

Space diversification process and evolution mechanism of typical village in the suburbs of Guangzhou: A case study of Beicun

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Abstract: The reform of global production mode and social system accelerate the process of urbanization, and the urban-rural factors accelerate rural space diversification. Based on the space production theory and game theory, this paper analyzed the space diversification process and its influence on Beicun village. The results show that: (1) In the past 30 years, the development of Beicun has experienced three stages: agricultural development, industrial development, and service industrial development. The industrial structure has changed from single to diverse. The transformation of agricultural decentralization to rural community has been realized. (2) Accompanying the rural economic development transformation, the land use type and structure of Beicun has diversified. The spatial relationship of various types of land use was complicated and gave rise to new characteristics of mixed land for commercial and residential use, and industrial and commercial use, gradually forming a circular spatial layout structure model of public service facilities, traditional residential areas and modern residential areas, commercial areas, agricultural and industrial areas. (3) Rural space diversification was mainly due to the intervention of new industries and the transformation of leading industries. The endogenous land transferring mechanism and exogenous urban capital jointly promoted the industrialization process, and the market power promoted the transformation of industry into the service industry. (4) The industrialization process promoted the functional replacement of historical buildings by village organizations. It changed the social relations of the village with the blood clan and geography oriented, and produced the occupational relation between migrant workers and urban low-income groups. (5) The multi-differentiation of suburban rural space followed the game logic of capital and land interests. The rural community played a key mediation in the competition for space and the game of interests among local villagers, farmers, economic cooperation, industrial operators, and service owners.

Keywords: rural development; space differentiation; space production; game theory; Beicun village

Received: 2020-01-15 **Accepted:** 2020-03-01

Foundation: National Natural Science Foundation of China, No.41871177, No.41801088, No.41401190; Science and Technology Program of Guangzhou, China, No.201707010097

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1 Introduction

With the globalization, urbanization, informationization, and marketization continuously spreading to the countryside, the rural economy form, space pattern, social function, and cultural forms have radically shifted. All kinds of commodities and capital are transferred from the city to the rural market (Liu *et al.*, 2017; Tabayashi, 2010; Yang *et al.*, 2018), resulting in capitalization and diversification of rural spatial landscapes such as rural settlements, residential buildings, and land resources (Fang *et al.*, 2012; Fang *et al.*, 2015; Liu *et al.*, 2018; Woods, 2010). Rural space productionism transformed to post-productionism (Mather *et al.*, 2006; Baylina *et al.*, 2010; Braun *et al.*, 2012), rural space reconstruction (Tu *et al.*, 2017; Long *et al.*, 2018a; Long *et al.*, 2018b), rural-urban migration (Argent *et al.*, 2015), and the second home (Halfacree, 2012; Argent *et al.*, 2015) have gradually become international research hotspots of rural geography. The research topics mainly focus on the following aspects:

(1) Research on the process and reconstruction mechanism of rural space diversification. With the development of social and economic conditions such as urbanization and industrialization, the space structure and functions of rural settlements have changed (Qu *et al.*, 2017). Urbanization changes the internal space structure of rural residential land use through population mobility. While industrialization affects rural development through industrial restructuring and economic development (Ma *et al.*, 2018), Holmes (2016) believes that with the development of rural economy and society, rural areas are constantly transforming into diversified directions such as production, consumption, and ecology driven by the market, and puts forward the theory of “multi-functional rural transformation” (Wilson, 2009; Chen *et al.*, 2015; Holmes *et al.*, 2016; Zhang *et al.*, 2016). Belton *et al.* (2019) argue that although the degree of rural mechanization is getting higher, the effect of improving labor productivity has not produced the quick purchase income to offset the increase of rural wages, which provides farmers with greater possibility of social and economic mobility. Influenced by the original natural environment, social and economic development, cultural customs and other factors, rural space morphology has obvious regional heterogeneity (Qu *et al.*, 2018). The diversification and heterogeneity of rural space promote the reconstruction of rural space functions and forms, and further exert influences on rural economy, society, and culture (Tabayashi, 2010). Rural areas are transformed from productivism to post-productivism. Agricultural production space first undergoes functional transformation. Post-productivism pays more attention to the free market consumption orientation, diversification, localization, ecology, and the satisfaction of local demand for agricultural development (Perkins *et al.*, 2015; Yang, 2017). Bjørkhaug *et al.* (2007) think that post-productivism is a policy and proposition aimed to protect rural space, cultural landscape, farming lifestyle, and food safety. In the post-productive era, the emergence of new rural space is inevitable because economic actors take advantage of the opportunities of agricultural crisis to participate in rural development and supervision (Lowe *et al.*, 1993).

(2) Research on the driving force and development path of rural space diversification. In the background of globalization, migration, international agricultural trade and tourism expansion process often intertwined. The reconstruction process of “global countryside” has been initiated. Rural areas with high environmental quality and good facilities attract migration and investment, drive the development of real estate and related services, and trigger

changes in rural economy, society, and landscape (Perkins *et al.*, 2015; Yu *et al.*, 2017). Li *et al.* (2018) take the multi-ethnic society in Northwest China as a case study. From the perspective of national culture, we found that rural space diversification is closely related to modern education and religious beliefs in rural space, and has a gradient feature in space. Berchoux *et al.* (2019) believe that spatial factors such as environmental conditions, distance between natural resources, and accessibility of services will have an impact on farmers' livelihood activities by affecting climate change, and thus affecting the type of rural space. In addition, some experts and scholars believe that transportation (Chen *et al.*, 2019), social differentiation (Wu *et al.*, 2017), population migration (Mahon *et al.*, 2018; O'Shea *et al.*, 2019), changes in land use patterns (Feng *et al.*, 2019) and other factors influence rural spatial differentiation (Hu *et al.*, 2016). Knickel *et al.* (2017) summarized that rural communities' resilience, prosperity and happiness, rural governance, and knowledge and innovation are the four driving forces of rural systemic change. Due to the diversity of driving forces, the pattern of rural space diversification has the characteristics of inconsistency and inhomogeneity on a global scale, presenting a diversified rural development pattern. For example, influenced by urbanization and industrialization, the outflow of population (especially young people) is more frequent. The lack of service subjects in tertiary industry leads to the reduction of services, the bankruptcy of enterprises and the shrinkage of social capital. This type of village retains the original land use mode of agricultural production. Such a village will gradually decline (Li *et al.*, 2019). On the contrary, immigrant investment activities mainly involving retirees, second-room owners, and commuters will promote rural consumption, which will be dominated by socio-economy (Randelli *et al.*, 2019), leading to a new way of land use dominated by consumption, thus reshaping the multi-functional landscape of the countryside (Richter, 2019). Scholars usually use social network analysis method and actor network theory to interpret the internal process and mechanism of local rural development model (Tonts *et al.*, 2014). Also, some scholars use the concept of path dependence and resilience in the field of evolutionary economic geography to explain the differentiation process of rural spatial economic transformation (Tonts *et al.*, 2014; Richter, 2019).

(3) Continue to pay attention to the research on the influence of rural culture on development and spatial differentiation. In addition to the public value, the creation of economic value of culture is getting much more attention. Culture can be used as a tool to promote the process of rural transformation. When cultural needs are embedded in rural development, the village itself will have a good ability to transform (Perkins *et al.*, 2015; Astuti *et al.*, 2016; Scott *et al.*, 2016; Stastna *et al.*, 2017). The combination of natural characteristics, social, economic, and cultural driving factors promotes the complex transition and change of rural space on multiple scales.

Currently, developing countries (Global South) are undergoing global livelihood transformation, including agricultural diversification (BIRTHAL *et al.*, 2019; Villa *et al.*, 2019), non-agricultural employment (Korah *et al.*, 2018), multiple employment (Broeck *et al.*, 2019), livelihood security migration (Jiao *et al.*, 2017; Qi *et al.*, 2018), etc. Resource relations break through the agricultural field and present the reallocation that triggers the reconstruction of rural space and landscape (Li *et al.*, 2014a; Li *et al.*, 2014b; Sreeja *et al.*, 2015). Along with the rural reconstruction and change, the meaning of land also changes beyond the traditional concept of land. Some scholars will see land use classification as a rural local

representation. Fuzzy boundaries of land use means that the rural areas are changing. Therefore, the reconstruction process of the countryside can be viewed through land use, that is, the process of reconfiguration of the landscape associated with practice, discourse, and history, which shapes the local livelihood while being influenced by the local livelihood (Hebinck *et al.*, 2018). In the context of the increasing mobility and vitality of rural space, the research has gradually shifted from the rural regional function to the rural spatial multi-differentiation driven by the rural spatial heterogeneity and mobility (Neal, 2013). Qualitative research methods are widely used in the research of rural reconstruction and have been appropriately applied and developed, including semi-structured interviews, focus groups, ethnography, participatory observation, literature analysis, etc. Meanwhile, qualitative and quantitative methods are also widely used (Šimon, 2014). Since the reform and development, the Pearl River Delta has gone through a rapid process of industrialization and urbanization driven by “three forms of OEM and compensation trades.” The Pearl River Delta has experienced both top-down urbanization and bottom-up rural industrialization and urbanization, presenting mixed urban and rural space mosaic characteristics. In the process of urban development regionalization, the rural areas in the suburbs of metropolises have undergone a drastic transformation and reconstruction process. Rural space presents the mixed and spatial mosaic characteristics of material space, industrial structure, social network, and residential landscape, etc. The rural space shows the process of differentiation and reorganization. However, a systematic study about the dimension, evolution, and mechanism of the spatial differentiation of rural areas in the suburbs of metropolises is not enough.

Taking Beicun village of Taihe town, Baiyun district, Guangzhou as an example, this paper does the following:

- analyzes the various stages of development and the process of village community organizations independently guiding social capital realizing spatial multi-differentiation and replacing village functions with spatial production theory
- analyzes the social network effect caused by capital

Based on the game theory, this paper analyzes the dynamic process of land resource transfer between agriculture, industry, and service industry. The paper also deepens the research on the space diversification of rural areas in urban suburbs and its influence mechanism, so as to lay a foundation for the theoretical discussion on deepening the spatial transformation and differentiation of rural areas in urban suburbs in economically developed areas.

2 General situation of study region and survey information

2.1 General situation of study region

Beicun is located in the northwest of Guangzhou, which belongs to Baiyun district. It is a subordinate administrative village of Taihe town (Figure 1). There are seven economic cooperatives in the area. Beicun is a suburban village located 18 km away from the central urban area. Beicun faces the first ring road of the city, namely Beitai Road, east to 106 National Highway, 600 m from Longgui Metro Station, 5 km from Baiyun International Airport, which is convenient to rail transit and airport. There are highway entrances and exits at the west of the village. Beicun is located in the alluvial plain between Liuxi and Shakengyong rivers, which provide sufficient arable land for the village. Its land form is relatively com-

plete, and its rural settlements are agglomerated. In 2015, Beicun had 2163 registered population, 1927 immigrants, and nearly 4000 overseas Chinese. It is a famous overseas Chinese hometown in Guangzhou. The rural development in the Pearl River Delta region generally experienced the dual influences of rural industrialization and urbanization. The clansmen and overseas Chinese in the Lingnan region often bring the ancestral hall, a very important public space. In addition, there is a widespread phenomenon of substitute farming in the development of agriculture. Through preliminary investigation, it is evident that the selection of the case area has the above mentioned universal characteristics and comprehensively measures the availability, representativeness, and typicality of data. In this study, Beicun village of Taihe town, Baiyun district, Guangzhou was selected as the typical case area. The research on the spatial differentiation process and dynamic mechanism of Beicun is helpful to understand the rural areas in the suburbs of the Pearl River Delta, and contribute to the rural revitalization and urban-rural integrated development.

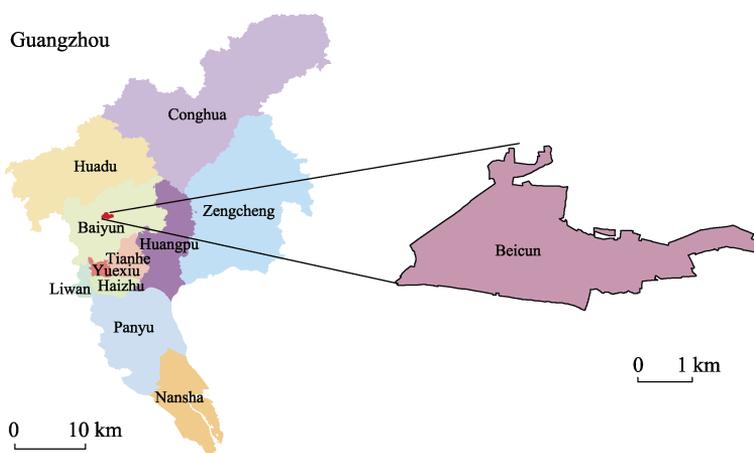


Figure 1 The location of Beicun in Taihe town of Guangzhou city, southern China

2.2 Investigation information

Fourteen people were interviewed in the on-the-spot investigation from March to April 2018, together with additional supplementary interviews, in-depth interviews, and questionnaires in November. The in-depth interviews focused on the changes in land use, residential environment and housing, population composition, the process of industrial development, the use of public space and arable land, and other topics in Beicun. The interviewees selected were representatives of various subjects who had a clear understanding of the whole development process of Beicun (Table 1). To further understand the changes in social network in Beicun, a questionnaire was designed to conduct a comprehensive survey on the changes and development subjects of social network in Beicun. After three surveys, the questionnaire was mainly given in the form of semi-structured interviews. In total, 141 questionnaires were given. As a result of semi-structured interviews, 129 questionnaires were valid, except for the interruption of 12 interviews. The questionnaire mainly concerned about the following: presence of relatives in Beicun, decision about joining overseas hometown associations, participation in village affairs, type and place of employment, age of their residence, construc-

tion, relationship with lessors, relatives with overseas Chinese, and housing. In fact, the questionnaire where 62 questions were designed is a comprehensive supplement to in-depth interviews. The main purpose of the questionnaires and interviews is to further explain the mechanism of multi-subjects and social network connection in the process of spatial differentiation of Beicun. The specific information of the survey is shown in Table 2.

Table 1 In-depth interview object attribution

ID	Gender	Identity/occupation	Duration
2018033001	Male	Secretary of Village Party Branch (concurrently village head)	2h 7min
2018040401	Male	Member of Federation of Returned Overseas Chinese	1h 17min
2018040402	Male	President of Federation of Returned Overseas Chinese (concurrently head of village mediation group)	1h 20min
2018040403	Male	President of Economic Cooperatives	2h 15min
2018041401	Female	Young local villager and her relatives	59min 41s
2018042301	Male	Non-native working in Beicun cosmetics factory	1h 3min
2018042302	Male	Non-native working in Renhe logistics company and renting in Beicun	29min 4s
2018042801	Male	Home owner of Jiulong Garden	37min 46s
2018042802	Male	Former Secretary of Village Party Branch (concurrently former Economic Cooperation accounting)	58min 5s
2018042803	Male	Local elderly villager	50min 22s
2018112801	Male	Migrant worker	30min 28s
2018112802	Male	Farmer from Guangxi	38min 12s
2018112803	Male	Non-native tenant/resident	42min 24s
2018112804	Male	Local elderly villager	55min 38s

Note: h is hours, min is minutes, and s is seconds

Table 2 Questionnaire attribution

Gender	Attributes	Number
Female	Local villagers	18
Male	Local villagers	22
Female	Nonnative tenants/residents	15
Male	Nonnative tenants/residents	18
Female	Migrant workers	14
Male	Migrant workers	16
Female	Nonnative tenants/residents and local workers	16
Male	Nonnative tenants/residents and local workers	22

3 Process of space diversification in Beicun

3.1 Stage characteristics of development and the evolution process of industrial development diversification

From the evolution characteristics of Beicun's industrial structure (Figure 2), it is evident that its development has gone through the following stages: agricultural, industrial, and service industry (Table 3).

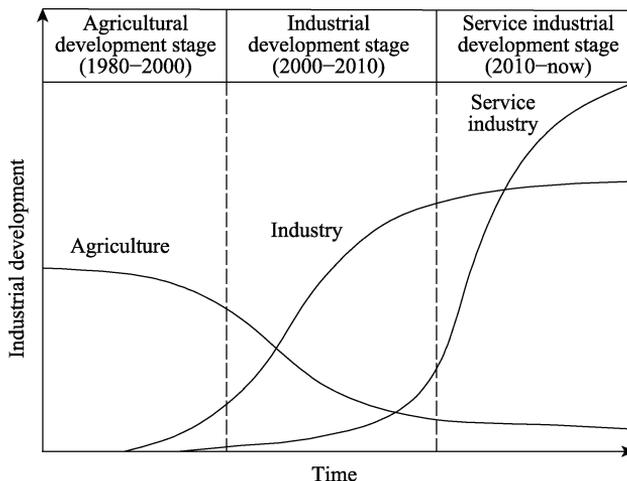


Figure 2 The schematic diagram of the industrial development in Beicun
 Note: This figure drew according to the enterprise data of Tianyantong

Table 3 Division of the development stages of Beicun

Development stage	Agricultural development stage	Industrial development stage	Service industrial development stage
Time range	1987-2000	2000-2010	2010-present
Land use structure	Most agricultural land	Most industrial land	Most industrial land supplementary commercial service industrial land
Leading industry	Agriculture (planting)	Industry	Service industry
Social culture	The blood clan and geographical relation	The blood clan and industry relationship	The blood clan and industry relationship
Management model	Self cultivating agriculture→Rental agriculture	Rental agriculture→Rental property	Rental property

(1) From the 1980s to 2000, the leading industry of Beicun was traditional agriculture. The way of livelihood of villagers was gradually transformed. In the early stage of reform and opening up, Guangzhou’s urban form mainly presented a group type spatial pattern with the old urban area as the core. Beicun is about 20 km away from the city center, which is relatively less affected by the economic radiation and industrial impact of the central urban area. In the early stage, with the implementation of the household contract responsibility system, Beicun mainly focused on agricultural cultivation including rice, vegetables, and fruits. The main producers were local villagers. As the production efficiency of agricultural labor improved and a large number of surplus labors were released, the employment demand of industrialization in central urban areas led the labor force to gradually transfer from agricultural production to industrial production. Stimulated by the pressure of subsistence and the increase of income from non-agricultural employment, the surplus labor force in Beicun transferred rapidly, and the young and the middle-aged labor force gradually moved to factories in Sanyuanli, Xinshi, and Shijing, thus realizing the transformation of “leave the field, but remain in the rural area. Around 1995, the migrant workers subcontracted the contracted land to the farmers of Guangxi (substitute farmers) by means of an oral contract, thus realizing the transformation of the decentralized agricultural rental management mode. The

mode of villagers' livelihood changed to non-agricultural income and rental of farmland. Because of the way of "leave the field, but remain in the rural area" as before, the rural social network still depends on the blood clan and geographical relation. With the continuous outflow of the labor force, the development of village collective economy is plagued by both the weakening of the main body of development and the lack of funds. In 1998, Guangzhou farmers' annual net income per capita was 5629 yuan, but Beicun farmers' annual net income per capita was less than 5000 yuan, and the village became a "poor village."

(2) From 2000 to 2010, the construction of transportation infrastructure boosted the industrialization process of Beicun and promoted the overall economic development of the village. Industry replaced agriculture as the leading industry of the village. In 1999, due to the construction of the North Second Ring Highway across Beicun, part of the collective land in Beicun was requisitioned uniformly, and the village received compensation of 15.4 million yuan in total. The village organizations made full use of land requisition compensation funds as the original capital for the development of village collective economy, comprehensively renovated the land on both sides of the main road, and constructed simple iron workshops on the open space outside Beicun to develop collective rental property and strengthen the village's collective economy. With the construction of the new Baiyun International Airport highway, railway, bus, and other external traffic, the sparse road network pattern in Baiyun district improved. This weakened the location disadvantage of Beicun being far from the central city. In 1998, Beicun Economic Cooperative convened a villagers' congress to centralize the management right of agricultural land and manage the land of the whole village through collective outsourcing. Economic cooperatives adopted the share cooperation system, which means "farmers" become "shareholders," forming a participatory "governance" mode of "every household has capital, every household holds share, every year has bonus." Beicun confirmed the land ownership through the capitalization and capital shareholding of land and collective assets. Economic cooperatives transferred agricultural and forestry land to industrial land with higher value through collective leasing of land and factory buildings. With abundant primitive capital and superior traffic conditions, village organizations vigorously introduced foreign capital, which made Beicun an industrial agglomeration area, and the dominant position of industry came into being conveniently. The rapid process of rural industrialization promoted the non-agricultural transformation of land use structure in Beicun, and industrial land became the dominant type of land use in the village. With the rapid increase of non-agricultural workers in villages and a large number of migrant workers working in Beicun, the traditional local society changed, and the industrial relationship among migrant workers strengthened.

(3) Since 2010, Beicun's transportation location advantages and low land rent attracted urban capital to the countryside and promoted the transformation of Beicun's industrial structure. Guangzhou became the first target of foreign capital transfer due to its geographical advantages of neighboring Hong Kong and Macau. Transportation cost and land rent were the main considerations when locating factories in the transferred manufacturing industry. Lower transport and rental costs prompted the influx of urban capital into Beicun and accelerated its industrialization process. Along the main road, five industrial parks were laid out, namely, Jiulong City Industrial Area, Beicun Second Community Industrial Area, Huangzi Industrial Area, Dalu North Hengsu Industrial Area, and Qishegangtou Industrial

Area, forming a business structure with hardware manufacturing as the main industry and plastic packaging as the auxiliary industry. With the increase of industrial enterprises in Beicun, a large number of migrant workers gathered in the village. Due to the rising housing prices and rents in Guangzhou central urban areas, urban low-income groups tend to seek relatively low-cost housing in the suburbs. Beicun became a platform to undertake population evacuation in the central urban areas due to its low cost of living. In 2015, the immigrant population of Beicun increased to 1927, accounting for 89.09% of the household registration population. The increase of village industrial enterprises and the growth of residential population have jointly created the market demand of the vast productive service industry, business service industry, and life service industry. The industrial structure of the village gradually shifted to the service industry leading to rapid development and transformation of retail, catering, trade, and consulting industries. At present, there are 20 life service enterprises and more than 30 productive services and business services along the main road in the village area. The scale of commercial service land increased rapidly, and the relationship between industries in the village increased significantly. Two major social networks exist in the village—one is the blood clan and the other is industry relationship.

3.2 Evolution process of diversification of land use types

From 1987 to 2017, Beicun's spatial growth and land use structure underwent rapid transformation. During this period, the scale of village construction land increased from 31 ha to 134.32 ha. The land structure changed dramatically, and the area of residential land, industrial land, roads, and transportation facilities increased greatly (Table 4).

(1) From the 1980s to 2000, restricted by factors of production such as capital restriction, Beicun continued the traditional agricultural production mode. The land use structure in Beicun was relatively single, mainly consisting of land for agriculture, forestry and water, supplemented by construction land such as residential land and urban road. Agricultural and forestry land accounted for 68.65% of the total land area, while village construction land only accounted for 16.66% of the total land area.

(2) From 2000 to 2010, with the further industrialization of Beicun, the land use types and structure of Beicun diversified. To enhance readability, can we rephrase as: During the period, the industrial land increased by 68.65% with 26.68 ha and 5.6 ha of residential space. During the period, the industrial land increased by 26.68 ha, residential space continued to expand by 5.6 ha, an increase of 68.65%. Area of agricultural and forestry land decreased from 127.76 ha to 48.73 ha, showing a sharp contraction trend. The differentiation characteristics of land use structure were characterized by the mosaic combination of facility land for commercial services, road and traffic facility land, and public management and public service land. The facility land for commercial services increased by 18.8%, that is 0.94 ha. Beicun gradually improved its external and internal traffic networks. Beside road and traffic facilities, a large amount of belt-shaped greenland and square land were laid out, resulting in an increase in the proportion of greening and square land. The internal structure of public management and public service land changed significantly, and the land for educational research and social welfare increased by 1.47 ha and 0.19 ha, respectively.

(3) From 2010 to 2017, with the industrialization of Beicun promoting the development of service industry, the spatial relationship of land use types became more complex. There were

more mixed patterns of commercial-residential land and industrial-commercial land, and the types of land use in the village were more diversified. The area of land for public facilities increased remarkably, from 3.13 ha in 2010 to 11.88 ha in 2017, with an increase of 279.55% and an average annual increase of 1.25 ha. The agricultural and forestry land further contracted to 4.8% of the total land area of village, while the area of residential land increased from 15.92 ha to 21.79 ha, a total increase of 36.87%. The construction of commercial service facilities increased by 420.2% to 5.15 ha by continuously replacing or combining industrial land. Some special mixed industrial and commercial land was formed and the characteristics of land use were diversified and mixed.

Table 4 The structure of land use type in Beicun (ha)

Land use	Agricultural development stage	Industrial development stage	Service industrial development stage
Residential land	10.32	15.92	21.79
Public management and public service land	7.79	9.26	1.68
Facility land for commercial services	0.05	0.99	5.15
Industrial land	0.58	26.68	29.21
Road and land for transportation facilities	10.01	23.59	27.37
Land for public facilities	0.41	3.13	11.88
Greenland and square	0.1	17.03	33.16
Other construction land	1.74	6.05	4.08
Water	24.36	20.02	10.61
Land for agriculture and forestry	127.76	48.73	32.12
Other non-construction land	2.98	14.7	9.05
Total	186.1	186.1	186.1

With the diversification of land use types and structures and the increasing complexity of spatial relations, Beicun's spatial layout pattern has gone through a series of processes of spatial creation and multi-spatial reorganization (Figure 3).

(1) In the stage of agricultural development, the spatial distribution of land use in Beicun presents a circular layout structure of "public service facilities, traditional residential areas, and agricultural production areas" from the core area to the marginal area. Xu's ancestral temple, Dong's ancestral temple, and historical building "village covenants" were the core of traditional rural settlements. Public service facilities were close to the ancestral temple and public space such as village community organizations, health stations, and grain-sunning grounds. The public space of ancestral temple and public service space were combined to form the central area of Beicun spatial layout. The periphery of the central area of the village area was a traditional residential area in the form of agglomeration. The residential area was connected with contiguous agricultural production area outwards, and the village presented a centralized layout pattern (Figure 4). The internal structure of the village was rigorous and orderly, forming a rich layout of artificial space. The two houses were separated by a one-person-wide roadway. They were arranged vertically and horizontally, with regular shape and compact layout.

(2) In the stage of industrial development, the industrialization of the village area was ac-

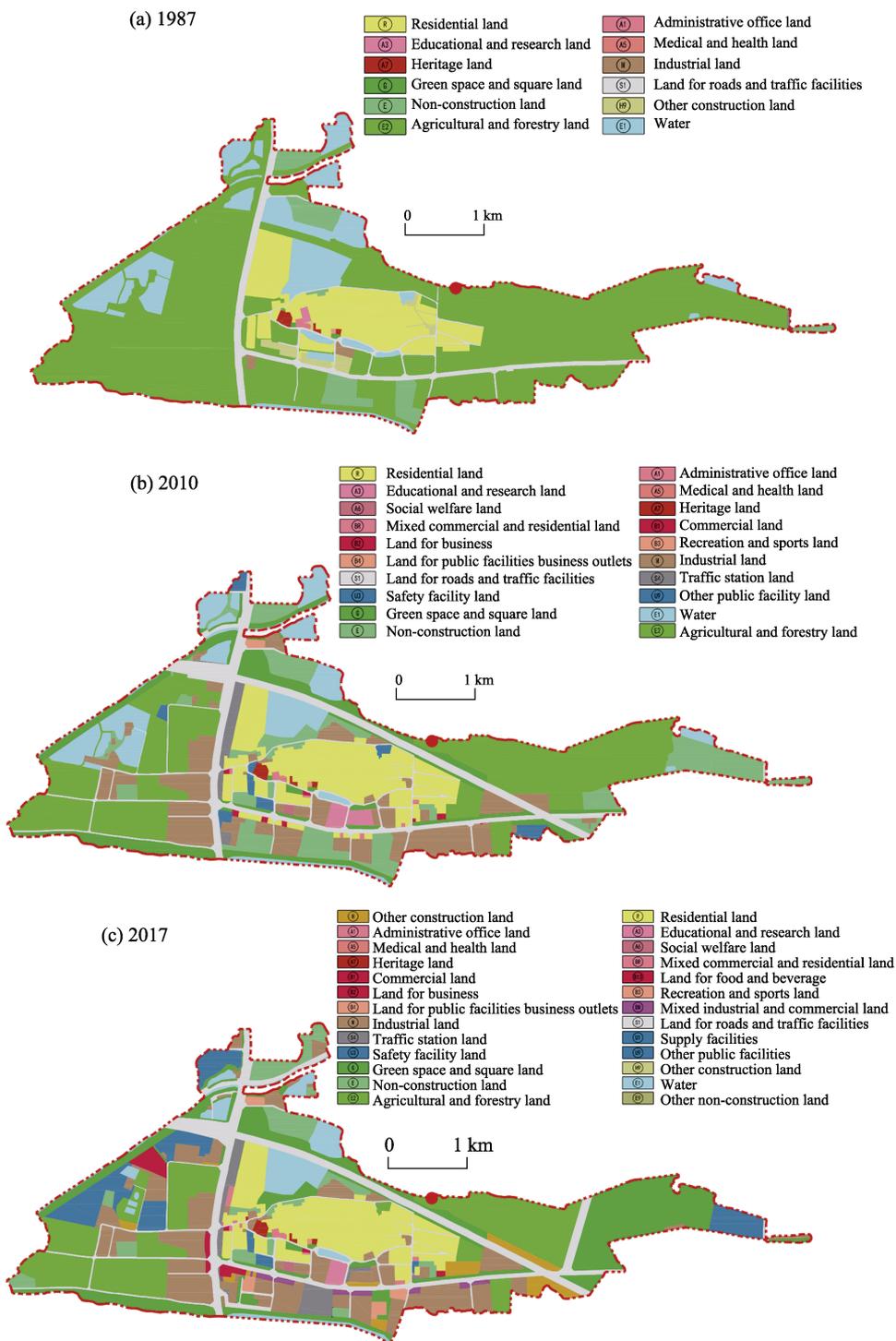


Figure 3 The land use spatial distribution at each stage of Beicun
 Note: a - land use plans for 1987; b - land use plans for 2010; c - land use plans for 2017.

celerating. Industrial land was arranged around rural settlements and along the main traffic roads. The land use structure of the village area derived a new land type—industrial land

from the original basis, and formed a circular structure with public service facilities as the inner circle, traditional residential areas and modern residential areas as the middle circle, and agricultural areas as the outer circle. The newly added industrial areas were fan-shaped between the middle and outer layers and along the main traffic line. The village still maintained a centralized development pattern as a whole (Figure 4). At this stage, the spatial change of land use in Beicun was mainly manifested by the emergence of industrial areas and the growth of living areas. Industrial areas developed independently along the main traffic lines in a rough saltatory growth mode. Living areas were built around traditional residential areas, showing a centripetal and radial spatial layout. The process of centrifugalization of settlements destroyed the internal rigorous and orderly spatial layout of villages. Rural new houses and old houses were mottled and miscellaneous. Residential space and industrial space were mixed. Spatial layout was chaotic, and land use types were mixed.

(3) In the stage of service industrial development, the industrialization process promoted the development of rural service industry, created the production space of service industry, and the circular structure of village land use was more obvious. The industrial patches were connected and spread to the most peripheral agricultural production space, and formed the outer layer of the circular spatial structure with the agricultural areas. Industrial production space squeezed agricultural production space, and agricultural production space gradually moved towards fragmentation and decentralization. At the present stage, Beicun has formed a circle structure with public service facilities as the inner layer, traditional and modern residential areas as the middle layer, and agricultural and industrial areas as the outer layer (Figure 4). Commercial space replaced part of the industrial production space and got sandwiched in strips along the main road between the middle and outer layers. Because of the pilot work of beautiful villages, villages are cleaned up in an all-round way and unauthorized buildings are demolished. The implementation of the “Old Village Reconstruction” plan has optimized the internal structure layout of villages, and the functional layout of villages has become clear and reasonable.

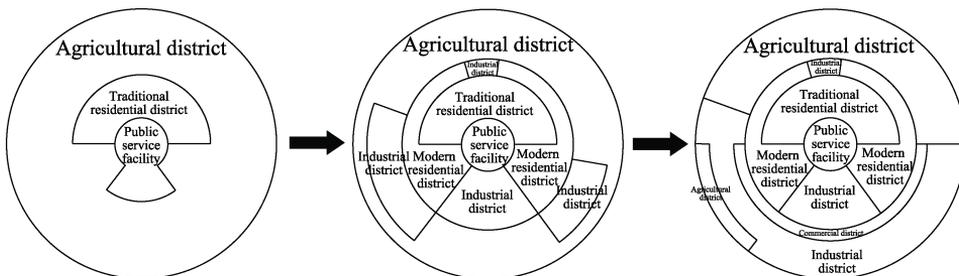


Figure 4 The evolution of the spatial layout in Beicun

3.3 Evolution process of diversification of ancient architectural functions

Beicun is an ancient village which has a history of more than 600 years with typical characteristics of south of the Five Ridges. There are well-preserved ancient buildings in the village, including ancestral temples, village covenants, and group of book houses. In traditional agricultural society, ancestral temples were the space carrier of rural clan culture, village covenants were the institutions of rural governance and centralization of rights, and the group of book houses was the important public space for rural education and cultural heri-

tage. With the change of times, the original functions of ancestral temples, village covenants, and group of book houses gradually disappeared. Village organizations made active use of and replaced the ancient buildings to remold the space multivariate value of the ancient buildings. The core function of the ancestral temple was ancestral sacrifice. The ancestral temple created the religious space in the countryside. At the present stage, the religious function of the Beicun ancestral temple is partly transformed into the cultural entertainment function. For example, Yuefengxugong Ancestral Temple is now the main training place for the village lion dance team that trains in the ancestral temple twice or thrice a week. Donggong Temple is converted into a celebration feast place for the villagers. Villagers hold a feast in the ancestral temple during marriage and funeral. Two ancient administrative offices, “village conventions” exist in Beicun. Village convention is the place where the great-grandfather presided over the internal affairs of the clan. It is also the space where the clan carried out the internal legal affairs and the external affairs. It was the core of the worldly right space. As a symbol of rural governance and centralization of rights, village conventions no longer exist. It has now become the main entertainment place for local villagers. Some rooms in the building are redecorated into village culture rooms and libraries. At the same time, the village community organizations have added some old farm tools and private goods to the “village conventions,” transforming the administrative function of the building into the function of education and publicity of farming civilization, thus surviving as the historical and cultural symbol of Beicun and inheriting the open and enterprising regional culture of the village. Beicun group of book houses was donated by the overseas Chinese in Beicun in the late Qing Dynasty, and served as the main educational place in old times. To protect historic buildings, village organizations have continued the cultural functions of old-style private schools and book house, and expanded them into “Beicun Starlight Old Man’s Home,” calligraphy and painting association activity base, rural book house, women’s activity center, green garden, Beicun farmer’s calligraphy and painting exhibition hall, and the cultural base of villages. Therefore, the function of preschool education in the old-style private schools and book houses is now transformed into the function of cultural entertainment in the village.

3.4 Evolution process of diversification of social relationship

In ancient times, there were only Dong and Xu families in Beicun. Dong’s ancestors came to Beicun from Huadu to raise ducks, and then brought their cousin Xu’s ancestors here. Because of the close relationship between the ancestors of the two families, the Dong and Xu families are always “brothers.” The Dong and Xu families adopt the mode of to “live with their family” mode. The members of the families are confined to a narrow geographical range. The mobility of the village population is weak, and the blood clan and geographical relation permeate each other. The clan relationship gradually weakened with the intergenerational change, and the geographical relationship always played a good auxiliary role in the blood relationship. The village always maintained the custom of banquet relatives and friends during funeral and marriage because of the overlapping of the living areas, similarity in production areas, and frequency in social exchanges between the two families. It was easy to maintain close relations between each other due to frequent social communication within the village. The spatial distribution of “live with their family” made blood relationship and

geographical relationship blend, and the village formed a social relationship centered on family clans and mainly on blood relationship and geographical relationship consequently (Figure 5). With the development of industrial economy in villages and the increase of non-native population, the main body of life and production in traditional villages has gradually diversified, and the interpersonal relationship has also changed. Along with the transformation in Beicun from the agricultural development stage to the industrial development stage, the income and economic strength of local villagers gradually differed. Villagers with strong economic strength built new multi-storied apartments on the edge of the old residential areas, and gradually separated the boundaries of public and private space. The separation of public and private space changed the content and form of social communication of local villagers. In-house interaction and communication are mainly confined to family members, involving private affairs, and have a main character of emotional communication. Outdoor communication between different families is mainly based on daily oral greetings and public affairs among acquaintances, rarely involving emotional exchanges. The emotional exchange of geographical relationship is mainly embodied in playing cards and chatting in small squares and open spaces in front of buildings and attending wedding, funeral, and presenting gifts, etc. The elderly and elders maintain the traditional content and form of social communication of the local villagers. The new generation of local villagers has more diversified entertainment methods, broader scope of friendship and social subject communication. Therefore, the frequency and depth of interpersonal communication based on geographical relationship have declined, and the emotional communication has gradually weakened.

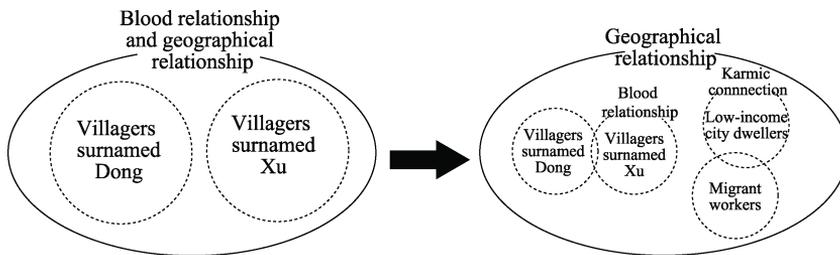


Figure 5 The evolution of social relations in Beicun

The process of rural industrialization and the radiation effect of the central urban area have promoted the population agglomeration of Beicun, and a large number of migrants have intervened in the social network of traditional villages. Tenant groups have certain control over the entity of rural residential space, but this logic has not penetrated into the geographical relationship of traditional rural society. Tenant groups and local villagers share consumption space, cultural and entertainment space, and part of the living space, but the social interaction between the relevant subjects mainly revolves around the lease relationship. Language differences and population mobility make it difficult for tenant groups to have an emotional dependence on local villagers. This is the reason why tenant groups have a weak sense of identity with Beicun. This additional geographical relationship is an important part of social interaction in the village. The migrant workers in local factories mainly came from inland provinces around Guangdong province, and their cultural level is gener-

ally not high (the level of primary school and junior middle school culture is common in the survey, accounting for 85% of the sample). They are engaged in relatively low-end production labor and mainly obtain employment information through adlets, leaflets, or with the help of their network of acquaintances of their fellow-villagers. The survey found that about 60% of migrant workers live in collective dormitories provided by factories and go out less frequently. The few local villagers in the factory are middle-aged people who stay in the village. They are mainly responsible for cleaning and factory security, and generally do not participate in the productive activities of the factory. Therefore, apart from occasional daily communications, such as purchasing commodities or other products in local supermarkets, migrant workers have little contact with local villagers. The factory itself is equivalent to a small closed society. The social network of migrant workers living in dormitories is limited to colleagues and direct leaders of the same department, and there is less trans-department communication. At the same time, the social space isolation of migrant workers does not promote the phenomenon of “unity” as they belong to the marginal group in the rural social relationship network. They depend on the narrow industrial relationship to maintain the basic survival needs. On the other hand, the closed management mode of factories makes the remaining 40% of migrant workers rent the houses of local villagers as a whole family. The behavior-driven mode of migrant workers and low-income urban tenants is similar. Compared with migrant workers living in factory dormitories, migrant workers living in villages have more opportunities to connect with groups outside the work area, such as local landlords, supermarket owners, and vegetable vendors. Therefore, they have more social network nodes, stronger social network connections, but subconsciously exclude local villagers. Except for regular communication with landlords every month to pay rent and buy daily necessities, there are not many opportunities to contact local villagers. This is the reason why they are less involved in local villages. Therefore, tenant groups of migrant workers do not exert their advantages to expand their social relations.

In addition, there are more outlanders who open supermarkets, restaurants and other life services, garages, hardware stores, and other productive services in Beicun. This group is also an important part of the main body of Beicun’s social network. Due to the high overlap of work and living space, social communication is limited in limited space. Although they are close to the local villagers’ gathering area, it is hard to be integrated into local social relations. There is no strong geographical relationship with the local villagers. The research concludes that the outlanders who provide life services on both sides of Beitai Road and National Highway 106, whose service objects are mostly migrant workers have less chance to leave the workspace or engage in social communication with local villagers. The outsiders engaged in production support service industry are limited by the nature of their work, that is, they mainly provide technical services to nearby factories, and they also have less contact with local villagers. To sum up, foreign capital injects into Beicun’s industrial production field by means of production creates Beicun’s industrial production space and promotes population agglomeration by forming service industrial production space accompanied by the cumulative cycle of foreign capital. The contraction of rural space by foreign capital leads to intense contradictions between people and land, and leads to the evolution of social relationship in a certain space. The single social relationship of Beicun with the blood clan as the core has become a complex social relationship of blood, geography, and industry co-

existence (Figure 5). The blood relationship, geographic relationship, and industrial relationship of Beicun are composed of local villagers and outlanders. These two social groups are absolutely isolated in the working space and relatively isolated in the living space. On the one hand, the rural society maintained by the blood clan and geographical relationship still continues the traditional way of social interaction. Although the change of work and living space leads to the weakening of the blood relationship in rural society, it is still the core of the social relationship in Beicun. On the other hand, outlanders use geographical and industrial relationships to establish a simple social communication space. However, the relative closeness of the living and working environment leads to the high limitations and low stability of these two relationships.

4 The diversification capital circulation logic of rural space and the game mechanism of land space

4.1 The capital logic of rural space diversification

With the deepening of market power, the urban fringe area has gradually become the stage of capital operation, succumbing to the logic of capital. The profit-seeking nature of capital leads to global flow of capital, looking for value recessions or avoiding partial risks, thus obtaining higher residual value or realizing asset preservation. The urban fringe area has become a “savings pool” for capital by feature of its proximity to the consumer market, its convenient transportation, population, and land dividends. In the process of capital flowing to the urban fringe, capital combines rural land and production materials or consumption data to set up factories to obtain the surplus value of regional production. When capital accumulation brings non-economic outcome and contradictions, capital will turn to the built environment of the suburbs of the city, which is represented by the village community organization based on land transfer. The village community actively cooperates to guide the construction of township-level industrial parks and private industrial parks. The village organization will fix the capital in the rural fixed assets to absorb the production factors such as labor and capital and ensure the sustainability of the rural economic development. As a result of the transition of capital from industry to land, a large amount of industrial space is generated, and surplus value continues to be generated. This promotes the suburban rural space to evolve into a functional structural state of “living + agricultural production + industrial production.” When the surplus value generated by the industrial space is exhausted, capital will turn to the service sector derived from the industrial sector, create a space for consumption services through a new round of land transfer, realize the expansion of capital value, and promote the further differentiation of rural space. The village has a composite function of living, consumer services, industrial production, and service industrial production. In addition, the social contradictions caused by the capital inflow have become the factors restricting the development of rural economy. Village organizations use their administrative power to replace the functions of ancient buildings, improve the living environment of villages and increase the social welfare of villages to realize capital diversion, reconcile the contradiction between rural society and industrial development, and maintain the sustainable development of the village. Based on this, the function of rural living space is increasingly rich. In summary, the essence of the multi-differentiation of rural space in urban

suburbs is the cyclical process of capital in various production areas and different spaces. However, the development process of different types of rural areas may be different.

The accumulation of capital in the industrial production of Beicun has produced local industrial production space and circulation space, which has brought a large number of consumers and stimulated the consumption market of Beicun, thus creating a space for local service industry consumption and commodity exchange. The living service space, the productive service space, and the business service space of Beicun have become the main space carriers for the future development of Beicun. After the second cycle, foreign capital flows to the service industrial production field and perfects the first cycle (Figure 6). The competition of foreign capital for rural production space and living space will lead to fierce human-land conflicts in the suburbs of the city. To ease the relationship between villages and foreign capital-led industries and services, the village community organization in Beicun uses the land rent obtained from the main body of the industrial operation to adjust the living space of the village and improve the living environment of the village. Foreign capital flows into rural welfare social investment under the intermediary role of village organizations to repair the historical buildings of the villages, townships and bookstores in Beicun, thus adding cultural entertainment and publicity and education functions of ancient buildings, creating public service spaces such as farmhouses and green parks, which enable more villagers enjoy a modern lifestyle. At the same time, the original space function of ancient buildings is

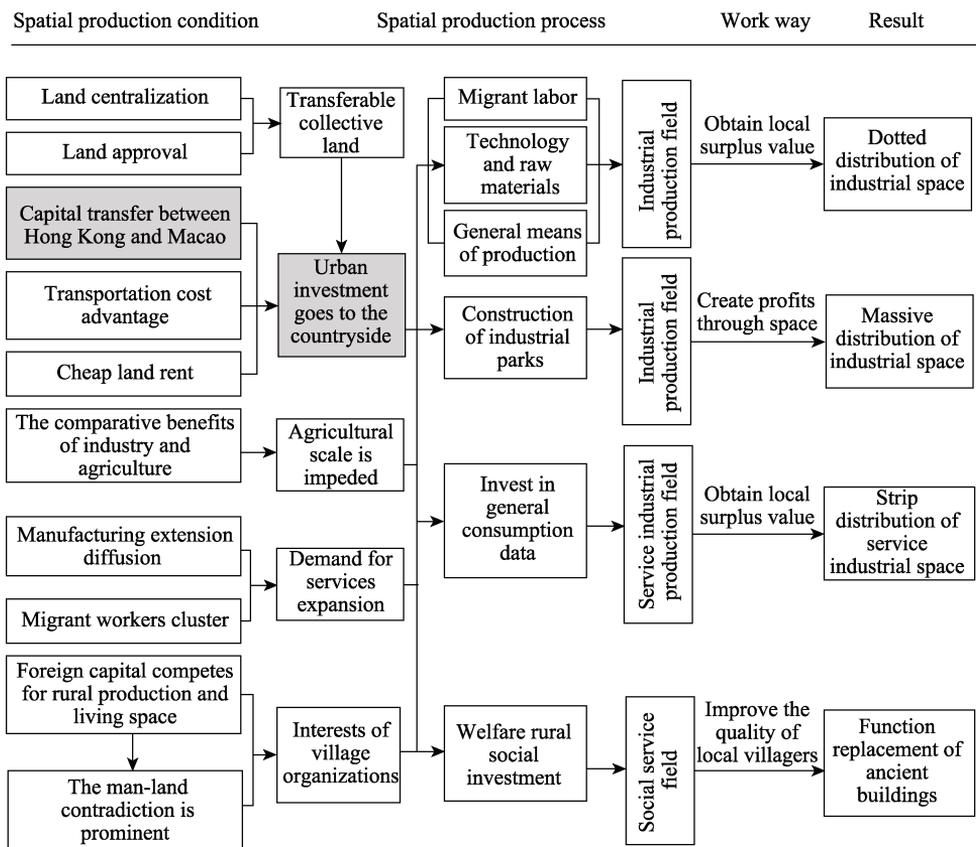


Figure 6 The capital logic of the space differentiation production in Beicun

to create a specific historical and cultural atmosphere, improve the blood clan consciousness of the local villagers in the new generation, and inherit the regional culture of Beicun, thereby enhancing the overall quality of the local villagers, strengthening the village's own "hematopoietic" function, and strengthening the long-term interests of the village so that foreign capital directly enters the third cycle from the first cycle.

4.2 Multi-differentiated land game logic in rural space

Land resources are the carriers of various production activities. The competition for land resources by various behavioral agents leads to the reconstruction of rural space. Therefore, the land game between the behavioral agents is the key link for the multi-differentiation of rural space in urban fringe. The actors in the land transfer process of Beicun include local villagers, Guangxi farmers (substitute farmers), industrial operators, and service operators (Figure 7).

The first interest game of Beicun land transfer occurred between local villagers and substitute farmers. Local villagers in Beicun were able to obtain additional land income after going out for work. However, when substitute farmers implement decentralized land transfer strategies, they can obtain agricultural economic effects and ensure survival. Therefore, local villagers and substitute farmers can obtain maximum economic benefits.

The key point of the second interest game of Beicun land transfer is whether local villagers and substitute farmers can obtain greater benefits under the intervention of economic cooperatives. The economic cooperatives can represent local villagers and substitute farmers to discuss land transfer matters, thereby reducing the transaction costs of both parties and achieving the purpose of land transfer. Therefore, at this stage, local villagers and substitute farmers can obtain high returns from the transfer of large-scale land.

The third game of Beicun land transfer occurs between the substitute farmers and the industrial management entities. This relationship can be transformed based on whether the local villagers are willing to transfer the agricultural land originally transferred to the substitute farmers to the industrial management entities. The industrial management entities acquire land by virtue of higher land rent payment ability, while the local villagers obtain

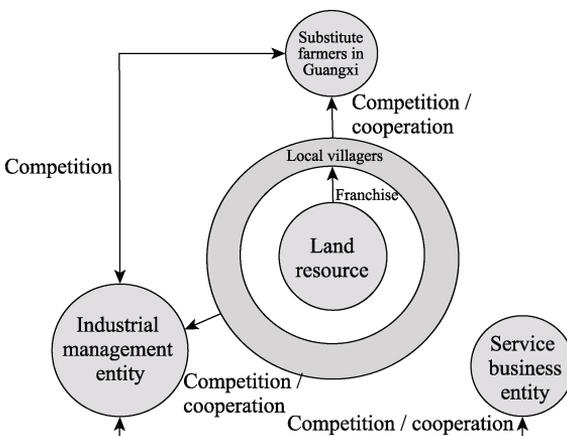


Figure 7 The game logic of land use efficiency of the space differentiation production in Beicun

higher dividends through the economic cooperatives. So the local villagers are willing to transfer the land to the industrial management entities instead of the substitute farmers. The substitute farmers lost in the land game, and industry became the leading industry of the village. The migrant workers became the main business unit of the development of the village.

The fourth land game in Beicun is whether the main body of the service industry can provide industrial enterprises with higher income than industrial production. By transferring the land to

the service business entity, the industrial operation entity can obtain additional rental income after the normal production activities, while the service industrial business entity can find the street shops to provide services to the surrounding industrial enterprises and residents, and earn economic benefits. Both parties to the transaction are profitable. Therefore, the main body of the industrial operation and the main body of the service industry can achieve the interest in the land game, and the land transfer can be realized. Therefore, the development of Beicun's industry turned to the service industry, and the foreigners who provided the service industry became the economic entities of Beicun accordingly. The behavior of each space production entity to compete for land resources through land rent has realized the triple cycle of capital. The rural space has shifted from the production of things in space to the production of space itself.

The mediating function of village community organization is the key to realize the multi-variate spatial differentiation of rural areas in the suburbs. The key role of village community organizations are as follows: (1) Village community organizations can represent the interests of rural residents, announce the situation of land transfer supply and demand, replace the bargaining of rural residents and the lessees including foreign farmers and industrial operators, and supervise the extent of the implementation by the lessee. They also reduce the transaction cost by the lessee and the land matching problem to promote the land transfer transaction. (2) Village community organizations reduce the land-lost risk of both sides of land transfer transaction. (3) Village community organizations can guide the inflow of foreign capital into the social welfare field to improve and create the public space of the village, enrich the cultural and entertainment functions of the village, create a specific historical and cultural atmosphere, improve the quality of rural residents, strengthen the "blood-making" function of the village itself, and stabilize the economic development of the village.

5 Conclusions and discussion

5.1 Conclusions

(1) In the transformation of the village economic development, the economic development of Beicun has experienced three stages of mixed development of agriculture, industry, and business services. Land expropriation compensation fund for transportation infrastructure construction has become the original capital accumulation of rural industrialization. The superior location of airport economic circle drives its industry from single to multiple and advanced. In the process of industrial diversification, the types and structure of land use tend to be diversified, and the spatial relationship of various types of land gets complicated, thus showing new characteristics of "mixed commercial and residential land" and "mixed commercial and industrial land." The pattern of micro-spatial differentiation in the village has gradually manifested itself, and a village area layout structure with "public service facilities — traditional residential areas and modern residential areas — commercial areas — agricultural areas and industrial areas" has been formed.

(2) The multi-differentiated development of material space stems from the addition of new industries in villages and the replacement and transformation of leading industries. Endogenous transfer mode of rural land centralization and exogenous urban capital going to the countryside jointly promote rural industrialization. As the core driving force, the market

promotes the transformation of village business forms into service industries (softening). The process of rural industrialization promoted the functional replacement and spatial activation utilization of historical buildings by village community organization. At the same time this changed the social relationship network structure of villages dominated by the blood clan and geography, resulting in the industrial relationship network composed of migrant workers and urban low-income groups.

(3) The multi-differentiation of the rural space in the suburbs of the city has multiple cycles of capital accumulation. Capital flows from the industrial field to the service industry, bringing the pluralistic differentiation of the rural spatial material structure. At the same time, the land resources of the village are the focus of the interests of the various actors, which is reflected in the process of space competition and interest game between local villagers, substitute farmers, economic cooperatives, industrial operators, and service owners. The intermediary role of the village organization is the key to the multi-differentiation of suburban rural space. The bottom-up social power aggregation in the rural spatial governance system of the Pearl River Delta dominates the path and mode choice of rural development to a certain extent.

5.2 Discussion

With the increasing diversification of agriculture and villages, agricultural “decentralization” and “post-agricultural” appeared in the rural regions. Villages are gradually divided into various complex types, such as industrial villages, consumption villages, tourism villages, factor loss hollowing out villages and seasonal villages with population reflux. Agricultural decentralization has brought about the transformation of village structure, such as the diversification of farmers and the diversification of village power structure (Li *et al.*, 2017). Also, it has led to the transformation of village functions, such as from a single production function to a multi-functional transformation of living, leisure and consumption. The development of rural areas has shown obvious type differentiation (Wang *et al.*, 2011). The change and transformation of economic development, social culture, spatial structure, architectural landscape, land use and ecological environment in rural areas constitute the main process and form of rural development and evolution. Rural reconstruction is directly driven by the evolution of rural factor structure and the transformation of space function (Li *et al.*, 2017; Shen *et al.*, 2019; Wang *et al.*, 2011). Rural economic form, social and cultural function and cultural form are affected by globalization, urbanization, informationization and marketization (Woods, 2010). With the transfer of various commodities and capital to the rural market (Tabayashi, 2010), the rural space landscape, such as rural settlements, residential forms, land resources, tends to be diversified (Woods, 2010). In the economy developed areas, the rural areas show the characteristics of mixed space differentiation due to the process of industrialization from bottom to top and from top to bottom. Urban and rural mixed, traditional authenticity and modernity mixed, industrial and agricultural industries mixed, land landscape mixed are included (Hebinck *et al.*, 2018). In other traditional agricultural areas, the process of space differentiation is slow due to the single function and main body of the countryside, slow flow of elements, and top-down organization. In today’s society, it is necessary to better explore the multiple functions of rural space (Kong *et al.*, 2019; Yao *et al.*, 2016).

The differentiation of rural space is a dynamic process of the evolution of the regional system of complex rural human-land relations, and the effects of administrative, capital, social, market, and other forces on multiple dimensions such as material space, economic development, and social function. This paper mainly focuses on capital and society from the research perspective, focusing on the combination of foreign capital and rural land resources, as well as the interest game of each subject in rural society for village land use, and the problem of the space differentiation dynamic mechanism of Beicun. However, in addition to capital circulation logic and land space game of the multi-dimension of metropolitan suburban villages, the following will have an impact on the diversity of village space: the space planning of urban areas, the adjustment of functional areas and the diffusion and restructuring of factors such as industry, population, and transportation (Liu *et al.*, 2019; Long *et al.*, 2019). The compensation for land acquisition, which is the initial capital accumulation of the development of Beicun, initiated the spatial differentiation process of the whole village. The above-mentioned multi-influence factors affect the rural spatial differentiation mechanism in urban areas. This needs to be researched in the future. At the same time, the analysis of the impact mechanism has divested the linkage between the administrative planning of the higher level government and the industry.

In the background of industrialization, urbanization, globalization, and informationization, rural development and spatial traits have undergone a process of differentiation and reconstruction at the regional level, presenting a variety of rural development paths, characteristics, dynamics, and governance methods. The development of rural areas and the use of space from the single agricultural production and living space have gradually emerged a variety of distinct differentiation characteristics such as “going to agricultural centralization,” “village industrialization,” “communitization,” and “tourism consumption.” In the urban-rural model, different rural areas in different locations have different material landscape forms, business structures, social network structures, and ecological patterns. The spatial differentiation characteristics of rural areas in economically developed areas are more noticeable. The issues of spatial ownership, spatial fragmentation, hybridization of human settlements, and industrial homogenization are the core issues of rural revitalization in the new era. The following points need to be researched in detail (Yang *et al.*, 2015):

- development of a technical system for rural space planning
- optimization and integration for rural governance and rural construction
- coordination of the development of coordinated linkages with different new formats
- reconstruction of rural production, living, ecological, social, and other spaces
- clarification of the scientific path and regional model of rural governance

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