator system of community public space governance constructed in Table 2, this analysis designs questionnaire items by measuring a variable through multiple questions. A total of 17 items are constructed for the 14 variables that need to be measured, as shown in Table 3. The question design is based on the variables in the existing index system and the three dimensions of the theoretical framework of public value management to ensure the structural validity of the questionnaire. The question options include binary variables of yes or no, as well as quartile variables

TABLE 4 Reliability statistics.

Cronbach's alpha	Number of items
0.763	17

Source: Calculated by SPSS26.

from low to high. The reason why the quartile method of the Li Kert scale is not chosen is that if the value assigned to the QCA is 0.5, it is the maximum fuzzy point. If there are too many data with the maximum fuzzy point in the sample, it is difficult to judge the sample's tendency on the question item. That is, 0, 0.33, 0.67 and 1 are used as the corresponding values behind the four items respectively.

3.4.2 Questionnaire data verification

3.4.2.1 Questionnaire distribution and recovery

The questionnaire was issued from August 1 to 30 August 2023. The questionnaire is mainly distributed to community residents, considering that residents are both users of public spaces and objective subjects for evaluating the effectiveness of community public space governance. Their usage experience can more intuitively reflect the effectiveness of community public space governance. In the selection of samples of residents in each community, stratified sampling surveys were conducted on residents of different ages, which were mainly divided into three age groups: over 60 years old, 35–60 years old and under 35 years old, and random sampling was conducted among residents in each age group.

According to the above criteria, 60 questionnaires were distributed in each of the 6 selected communities, and 352 questionnaires were finally distributed and collected through the Questionnaire Star online. According to the answer integrity of the questions and cross-verification of

mutually exclusive question options after the questionnaire is recovered, invalid questionnaires that do not meet the requirements are eliminated, and 300 valid questionnaires are finally obtained.

3.4.2.2 Reliability and validity verification of questionnaire data

The collected 300 valid questionnaire data were incorporated into SPSS26 software for reliability and validity analysis. In the reliability analysis, Cronbach's alpha coefficient was adopted for judgment, and the final result of 0.763 was greater than 0.7, indicating that the data had a high degree of reliability, as shown in Table 4.

By conducting exploratory factor analysis (EFA) on the data, factor extraction and principal component analysis were carried out on the measurement items composed of 10 independent variables, and 10 effective factors were extracted with factor loads greater than 0.9, which proved that the questionnaire had good structural validity, as shown in Table 5.

4 Empirical results and analysis

4.1 Raw data Calibration and truth table construction

The variables selected in this study include values such as yes (1) or no (0), as well as interval values between 0 and 1. Considering the coding method of csQCA and mvQCA, the dependent variable Y is taken from the average of Y1, Y2, Y3 and Y4. The independent variables are taken as 1 or 0 based on yes or no, and 0, 0.33, 0.67 or 1 based on different levels of preference among residents. This analysis standardizes the raw data and obtains the truth table of all samples.

TABLE 5 The component matrix after rotation.

No.	1	2	3	4	5	6	7	8	9	10	Variable
1			0.972								X1
2									0.911		X2
3										0.911	X3
4	0.961										X4
5		0.964									X5
6								0.938			X6
7					0.967						X7
8							0.954				X8
9						0.966					X9
10			0.991								X10
Extraction method: principal component analysis											
Rotation method: Caesar's normalized maximum variance method											

Source: Calculated by SPSS26.

TABLE 6 Necessity and Sufficiency of single factor of “Achieved good governance of community public space.”

Antecedent condition	Consistency	Coverage	Antecedent condition	Consistency	Coverage
X1	0.570973	0.825174	~X1	0.788369	0.615209
X2	0.695659	0.531432	~X2	0.304341	0.458082
X3	0.648619	0.727918	~X3	0.673130	0.621916
X4	0.756038	0.704640	~X4	0.600805	0.667215
X5	0.667876	0.755048	~X5	0.701004	0.643796
X6	0.805258	0.726119	~X6	0.622422	0.720047
X7	0.804041	0.715222	~X7	0.592936	0.698209
X8	0.836734	0.705616	~X8	0.561542	0.712990
X9	0.837564	0.707769	~X9	0.561641	0.710919
X10	0.272692	0.524747	~X10	0.727308	0.500300

Source: Calculated by fsQCA3.0.

TABLE 7 Necessity and Sufficiency of single factor of “Failure to achieve good governance of community public space.”

Antecedent condition	Consistency	Coverage	Antecedent condition	Consistency	Coverage
X1	0.493433	0.694149	~X1	0.875726	0.665207
X2	0.630124	0.468568	~X2	0.369876	0.541918
X3	0.579602	0.633167	~X3	0.750937	0.675353
X4	0.692152	0.627944	~X4	0.674439	0.729072
X5	0.601548	0.661979	~X5	0.777410	0.694981
X6	0.751392	0.659530	~X6	0.687971	0.774713
X7	0.736711	0.637903	~X7	0.671111	0.769249
X8	0.767780	0.630250	~X8	0.641377	0.792701
X9	0.765381	0.629573	~X9	0.644730	0.794391
X10	0.253719	0.475253	~X10	0.746281	0.499700

Source: Calculated by fsQCA3.0.

4.2 Necessity and sufficiency analysis of a single independent variable

The qualitative comparative analysis method mainly analyzes how the respective variables are combined to have an impact on the dependent variable, assuming that no single independent variable is a necessary or sufficient condition for the dependent variable. In fsQCA3.0 software, the options of coverage and consistency testing can be used to analyze each independent variable. Generally speaking, the standard for determining a necessary condition for an independent variable is coverage $(X_i \leq Y_i) \geq 0.9$, which means that when the probability of cases containing the condition is greater than or equal to 0.9, then this variable can be seen as a necessary condition. The criterion for determining it as a sufficient condition is consistency $(X_i \leq Y_i) \geq 0.8$, which means that the probability of the result occurring when the condition occurs is greater than or equal to 0.8, then this variable can

be seen as a sufficient condition (Rihoux & Lobe, 2010). The necessity and sufficiency of single variable are shown in Tables 6, 7.

As shown in Table 6, in the necessity and sufficiency analysis of the antecedents for “Achieved good governance of community public space,” X6, X7, X8 and X9 have consistency greater than or equal to 0.8, and the antecedents with coverage greater than or equal to 0.9 do not exist. Therefore, there is no single variable that can be considered as a sufficient and necessary condition for the occurrence of this result.

In the necessity and sufficiency analysis of the antecedents for “Failure to achieve good governance of community public space” in Table 5, there are ~X1 and ~X2 with consistency greater than or equal to 0.8, and the antecedents with coverage greater than or equal to 0.9 do not exist. Therefore, there is no single variable that can be considered as a sufficient and necessary condition for the occurrence of this result.

TABLE 8 The combination of antecedent conditions for “Achieved good governance of community public space.”

Configuration	Intermediate solution		Parsimonious solution
	1	2	1
X1	⊗		
X2		●	
X3	⊗	●	
X4		●	
X5			
X6	●	●	
X7	●	●	
X8	●	●	
X9	●		●
Number of cases	18	25	45
Consistency	0.923524	0.88933	0.707769
Raw coverage	0.3241	0.342929	0.837564
Unique coverage	0.138065	0.156894	0.837564
Overall solution consistency	0.874761		0.707769
Overall solution coverage	0.480994		0.837564

Source: obtained after the operation of fsQCA3.0. Note: frequency cutoff = 5, consistency cutoff = 0.913087. Assumptions: X5 (present), X8 (present). ● represents the existence or high membership score of the condition, and ⊗ represents the absence or low membership score of the condition.

4.3 Path analysis based on combination of antecedent conditions

Place the independent variables X1-X9 and the dependent variable Y into fsQCA3.0 for analysis, set the frequency of case occurrences greater than or equal to 5 and consistency greater than or equal to 0.8 as screening criteria, and combine the reality of community public space governance to set X5 (conflict coordination) and X8 (value creation and loss) as present while other variables as present or absent. The combination path of antecedents for “Achieved good governance of community public space” and “Failure to achieve good governance of community public space” has been identified.

4.3.1 The path and analysis of “achieved good governance of community public space”

In Table 8, it can be seen that in the combination of conditions for achieving “Achieved good governance of community public space,” the intermediate solution of $\sim X1^* \sim X3^* X6^* X7^* X8^* X9$ and $X2^* X3^* X4^* X6^* X7^* X8$ have high consistency and coverage, corresponding to 18 and 25 case samples, with a total consistency of 0.874761 and a total coverage of 0.480994.

The first path can be summarized as the type named “property management is authoritative and wins residents’ trust.” In this type of community governance, there is no tradition or channel for residents to express their wishes, nor is there a targeted provision of diversified public facilities and activity spaces for the elderly and children. However, property companies have a high degree of specialization, strong sense of responsibility and strong authority

within the community residents. Typical community representatives are emerging commercial housing communities in cities.

The second path can be named “customer oriented and consultation is democratic.” In this type of community governance, the demands of residents are often well met. Property management companies, neighborhood committees and owners’ committees can engage in equal dialogue and handle community public affairs. The division of powers and responsibilities among multiple governance entities in the community is clear and reasonable, achieving a relatively benign promotion of public interests, Typical community representatives are improved commercial housing communities in the urban core area.

In addition, the appearance of X9 in the aggressive strategy has a consistency of 0.707769 and a coverage rate of 0.837564, corresponding to 45 case samples. From this, it can be concluded that there is a direct correlation between residents’ overall satisfaction and the effectiveness of community public space governance, and the relationship between community public space governance and residents’ satisfaction is equivalent in a sense.

4.3.2 The path and analysis of “failure to achieve good governance of community public space”

In Table 9, it can be seen that in the combination of conditions for achieving “Failure to achieve good governance of community public space,” the intermediate solution of $\sim X1^* \sim X2 \sim X3^* \sim X4^* \sim X6^* \sim X7^* \sim X9$, $\sim X1^* \sim X3^* X4^* X6^* X7^* X8^* X9$, $\sim X1^* X2^* X4^* X6^* X7^* X8^* X9$, and $X2^* X^3 X4^* \sim X5^* X6^* X7^* X8^* X9$ have high consistency and coverage,

TABLE 9 The combination of antecedent conditions for “Failure to achieve good governance of community public space.”

Configuration	Intermediate solution				Parsimonious solution	
	1	2	3	4	1	2
X1	⊗	⊗	⊗			⊗
X2	⊗		●	●		
X3	⊗	⊗		●		
X4	⊗	●	●	●		
X5				⊗	⊗	
X6	⊗	●	●	●		
X7	⊗	●	●	●		
X8		●	●	●		
X9	⊗	●	●	●		
Number of cases	49	28	19	13	32	54
Consistency	0.932138	0.903304	0.832263	0.852003	0.694981	0.665207
Raw coverage	0.19458	0.325664	0.295608	0.196853	0.77741	0.875726
Unique coverage	0.120989	0.0229509	0.024936	0.0156779	0.0820554	0.180372
Overall solution consistency	0.8492				0.623598	
Overall solution coverage	0.528818				0.957782	

Source: obtained after the operation of fsQCA3.0. Note: frequency cutoff = 5, consistency cutoff = 0.913087. Assumptions: X5 (present), X8 (present). ● represents the existence or high membership score of the condition, and ⊗ represents the absence or low membership score of the condition.

corresponding to 49, 28, 19 and 13 cases, with a total consistency of 0.8492 and a total coverage of 0.528818.

The first path is named “public lack and disorderly management.” In these communities, there is no clear division between private and public spaces and may not be property management companies, neighborhood committees or owners’ committees. The governance of public spaces such as roads, corridors and parking space relies on municipal sanitation companies or residents themselves, so the conflicts often arise between residents due to the use and maintenance of public spaces. Typical community representatives are old unit houses or old residential areas that have been relocated to villages within the city.

The second path can be summarized as “public opinion ignored and one-way management.” In this type of community, individual residents are unable to express their own wishes and participate in the decision-making of daily community affairs. Property companies, neighborhood committees, and owners’ committees cooperate to be responsible for the decision-making of daily public affairs. Although residents are relatively satisfied with the division of rights and responsibilities of various governance entities in the community, due to the complexity of community affairs and the lack of public opinion expression mechanisms, residents are still unsatisfied with the governance effect of public space, which is typically represented by the newly built commercial housing community in the urban fringe with a large number of young people.

The third and fourth paths can be summarized as “public opinion ignored and conflicts accumulated.” In such communities, residents either do not have a way to express their will or there is a lack of negotiation and resolution of public affairs disputes within the community. The lack of these two channels often leads to ineffective

resolution of conflicts within the small area, so residents lose confidence in the spatial governance ability of the community at this rate. Once a conflict occurs, it can lead to the rapid failure of internal coordination mechanisms and even attract external forces to intervene, typically represented by low-end urban communities with property companies and neighborhood committees are at a disadvantage.

In addition, the appearance of ~X5 and ~X1 in the aggressive strategy showed consistency of 0.623598 and coverage of 0.957782, corresponding to 32 and 54 cases. From the sample size of the case, it can be determined that although ~X1 and ~X5 are not sufficient and necessary conditions for low efficiency of community public space governance, the two independent variables have a direct impact on the occurrence of ~Y after the intervention of logical residuals. Therefore, they can be considered as important influencing factors for poor effectiveness of community public space governance.

5 Research findings and policy suggestions

5.1 Research findings

This study analyzes the identification, management and confirmation of public value in community public space governance as independent variables, and the effectiveness of community public space governance as dependent variable. It explores several paths that lead to good community public space governance and bad community public space governance, and analyzes the combined paths of single influencing factors and antecedents. The following research findings are drawn.

First of all, the effectiveness of community public space governance is influenced by the comprehensive factors of public value identification, management and confirmation in governance actions. No single factor in evaluating public opinion, stating needs, expressing preferences, cooperative management, conflict coordination, consistency of rights and responsibilities, value creation and loss, consistency of results and expectations, citizen satisfaction and community openness is sufficient to directly lead to the effectiveness of governance. It is different from the findings in existing research that material factors, subject factors, social factors directly affect the effectiveness of community public space governance (Jiang and Guo, 2022). It proves that the governance effect of community public space is affected by many concurrent factors, and better corresponds to and explains the dilemma faced by community public space such as public pond resources in governance.

Secondly, the paths that bring about good governance efficiency in community public spaces include “property management is authoritative and wins residents’ trust” and “customer oriented and consultation is democratic.” In these two paths, the simultaneous occurrence of three influencing factors, consistent rights and responsibilities, consistent results and expectations and value creation and loss has a positive impact on the appearance of results. The difference between the two paths lies in evaluating public opinion, stating needs, expressing preferences and cooperative management, which also reflects that in the governance of community public space, value identification has not received enough attention from residents and other community governance entities, and the interests of residents’ public spaces are generally represented by property companies and neighborhood committees, and there is no permanent mechanism for consultation on what constitutes agreement on the common good of the community.

Finally, the paths that lead to the low efficiency of community public space governance include “public lack and disorderly management,” “public opinion ignored and one-way management” and “public opinion ignored and conflicts accumulated.” Among the three paths that are relatively consistent, although the division of power and responsibility within the community is reasonable and the public interests of residents in the community have also been basically improved, there is a general lack of feedback channels for residents’ opinions or mediation institutions for residents’ disputes. The result indicates that these two factors are crucial for improving the effectiveness of community spatial governance and their lack will directly lead to a decrease in the effectiveness of community public space governance.

5.2 Policy suggestions

The effective governance of community public space is an inevitable requirement for people to pursue the improvement of living quality when China enters the stage of post-industrial society. It is also the only way to solve contradictions in the transformation of old residential areas to commercial communities and promote community residents’ exchanges and mutual assistance in China. In the process of improving the effectiveness of community public space governance, cooperative governance forms have emerged that enable people to constructively participate in policy formulation and management across public, private and citizen groups in order to achieve public goals (Emerson et al., 2012). In order to ensure the multi-subject coordination mechanism, public opinion expression mechanism, residents dispute mediation mechanism smooth, the government, neighborhood committees, property

companies and owners’ committees should collaborate to provide policies, facilities, technology Platform and personnel support.

First of all, as the representative of the public sector, the policy support provided by the urban government and the subdistrict office can effectively regulate the behavior and values of all subjects in the governance of community public space. In terms of policy, the state can issue legal norms to govern illegal acts such as throwing objects at high altitude in communities according to the Civil Code and the Criminal Law. For communities that meet the conditions for pedestrian and vehicle separation, laws should be formulated to regulate the driving and parking behavior on community roads. Policy guidance should be provided at the macro level for parking difficulties, elevator installation and access safety issues in old residential communities, encouraging neighborhood committees, property management companies and owners’ committees to negotiate solutions based on the situation of the community. In addition, the subdistrict office under the government and the functional departments of civil affairs, fire protection, public security and environmental protection should actively connect with the relevant institutions and personnel within the community, and regulate their daily management activities from the perspective of public value. For example, the fire department can carry out irregular inspections of fire fighting equipment, flying line charging and daily inspection of fire passages, the public security department can get more involved in public space conflicts such as disputes over public parking Spaces in communities, and the environmental protection department can regulate the sanitation treatment of the community.

Secondly, as a profit-making entity that directly operates and manages community public space, property companies should provide support for community public space governance at the facility and technical levels, instead of making rules on behalf of residents in the management and even profit of public space in the community. It is not uncommon for property management companies to encounter conflicts with residents and neighborhood committees regarding public affairs such as community waste disposal, high-altitude throwing, green maintenance and parking space management. As a commercial operation entity chosen by residents through voting, property management companies should abandon the dominant mindset of property management after moving into the community, positioning themselves as service entities rather than management entities and integrating the concept of collaborative governance into daily operations. In the formulation of community management rules, the first step for property companies is to follow government laws and neighborhood committee regulations, while fully utilizing the effective communication between the community committee and residents and regularly holds meetings with the industry committee and the neighborhood Committee on matters related to the development of public space in the community. What’s more, they should disclose the collection standards of property fee and the usage of public space profits. In addition, property companies are good at updating the community security system and recreational facilities according to the technological development, such as the 24-hour 360 panoramic intelligent monitoring system and leisure equipment for residents.

Once again, as a owners’ committee initiated by residents’ self-organization, it should have a more legitimate and reasonable position in the decision-making of community public affairs, providing a platform for the expression of residents’ interests and demands. The government should issue the Regulations on the Management of Urban Community Owners’ Committees to clarify the status of owners’ congresses from a

legal perspective. The neighborhood committee should provide the chairman of the owners' assembly with a meeting seat in the decision-making process of public affairs in the community. The property management company should maintain smooth communication with owners' committee and fully respect their suggestions. As the main principal of the owners' committee, residents should raise awareness of their power, actively participate in the preparation and election of the owners' committee, and effectively express organized public opinion through it. The residents' discussion platforms and dispute mediation institutions are set up in neighborhood committees in general, and the trust and enthusiasm of residents towards this platform are not high. The residents' discussion and consultation platform established under the leadership of the owners' committee is more closely related to the living needs of residents and has a more convenient way of participation. Due to the inherent resident identity of the owners' committee members, residents in the community have more trust in this way of expressing their wishes and have higher enthusiasm for participation. As the main client of the industrial committee, the community residents should improve their understanding of the industrial committee, actively participate in the preparation and election of the industrial committee, and effectively express the organized public opinion through the channel of the industrial committee. At present, the mechanism and channel for residents to participate in the expression of community public decision-making opinions are not smooth enough. As the grassroots representative of the public sector, the sub-district office should urge the community that has not established the industry committee to take the initiative to promote the establishment of the industry committee through administrative penalties, and let residents and property companies realize the importance of the legal status of the industry committee through regular publicity.

Finally, as a grassroots autonomous organization for residents to self-manage, self-educate and self-serve themselves, neighborhood committees serve as bridges and bonds connecting the government and residents, playing a buffering and coordinating role in the game between public and private power. Dispute mediation among residents is the focus of community affairs, and the neighborhood committee has a special power between public and private. Especially when the property company conflicts with the owners, the neighborhood committee can use the public power granted by the subdistricts office to require the property company to comply with laws and social norms and even give priority to the reasonable demands of residents. The dispute mediation mechanism established under the leadership of the neighborhood committee can be either institutional or personnel level, with community grid management personnel conducting door-to-door coordination, assigning responsibility to individuals and resolving conflicts in the bud. In addition, the neighborhood committee can also collaborate with the property committee to develop a property service evaluation system for the community. This system designs issues such as evaluators, evaluation objects, evaluation standards and evaluation frequency. By reflecting real-time and dynamic property service quality, the management behavior of the property company can be corrected in a timely manner and the reasonable demands of homeowners can be actively met. For residential property companies with low resident satisfaction and low ranking of community governance effect, the neighborhood committee should organize residents to vote on whether to replace the property company.

5.3 Deficiencies and discussions

Due to the limited scope, this study only conducted qualitative comparative analysis on 300 samples. When faced with the effectiveness of public space governance in many different types of communities, the explanatory power and generalizability are limited. In future research, indepth analysis should be conducted on the impact of community types, resident heterogeneity, urban-rural regional types and social capital (rules, networks, trust) (Robert, 1995) on the effectiveness of community public space governance, and conducts classified research on cities in different regions in order to improve the explanatory power of research conclusions.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Ethics statement

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. Written informed consent from the participants was not required to participate in this study in accordance with the national legislation and the institutional requirements.

Author contributions

YL: Writing—original draft, Writing—review and editing.

Funding

The author(s) declare financial support was received for the research, authorship, and/or publication of this article. This research was funded by Tianjin Social Science Foundation Youth Project, grant number TJZZQN22-001.

Conflict of interest

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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