



Analysis of the spatial coupling of handicraft workshops in Chinese capitals before Qin and Han dynasties

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The ancient capital of China is an important materialized carrier for ancient civilizations. Nowadays, the ancient Chinese capital lacks attention to the secularized space in the capital, especially the space related to the handicraft production. In addition, whether or not the space division method of the ancient urban planning land use can be measured by the spatial division theory of modern urban planning is an issue worthy of discussion. This research is based on archeological reports and the latest progress in archaeology. It targets different types of handicraft workshops in 18 ancient capitals from Three Dynasties (i.e. Xia, Shang and Zhou Dynasties) to Qin and Han Dynasties in China. The properties, scales, and location distribution of the workshops (including suspected relics) and other types of space are carried on the statistics and integrated application of multi-analysis methods, such as architectural spatial analysis and archeological database quantitative analysis. It also explores characteristics of handicraft workshops in different industries, including the spatial composition, distribution sites, spatial coupling and long-term spatial evolution. Meanwhile, it extracts the space land composition and attribute features, structural elements, distribution locus, planning methods, and the interaction process with other spaces. By the covariation analysis, the relationship between the evolution of inner space structure and civilization in the ancient capitals of China is put forward. The study has found:

(1) The handicraft workshops in the early Chinese capitals contain not only production space, but many other functions, such as for living, tombs, and sacrifice. With the development of the early kingdom to the empire, the coupling nature of this multidimensional space was gradually decreased with the reduction of the number of sites and tombs in the workshops and the vanishing of the sacrifice space, resulting in the number decrease of coupled space workshops. Along the continuous merger between workshops and markets after Qin and Han Dynasties, new spatial changes took place.

(2) The spatial coupling degrees of various industries in the workshops are different, and directly related to the importance of the workshop industries. The bronze casting workshops have the highest spatial coupling degree, followed by bone-making, iron smelting, and pottery workshops. As the "state machine" of the early capitals, the bronze casting workshop has an upper rank for a long term, which embodies that the higher spatial coupling is greatly controlled by the state power.

(3) The unity of the "work, residence, and burial" space reflected in the capital handicraft workshops of Yin and Zhou Dynasties may be related to the patriarchal system and is one external manifestation of social governance measure.

In general, from Three Dynasties to Qin and Han Dynasties, both the means of space division and the social hierarchies of land use in the capitals are changed, which shows the evolution of the root factors, like the cosmology, religious consciousness, the state power strength, and the social governance system.

In terms of research significance, a spatial quantitative analysis is based on archaeological data, and a special study on secular space in the ancient capitals is done. It is an important supplement to the current research on the space planning of the ancient capitals in China, and it has a certain enlightening significance for the issues of current urban industrial space and social spatial stratification. It can also provide the complete systematic evidence for protecting the urban heritage.



Keywords: Capital; Handicraft Workshops; Spatial Coupling

1. Introduction

Since the formation of archeology in China in the late 19th century and the early 20th century, the research on palaces and ancestral temples in ancient capital cities has been the focus. Such research tendency also influences the study of architecture and urban planning, which leads to the result that the study of handicraft production space has not received wide attention. Actually, the shape, structure, characteristics, evolution laws and planning ideology of the handicraft production space system can reflect the change of the state form and the political governance system in ancient times, and confirm the planning ideology of spaces relevant to “power”, such as palaces and ancestral temples, from another perspective.

For a long time, there is a reliance on the theory of functional districts in urban planning, and it seems that the understanding of urban spatial pattern tends to stick to the clear-out division of functional districts. In addition, due to limited archaeological data and literature, there tends to be narrow and single interpretation of the internal properties of spaces of specific types in ancient capitals. It is generally believed that the spatial division ideology of ancient capitals was beyond the common ideas of “ju” (gathering). With clear spatial boundaries and functional zones showing hierarchical differences, the spatial pattern reflected the social hierarchy and there existed a direct or indirect interaction between different types of spaces. In the Pre-Qin period, the space in capitals was divided into several types, including administration, sacrifice, production, living and market trading. In the past, the space associated with handicraft workshops was often defined as “productive space”, but currently such classification appears to be limited. In this research, based on statistics on the location, shape, structure and internal relics of handicraft workshops in capitals before Qin and Han Dynasties, it is discovered that the space in handicraft workshops in early capitals was not for the single purpose of production. Rather, inside a large number of workshops or “handicraft parks”, there were types of spaces for other purposes such as living, cemetery and sacrifice. Especially in the state-owned handicraft areas, there were usually clear and strict borders, and some areas were highly professionalized settlements consisting of workshops, houses and cemeteries. Such spatial coupling endured for a long time and the degree of coupling varied in different periods.

The study of urban spatial pattern and land use requires quantitative research. Originated from the field of natural science, the theory of “coupling” originally refers to two or more electronic components that coordinate closely and influence each other. Currently, the coupling theory is not only applied in physics, geography and economics, but also involved in the research of regional economic space, urban traffic space, urban land and open space. For the concept of coupling space, there are indicators such as the shape and pattern of the space. This research aims at investigating the phenomenon, attributes and dynamic characteristics of spatial coupling of handicraft workshops in ancient capitals. Due to the difficulty in obtaining data of land types in ancient capitals, this paper will adopt both quantitative and qualitative analyses.

2. Basic Information and Characteristics of Handicraft Workshops in Capital Cities before Qin and Han Dynasties

Through the investigation of 18 capital cities in the period from the Xia Dynasty to the Western Han Dynasty with relatively adequate archaeological data, all handicraft workshops and relics of suspected handicraft workshops are counted and the numbers of different types of handicraft workshops in each city are figured out. Statistics show that there were 50 handicraft workshops in total in capitals of the Xia and Shang dynasties, 65 in those of the Western Zhou Dynasty, 173 in those of the Spring and Autumn Period and 37 in those of the Qin and Han Dynasties. With the unbalance of archaeological data in different period of time taken into account, “a certain type of handicraft workshop in a certain area” mentioned in the archaeological reports as well as uncertain information such as “relics of a suspected handicraft workshop” is included in the statistics of this research. According to the statistics, there were 57 bronze-casting workshops, 54 bone-processing workshops, 39 iron-smelting workshops, 143 pottery workshops, 8 stone-processing workshops and 12 jade-processing workshops.

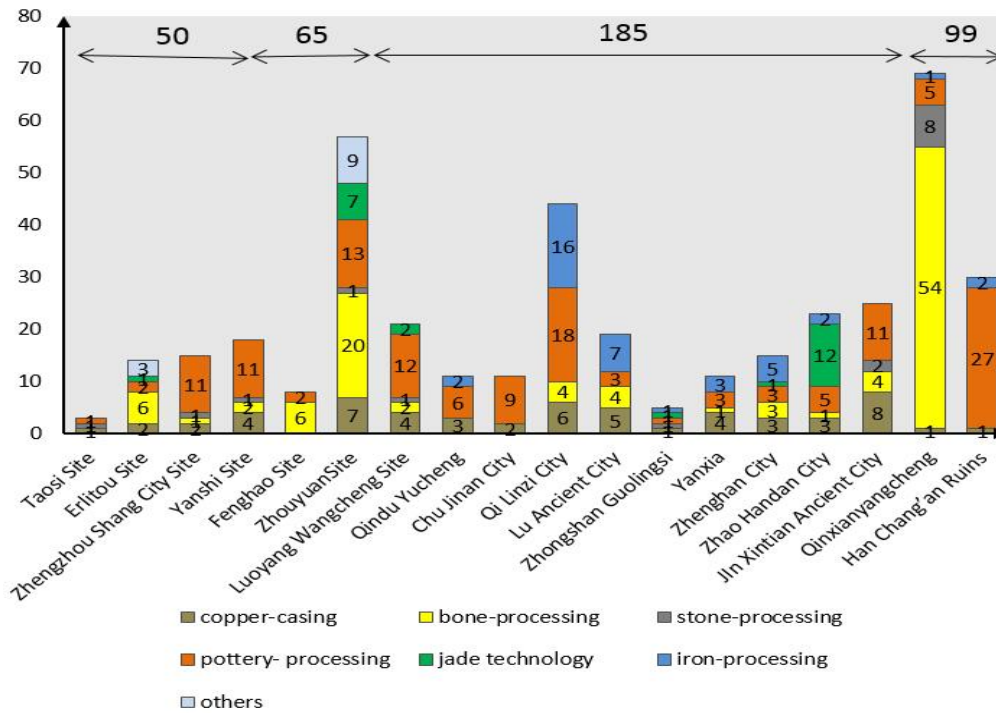


Fig. 1 Quantity statistics of handicraft workshops in the main capitals from Xia-Shang-Zhou Dynasties to Qin and Han Dynasties

Tab. 1 List of handicraft workshops containing dwellings, tombs and sacrifice space in the capitals before Qin and Han Dynasties

Cities	Handicraft Workshop	Scale (m ²)	Site Remains	Others(Tombs/Judaes)	Attributes
Taosi Site	Southwestern Stone Industry Zone YJ5	200,000 m ²	living sites and cave dwellings ; Handicraft Construction Department IIIIFJT2	Industry Zone with Trench Wall, Division Control	State-run
	Ceramic Kiln in the northeast	Two Kilns	4 Huikengs		
Erlitou Site	Kallaitite and copper-casting located on the key axis.		Partitions and closed sites as well		State-run
	Others (unknown attribute)			There are burials nearby.	
Zhengzhou Shang City Site	C5&C9workshops in the southern of the inner city	1,000 m ²		Bones and big-mouthed flat-bottom vat were the main tools for sacrifice. There may exist human skull pits.	State-run
	Ming Gong Road Pottery Workshop (the largest ceramic pottery in the city)	1,400 m ²		Six tombs were found in C11F102 and F12, as the laying foundation of ground.	
AnyangCopper Casting Workshop	There were workshops in the palace area.		There were common sites near C.		State-run
	Xiaomintun Copper-casting Workshop (No. 1-4)	50,000 m ²	Semi-Geosite Site Artisan Cemetery	Coppers' pits, sacrifice pit on the edge of the workshop	State-run
	Miaopu Northland Copper-casting Workshop (No. 1-4)	10,000 m ²	There were more premises in the west district.	There were sacrifice relics.	Royal family



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	Dasikong Bone-processing Workshop(attached to the comprehensive workshop area)		3 pits	There were over 900 Brigade cemetery and tombs.	Tribe-run
	Beixinzhuang Bone-processing Workshop	1,380 m ²		Cattles for sacrifice	Tribe-run
Yanshi Site	Palace Inner Relics.		Annex buildings were found in west and east of the town.		State-run
	Dacheng Inner Pottery Workshop Area	45,000 m ²	Small-scale ground construction and semi-pitched architecture	Note: Most of the 160 tombs were used on the road, the rest are in the workshop.	
ZhouyuaSite	Li Copper	Thousands of m ²	Pits, premise sites, well relics		
	Qijiabei Stone-processing Workshop (Qijia Integrated Workshop Area)	20,000 m ²	Full-time craftsman	Cemeteries (M1/M5/M19) were found in Qi and Li Workshops.	Royal Family
	He, Li, Qi, Yun and Zhuang			Many tombs, premises and pits were mixed with each other. Most of tombs were small and medium-sized..	
Fenggao Site	Zhangjiapo Bones Workshop		H143、H160deep-ditch Kiln-style houses, craftsmen's houses		Tribe-run
	Fengcun Bones Workshops		A large number of tiles were the sites for production, found at 2013SFCH1		Maybe Tribe-run
	Bronze ware cellar near the residential area of Xinwang Nobility	9,000 m ²	The workmen maybe live in this area.	There were likely residences for the height class.	
Luoyang Wangcheng Site	Wangcheng XIbeiyu Pottery Kiln(in the middle and late Warring States Period)	18	Workshops, workshop gathering place with stoves	tombs	State-run
	Yijiatuan Shangyang Huafu Pottery(in the Warring States Period)	1		tombs	State-run
	No.1 Ganxiu Pottery	2		Tombs	State-run
	Wenhenan Stone-processing	1		tombs	
Qindu Yucheng	Tofu Village Pottery Workshop(Yaojiagang Handicraft Zone)	35,000 m ²	There were rammed, separate walls. The southern district B is for craftsmen.		State-run
Lu Ancient City	Yaopu Copper-casting Site(the Western Zhou Dynasty to Late Spring and Autumn Period)	14,000 m ²	Sites	Tombs	State-run
	Linqian Village Bone-processing Workshop(the Warring States Period)	15,000 m ²	The south were residence sites.		State-run
Zhongshan Guolingsi	No.5 Copper and Iron Casting Workshop	Large-scale	Workshop management building/ residential area		State-run
Jin Xintian Ancient City	Copper-casting II & X & XII Workshop	50,000 m ²	Pottery for life uses	37 tombs	State-run
	Shigui Workshop (near copper-castingII&X&XII) The sacrificial pits XXI are in the south.	5,000 m ²	11 sites and pits	Tombs	Minister-run
	Farmers' Market Pottery Workshop	20,000 m ²	The west were pits.		



Yanxia	No.23 Copper and Iron Casting (Weapons)Workshop (the Warring States Period)		The north seemed to be residence sites	No.21& No.18 were the key concentrated distributions. The west were for the palace areas and the east are for the burial areas.	State-run
Qinlin City	Dacheng Iron-processing Workshop	40,000-400,000 m ²	Workshops, residence sites and pits are crossed distributed.		State-run
Zhao Handan City	City Museum of Copper-casting Site			tombs	
Zhenghan City	State Zheng-Wu Copper-casting Site(the Spring and Autumn to the Warring State Period) Sacrificial Vessel, Weapons and Coin.	100,000 m ²	75 pits(the Spring and Autumn)	These workshops for weapons-making and sacrificial vessels are less for Cang city, yet pits with enclosure technology are more.	
	State Zheng-Cang City Iron-processing Workshop(iron clothes)	160,000 m ²	8 pits		
	State Zheng-Dongcheng Bone-processing Workshop((the Spring and Autumn to the Warring State Period)	7,000m ²	59 pits		
	State Han-Nengren Road Pottery-processing Workshop(late Warring State Period-the Western Han Dynasty)	50,000 m ²	Sites for life use		State-run
	Dawulou Pottery-processing Workshop		Sites for life use		
	Han built a cast copper iron workshop on the basis of Zheng.(in the small town)				
Qinxianyangcheng	State-run workshops were near the palace area, yet pottery workshops were near the market.		Unknown	It may intersect with the residential area.	
Han Chang'an Ruins	State-run workshops mainly located inside the city, yet private ones are outside the market.		There was no site in the workshop, while it did as document recorded.	No record	

Notes: All the information above are collated from the latest excavation information and related archaeological reports.

The majority of the house foundations discovered near handicraft workshops were habitation sites with ash pits, and some were office buildings for governance. According to Liu Qingzhu, "around and near the palace-city in the capital of a kingdom, there were state-run handicraft workshops of bronze-casting and jade-processing". Based on statistics on handicraft workshops in capitals of kingdoms, the author found that during many periods of time, handicraft workshops existed not only around and near the palace-city, but also inside it where workshops for bronze-casting, bone-processing, jade-processing, pottery and so on appeared. The purpose of locating workshops in the palace-city was to maintain control over handicraft production as well as constraining the mobility of craftsmen.

Information about habitation sites of craftsmen is now discovered in a small number of workshops inside the place-city. For example, in Erlitou bronze and turquoise workshops, there were spaces separated by walls. Beside the bronze-casting sites in the palace-city of Yinxi and Shangcheng, there existed attached buildings or small towns. In state-run weapon workshops in the palace-city of Xiadu in the Yan State, craftsmen might have lived inside the workshops, but no low-ranking cemetery is discovered in the palace-city.

From the attached buildings found in the palace areas in the late Shang Dynasty, it can be speculated that in early capital cities, for important state-run handicraft workshops (such as bronze-casting workshops), the settlements of craftsmen often located in the palace areas. This results from the monopoly on handicraft production technology in the Bronze Age. Although there is no clear information about craftsmen's habitation sites in other types of handicraft workshops in the palace area due to the lack of archeological data, it can be speculated that there should also be craftsmen's living sites inside high-ranking workshops for bone-processing or jade-processing.



As for workshops outside the palace-city, separation of space also appeared in different kinds of workshops during different periods of time. For instance, stone-processing and pottery workshops in the Taosi period and the Yaojiagang handicraft industry area in Yongcheng, the capital of the Qin state, were surrounded with walls. Such spaces showed closure of various degrees.

3. Spatial Coupling of Handicraft Workshops and its Characteristics

(1) Characteristics of spatial evolution over a long period

As is shown in the figure, workshops with both habitation sites and cemeteries were usually of larger size. Except for the stone “gui” (an elongated pointed tablet used on ceremonial occasions) workshop of the Jin state that was 5,000 square meters, other workshops were over 10,000 square meters, and some even reached over 100,000 square meters. The size of the officially-run workshop in Lingshou of the Zhongshan State reached 600,000 square meters. Most of those workshops were run by the state and some belonged to the clans.

From a diachronic point of view, from the Xia Dynasty to the Western Han Dynasty, in the 18 capital cities there were totally 28 handicraft workshops with residence sites, 20 with cemeteries and 5 with sacrifice space. The proportion of residence sites was higher than that of cemeteries. Meanwhile, the proportion of workshops with residence, cemetery and sacrifice spaces gradually decreased. Despite the lack of archaeological data of workshops in the Qin and Han Dynasties, the proportion of workshops containing residence sites decreased from 16% in the Xia and Shang dynasties to 8.6% in the Eastern Zhou Dynasty. The proportion of workshops containing tombs reached 6% in the Xia and Shang Dynasties, peaked at 13.8% in the Western Zhou Dynasty and later decreased to 4.6% in the Eastern Zhou Dynasty. Sacrificial relics were discovered in workshops in all capitals of the Shang Dynasty, but they were not found in capitals of the Eastern Zhou Dynasty, except in Yongcheng of the Qin State. Sacrificial activities might continued in other forms, but exclusive space for them in workshops gradually disappeared.

However, it should be noted that statistics on the Zhouyuan site of the Western Zhou Dynasty are impact by limited data. Archeological reports show that residences and cemeteries in many settlements in the Zhouyuan site overlapped each other. There existed handicraft workshops in most of those settlements, for example, Licun, Qijia, Yuntang and Zhuangbai. In Fenghao, the capital of the Western Zhou Dynasty, there were many settlements that were located close to workshops. Therefore, it is speculated that in fact the combination of residence and cemetery in handicraft workshops in the Western Zhou Dynasty should be more common than what is indicated by statistics, and the proportion of workshops with residence in the Western Zhou Dynasty might approach or even exceed that in the Xia and Shang dynasties. In the archaeological reports on Xianyang of the Qin Dynasty and Chang'an of the Han Dynasty, residence sites or cemeteries inside handicraft workshops were not mentioned in detail, nor were the sacrificial relics. Although the report on residence in the market of Chang'an appeared in historical literature, the relationship between the residence and handicraft workshops was not clear. Thus, such residence is not included in the statistics of this research.

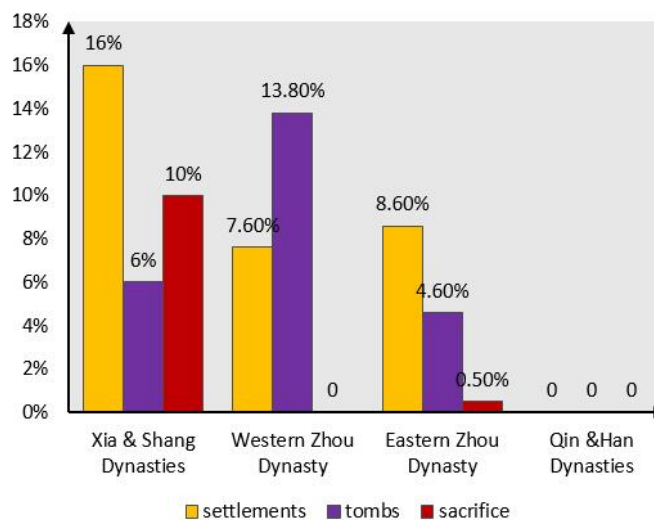




Fig 2 Ratios between workshops containing dwellings, tombs and sacrifice space and the total workshops from Xia-Shang-Zhou Dynasties to Qin and Han Dynasties

From the Xia Dynasty to the Shang Dynasty, handicraft workshops, especially those important ones run by the government, showed a high degree of spatial coupling. The space inside the workshops included production space, government office, residence sites for craftsmen, tombs for craftsmen and exclusive space for sacrifice, which was related to the institution of building officers in the early kingdoms. With the implementation of the “kin-ordered settlement system”, a population management system in the late Western Zhou Dynasty, the spatial coupling inside workshops reached its peak.

Since the Spring and Autumn period, the liveliness of the economy in capitals of the Eastern Zhou Dynasty led to obvious changes in the spatial pattern of capital cities. The living space and public space such as the tombs in handicraft workshops began to shrink gradually, and the number of workshops with a variety of space types dropped sharply. In other words, the degree of spatial coupling of the workshops decreased.

The ideas of division of urban space according to its functions issued by Guanzhong might have a great impact on the space for handicraft producers. Residence space was divided in accordance with different identities of people. For example, craftsmen lived near the government office and merchants lived near the market. Guanzhong divided Linzi, the capital of the Qi State, into 21 areas, of which 6 specialized in handicraft and business and were managed by the "three clans". This resulted from the fact that the handicraft industry was usually inherited by families from generation to generation. In the Qi State, business people and craftsmen could not easily change their career. According to the records in “Zizhang”, a chapter in The Analects of Confucius, Zixia said that craftsmen lived in their workshops next to the streets and did their business. In the late Spring and Autumn Period, the class of craftsmen (called “Baigong” in Chinese) gradually became the populace, and the originally self-enclosed workshops gradually overlapped with the market.

During the Qin and Han Dynasties, with the space of handicraft workshops gradually merging with the market, no trace of cemeteries could be found in the east and west markets of Chang'an. However, the living space still existed, attaching to the space of market trading.

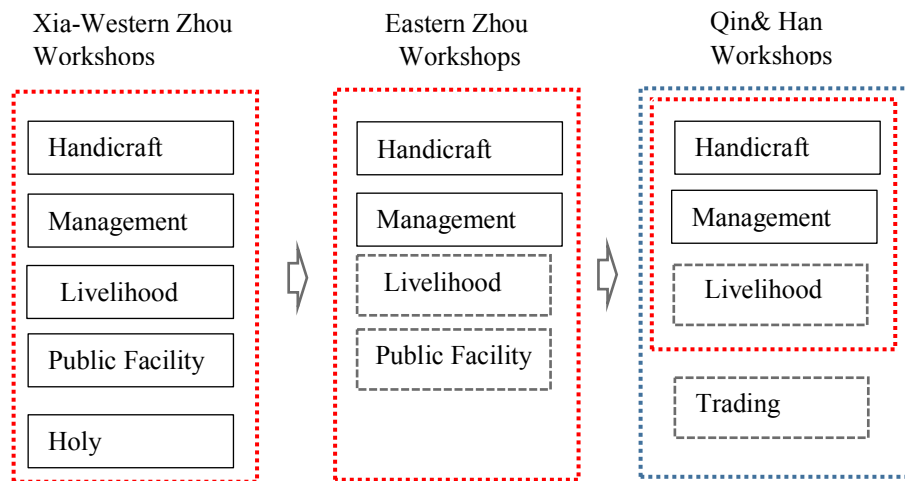


Fig. 3 Schematic diagram of evolution of space composition of handicraft workshops from Xia-Shang-Zhou Dynasties to Qin and Han Dynasties

(2) Spatial coupling of workshops in different handicraft industries

In terms of different handicraft industries, the degree of spatial coupling varied among different types of workshops, which is illustrated in the following figure.

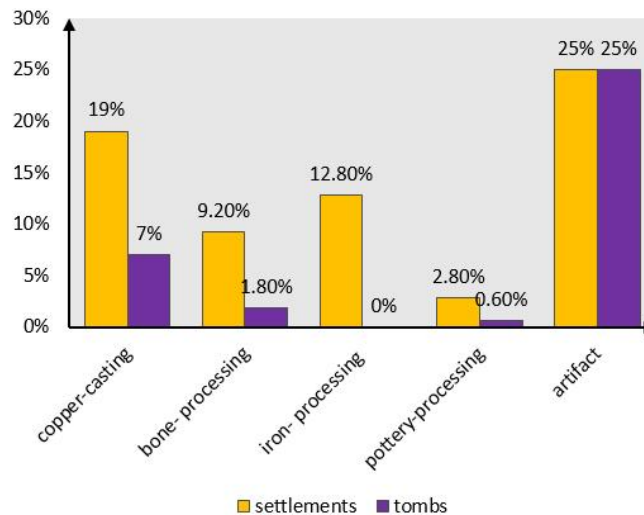


Fig. 4 Evolution of the space composition of handicraft workshops from Xia-Shang-Zhou Dynasties to Qin and Han Dynasties

According to the figure, 25% stone artifact workshops contained residence sites and another 25% contained cemeteries. The proportions were the highest, followed by those of the bronze-casting, bone-processing, iron-casting and pottery workshops. No residence was found in jade processing workshops, which might result from their higher rank and their location in the palace area.

It should be noted that there is something special about the data of stone artifact workshops. In the 18 capital cities, only 8 stone artifact workshops were found, and 2 of them, the Taosi site and the ancient capital of the Zheng and Han States, contained residential or burial space. In the Taosi site, the stone-processing workshop was located in a relatively closed stone-processing industrial park. The mid-term relics in the Taosi site showed that high-ranking residence, together with stone artifact and pottery workshops, was built on the high and smooth land in the city. Stone-processing workshops no longer appeared in the Erlitou site, which might be related to the fact that stone processing had been transferred to other professional settlements. Different families or clans had their own workshops. The stone-processing workshops in the ancient capital of the Zheng and Han State specialized in the production of stone artifacts used on ceremonial occasions.

Besides, the proportion of residential or burial sites contained in bronze-casting workshops was much higher than that of other types of handicraft workshops. In some bronze-casting workshops, there were both residence and cemeteries. Some scholars found that bone-processing workshops and bronze-casting workshops often appeared in pairs, so the proportion of bone-processing workshops with residential and burial space ranked the third. It also reflected the spatial closure of such workshops. With the advent of ironware in the Spring and Autumn Period, iron was widely used in the manufacture of weapons and production tools (but currently no sacrificial vessels made of iron was found). Because the raw material of iron was easier to obtain than bronze, the extensive production of iron required a large number of craftsmen. However, the proportion of iron-casting workshops with residence was not the highest. For example, both the Dawulou bronze-casting workshop and the Cangcheng iron-casting workshop in the capital of the Zheng and Han States existed in the same period of time and covered over 100 thousand square meters respectively. There were 75 residence sites in the Dawulou bronze-casting workshop, much more than those in the Cangcheng iron-casting workshop. The reason might lie in the fact that Dawulou produced sacrificial vessels, weapons and coins, while the Cangcheng workshop produced iron farm implements. The Dawulou workshop, with an obvious higher rank than Cangcheng workshop, satisfied the needs of the nation and guaranteed national security and governance by making a larger number of craftsmen live inside the workshop.

4. Factors Affecting the Spatial Coupling of Handicraft Workshops in the Capitals before Qin and Han Dynasties



(1) the long-term high status of bronze-casting workshops as the "state apparatus" in the early capitals

The degree of management and control over different types of workshops differed. The sacrifice and military affairs were the most important issues of a country. In the early kingdoms period, bronze ware was the symbol of the state power. Thus the authority took absolute possession of the copper mines, production technology and casting space. Bronze-casting workshops could be regarded as a part of the "state apparatus". The location of bronze workshops in the capital city was also very important. There was "exclusive" space for bronze workshops, a "space of power" like the palace and the ancestral temple. Because of the monopoly of handicraft technology in ancient China, high-tech handicraft industries such as bronze-casting were often tightly controlled. Such control was reflected not only in the location of workshops, hereditary system of technology and closure of workshop space, but also restrictions on the living place of craftsmen.

We can not regard bronze-casting workshops as a mere "productive space". The spatial coupling phenomenon where production, management, craftsmen's living space, craftsmen's cemeteries and sacrificial space were strictly controlled in a closed unit reflected the enormous power of the early kingdoms.

(2) The kin-ordered settlement system influencing the coupling of handicraft space in capitals in the Shang and Zhou Dynasties

The combination of "production, residence and cemeteries" in the handicraft workshop space was likely to be relevant to the land ownership system and the population management system, which was evident in the Shang and Zhou Dynasties. In Yinxu, the clan and settlement management system was "mixing together in general and living in compact communities in specific regions". People lived together as a clan but at the same time the population was also decentralized. With the hereditary system, the technology was controlled by professionals from one generation to the next, and was prevented from being lost. Craftsmen of the same workshop as well as some managers might live together as a clan, and with the clan there were both agricultural production and a variety of handicraft industries. Different clans formed independent units with comprehensive functions, guarding the central area of the palace. Moreover, not all the craftsmen were slaves. Based on the funeral objects discovered in the west part of Yinxu, it could be speculated that one-tenth of the tomb occupants were craftsmen. They were professional handicraft workers who fell into the class of freeman. These freemen worked and lived within the clan for a long period of time and were buried in the same area after death.

In the early Western Zhou Dynasty, the clan management system was very similar to that of the Shang Dynasty. At that time, the industry, commerce, their organization and the system of ownership were all with the characteristics of rural commune ownership. The rural commune system is a kind of political governance which can control all the relations of production. Marx and Engels argued that the organization of industry and its corresponding ownership in the ancient society were with the nature of land ownership.

In ancient times "guoren" (literally meaning "capital people") referred to people living in the capitals. Only when the conqueror thought that the conquered shared the same status and common interests with themselves, would they permit the conquered to live in the capitals. The Zhou Dynasty's governance over people of the Shang Dynasty was like that. The Zhou authority made the Shang people moved to Shaanxi in order to develop the economy. The Shang people were allowed to live and produce handicrafts in Zhouyuan, a settlement of aristocracies with family names different from that of the rulers of the Zhou Dynasty. Craftsmen coming to Zhouyuan in early times were probably professional handicraft workers rather than slaves. According to the Japanese scholar Taketoshi Sato, bronze craftsmen in the Shang and Zhou Dynasties formed professional groups with the structure of clans. These professional craftsmen were arranged in a relatively small area of handicraft workshops. They did not own land in the vicinity of Zhouyuan and could only be buried in the handicraft workshops. Through the analysis of the "pottery tube", a tool for bronze-casting, some scholars believed that in the Western Zhou Dynasty the tombs of craftsmen were inside the workshops.

The combination of spaces with different functions, influenced by the clan management system, gradually formed an "integrated space unit". The "handicraft space" could not be simply classified as "space of production" or "space of power". Production (workshops), life (residence), power (management buildings), sacred space (sacrifice) and space for public facilities (cemeteries) were coupled together. Under the clan management, the coupled space was an "integrated space for the branch of power", and its handicraft production was closely related to the state form and the state governance mechanism. The integrated space can even be considered as the



earliest "public space for the clan members " with economic attributes, a production space where clan members worked together.

(3) The changes in cosmological ideas and religious beliefs influencing the spatial demand of sacrificial activities in the workshops

The earliest relics of sacrifice in the handicraft workshops was dated back to the Yangshao period. Sacrificial activities were common in the Shang and Zhou Dynasties, and handicraft production, especially that of the ceremonial vessels, was given a mythological flavor. At present, sacrificial sites can be found in all the ancient Shang capitals unearthed. In the bronze-casting and pottery workshops in the Shang and Zhou Dynasties, there were remains of people, animals and artifacts found in pits. Such distribution of space was likely to be specially planned. The existence of the sacred space in the Shang and Zhou Dynasties indicated that the planning of such a sacrifice space could be dated back to the time of the lower layer of the Erligang site or to the Xia Dynasty.

With the changes of the objects of sacrifice and the simplification of sacrificial activities, the sacrifice space shrunk correspondingly. Although sacrificial space was found in the handicraft workshops in Yongcheng of the Qin State, it was not common in the Eastern Zhou Dynasty, and it was not yet possible to determine whether this type of space existed in workshops in other capital cities at that time. Since the Song and Yuan Dynasties, the worship of gods of different industries has become a general folk belief in the handicraft industry. However, it was difficult to distinguish the buildings for those gods from ordinary house foundations, and the god for some industry might be just a stone.

The sacrificial space in workshops in the early capital once took a very important spatial position, but as the time passed by, the original sacrificial space shrunk and disappeared. This was related to the gradual standardization of sacrificial places by the state. Although sacrificial activities and the worship of gods might have already occurred, the sacrificial space itself might be gradually reduced or disappeared in terms of size.

In general, from the Xia-Shang-Zhou Dynasties to the Qin and Han Dynasties, there was a downward trend in the degree of spatial coupling of the handicraft workshops in the capital cities, which reflected the evolution of various factors such as the state form, power intensity, social governance system, religion and so on.

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