



# Walled cities in late imperial China



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## ABSTRACT

For thousands of years, the Chinese and many other nations around the world built defensive walls around their cities. This phenomenon is not well understood from an economic perspective. We rationalize the existence of city walls by developing a simple model that relates the dimensions and quality of city walls to a set of economic and geographic variables. We report an empirical analysis using hand-collected and previously unutilized data on city walls in the Ming (1368–1644) and Qing (1644–1911) Dynasties. We find that the circumference of a city wall is correlated with local economic and geographic conditions, that wall size is positively correlated with population size in the jurisdiction, and that frontier cities subject to a higher probability of attack tend to have stronger city walls. We examine the physical size distribution of walled cities in late imperial China and show that city sizes above a certain cutoff follow a Pareto law, although the Pareto coefficient decreases algebraically with the cutoff point. This result complements findings in the existing literature that focuses almost exclusively on the population size distribution of cities. We also find that cities with walls in the past have higher employment and population densities at the present time.

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There is no real city in Northern China without a surrounding wall, a condition which, indeed, is expressed by the fact that the Chinese use the same word *ch'eng* for a city and a city-wall: for there is no such thing as a city without a wall. It is just as inconceivable as a house without a roof.

Osvald Sirén (1924, pp. 1–2)

## 1. Introduction

China's continuous history over thousands of years as a unitary state provides a useful context for studying a large urban system from a historical perspective. Many important questions arise in this context: What factors determine urban development in history? How does the distribution of city sizes look like in history? Do any historical features of cities have persistent effects on cities today? Although questions like these are clearly of great scientific interest, urban economists have not systematically studied them in the context of China primarily due to lack of data. In this paper, we aim at studying systematically the urban system in late imperial China. Our effort is made possible by the observation that almost all of Chinese cities had defensive walls in history, and data

on such walls are consistently available. We establish that dimensions of city walls are related to economic fundamentals and thus they can be used to proxy for economic variables that are normally unavailable. Our empirical analysis takes advantage of rich data on walled cities, and demonstrates an approach that will hopefully prove useful for researching other urban issues in history.

Archaeological evidence reveals that as early as over 4000 years ago, human settlements in China were often surrounded by walls. Throughout the recorded history of China, major cities always had defensive walls. In the imperial period, the great majority of urban residents lived in walled cities (Chang, 1977). It is a surrounding wall that most Chinese people used to essentially distinguish a proper city from towns and villages.<sup>1</sup> City walls represented a most

<sup>1</sup> City walls were also common in other civilizations. According to Homer's *Iliad*, a story which took place about 3200 years ago, the city of Troy had strong walls with high towers and great gates. At the archaeological site of Troy in Hisarlik, Turkey, excavations revealed that a stone-walled human settlement existed more than 4000 years ago. According to the Bible, when Moses led the Israelites out of Egypt, which probably occurred some 3400 years ago, many cities in the Middle East were fortified by city walls. The walls of Jerusalem and Damascus are mentioned repeatedly in the Bible. In some of these cities, such as Jerusalem, medieval city walls have survived and remained a tourist attraction today. Elsewhere, as in Paris, their survival till the modern era allowed city planners to build modern amenities. For example, the site of the Thiers Wall, the last remaining of the city walls of Paris, provided vacant land for the Boulevard Peripherique, the ring road that runs roughly along Paris' municipal boundaries.

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Fig. 1. City wall of Beijing in late 19th century. Source: <http://www.photographium.com/south-gate-beijing-china-1874>, with authors' modifications.

salient feature of Chinese cities throughout history until the mid-twentieth century, when the government sought to demolish city walls all over the country in the name of shaking off “the shackles of the past.” Today, complete city walls have been preserved for only a few Chinese cities, including Jingzhou, Pingyao, Xi’an, and Xingcheng. In most other cities, one can hardly see a trace of a city wall.

City walls in China were built primarily for defensive purposes. Typical city walls were thick enough to allow soldiers, horses, or even chariots to march on the top. They were usually fortified by adding battlements, towers, and barbican gates (see Fig. 1). Earlier city walls were generally made of rammed earth only. Starting in the Ming Dynasty (1368–1644), it became a common practice to have city walls faced with bricks. Most Chinese cities had moats surrounding their city walls.<sup>2</sup>

One of our intentions in this study is to demonstrate that the evidence on city walls in late imperial China, which we discuss at length below, functions as an important window to understanding China’s urban development. Defense considerations are closely related to a city’s geographic location. Cities surrounded by a rich hinterland would naturally be preyed upon by bandits or disgruntled nobles. Coastal locations may be more vulnerable to incursions by foreigners, but their wealth may have generated envy by non-foreigners too. Cities in remote locations were critically important in the Chinese state’s ability to fend off invaders, and had to be able to provide for their sustenance during sustained sieges. City walls defined city life in many instances.<sup>3</sup> The well-kept records of city walls has allowed researchers to use their physical size as a proxy for their populations in case where historical data on populations are unavailable (Skinner, 1977b; 1977c).

Despite the long history of city walls, modern urban economics has paid little attention to it. The classic monocentric city model puts the city on a featureless plain. The balance between agglomer-

ation economies and diseconomies determines the physical structure of the city. Such models have no place for a city wall. In fact, to the best of our knowledge, no model of city walls exists.

In the present study, we rationalize the existence of city walls using a simple monocentric city model. In our model, city walls are a man-made amenity built to protect residents, property, and valuable belongings from enemies and bandits. The model relates the dimensions of a city wall to key economic variables.

We test the predictions of the model by using two unique and hitherto unutilized data sources. The first data set was constructed by digitizing hand-collected information from a monumental work, the 130-chapter *Important Notes on Reading the Geography Treatises in the Histories* (*Du Shi Fang Yu Ji Yao*), written by Gu Zuyu (1631–1692), an early Qing Dynasty (1644–1911) scholar. In his book, Gu sought to cover the history and geography of all places in China in the late Ming Dynasty. We coded data from Gu Zuyu’s work on the circumference of city wall and population of the associated jurisdiction for 1182 cities. These data are used to confirm the positive correlation between the size of city wall and population, as suggested by our model.

The second data set has been assembled by a group of researchers led by the anthropologist G. William Skinner (1925–2008). They hand-collected data on city walls for the late Qing Dynasty from more than 900 published gazetteers. Their data contain information on various dimensions of city walls for more than 1600 cities. Using these data, we show that cities facing higher probabilities of being attacked tended to have stronger walls, as predicted by our model. We also report estimation results for city wall sizes in the Qing Dynasty in relation to such geographic fundamentals as quality and properties of the soil, terrain ruggedness, distance from Beijing and from the Silk Road, and broad geographic characteristics of their sites.

Since city walls were built to protect urban residents and properties from outside attacks, they served as physical and to some extent economic boundaries of cities. Therefore, the land area inside a city wall is a natural proxy for the size of the city. Using data from both Qing and Ming Dynasties, we examine whether city size distribution follows a power law as suggested by our model. For both periods, we find evidence that above a certain size cutoff the physical size of walled cities indeed follows a power law. This finding, combined with recent contributions by Dittmar (2011) and

<sup>2</sup> Moats and city walls were usually built at the same time: The earth used for the city wall was dug out of the ground right outside the wall, resulting in a ditch that was then filled with water to serve as a moat.

<sup>3</sup> The early English literature on the life of the Chinese people almost surely would refer to city walls. See for example Buck (1931) and Waln (1933), both of whom lived in China for many years and wrote extensively about its people during the early 20th century. We thank Anna Hardman for the latter reference.

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