Real Estate Prices in Beijing, 1644 to 1840*

Daniel Raff
Wharton School of Management
University of Pennsylvania
3620 Locust Walk
Philadelphia, PA19104, USA
Phone: (215) 898-3804
raff@wharton.upenn.edu

Susan Wachter
Wharton School of Management
University of Pennsylvania
3733 Spruce Street
Philadelphia, PA19104, USA
Phone: (215) 898-6355
wachter@wharton.upenn.edu

Se Yan
Guanghua School of Management, Peking University
Mailing Address:
Rm 402, Guanghua School of Management
Peking University, Beijing, 100871, China
Phone: 86-1062757764
Fax: 86-1062753178
seyan@gsm.pku.edu.cn

* We are grateful to Zhang Xiaolin and Deng Yibin for their generous support in our gaining access to these contracts. Roy Mill and other participants in the 2012 Chicago ASSA meetings gave helpful comments. We owe thanks to the University of Pennsylvania Global Engagement Fund and the Wharton Global Initiatives research fund for grants for this project. Raff thanks Wharton's Mack Center and Dean's Office and Wachter thanks the Research Sponsors Program at Wharton's Zell-Lurie Real Estate Center for personal research support. Yan acknowledges support from the NSF (SES -0922531), the NSSFC (09CJL009), and the China MOE Liberal Arts and Social Sciences Youth Foundation（09YJC790012）. The usual disclaimer applies.

Real Estate Prices in Beijing, 1644 to 1840

Abstract:

This paper provides the first estimates of housing price movements for Beijing in late pre-modern China. We hand-collect from archival sources transaction prices and other house attribute information from the 498 surviving house sale contracts for Beijing during the first two centuries of the Qing Dynasty (1644-1840), a long period without major wars, political turmoil, or significant institutional change in the Chinese capital. We use hedonic methods to construct a real estate price index for Beijing for the period. The regression analysis explains a major proportion of the variance of housing prices. We find that house prices grew steadily for the first half-century of the Qing Dynasty and declined afterwards in both nominal and real terms through the late eighteenth century. Nominal prices grew starting in the late eighteenth century and declined from the early nineteenth century through 1840. But these price changes occurred with contemporaneous price changes in basic measures of the cost of living: there was little change in real terms to the end of our period.

JEL Codes: N95; R31;

Key Words: Beijing; Qing Dynasty; House Prices; Hedonic Regressions

1. Introduction

In this paper, we assemble a new and unique dataset for house prices in Beijing between 1644 and 1840 (that is, from the start of the Qing dynasty through 1840), a period without war, major political turmoil, or significant institutional change in the Chinese capital.[1] We use the dataset to document long-run house price trends in Beijing. We combine this long-run house price index with historical information on population, economic conditions, government policies, and natural, political and economic shocks, and discuss what the driving forces behind the long-run historical price changes might be. We combine the historical house price series for Beijing with series for consumer goods prices and wages to estimate the change in real house prices. More speculatively, we relate these to recent and present price levels for housing in Beijing.

The contracts underlying our dataset have not been previously used by economists. In fact scholarly research on the historical housing market in China has been quite limited.[2] Lack of data hampers solid inquiry into this unknown area of research. Our study of historical housing prices in Beijing is the first quantitative study of China's historical housing market.

This paper makes several contributions. First, the dataset we have created covers a long span of the Qing dynasty period, from its rise through its heyday and into its decline. The data are uniquely valuable: the house transaction contracts from which our

[1] Readers may wonder how the terminal date of 1840 was selected. The Sino-British Opium Wars broke out in 1840. In the end Qing government was forced to open up to foreign forces. This brought about drastic changes in political institutions and economic conditions. Therefore, in this study we confine our attentionto house sales through 1840 only.

[2] Several historians in China have done research about the city of Beijing, for example Han (1996), Zhang (2000) and Liu (2008). But these studies basically use history and sociology approaches and do not focus on the housing market and real estate prices. Zhang (2000) is the only research that utilizes some of these contracts to describe the city and the society in Beijing. But that study is also quite descriptive. The landmark English language works of Rawski (1998) and Naquin (2000) are also not focused on the matters which concern us here.

dataset is drawn are the only reliable primary source for information on the development of the housing market in Qing dynasty China.[3] Besides price, we also collect characteristics for properties that changed hands transacted, and we also identify the location of these properties. We are then able to link the locations to centers of political and commercial activity in historical Beijing.

Second, by estimating a hedonic price model, we construct a time series of housing prices for this nearly 200-year period. Moreover, we construct other economic series, including measures of the price of rice and of consumer prices more broadly over the period, which we use to deflate the real estate price index to create a series in real rather than merely nominal terms. The hedonic model provides insights on the value to be attributed to particular characteristics of housing in this historical period, including the important factor of location. The housing price index provides insights on the time path of housing prices over time. The latter can be compared to other historical trends, for example those of prices more generally.

Third, in recent years there is a large body of literature aiming at comparing real income and standard of living in China with those in other major economies in a longer historical horizon. Concerted efforts in collecting more historical price and wage data from Chinese historical archives have produced academic achievements.[4] Such studies provide valuable insights for us to understand the long-run causes, processes and consequences of the divergence between Europe and Asia. Housing-related expenses are an important item of household consumption, and changes in house prices and rental

[3] These data are for Beijing, the capital city throughout the period. There are no data available for other Chinese cities in this historical period.
[4] See, for example, Pomeranz (2000), Ma (2008), Allen *et al* (2011). Also, the Global Price and Income History Project (http://gpih.ucdavis.edu/) provides a collection of most up-to-date scholarly achievements on international comparison of historical price and income history.

costs have large impacts on people's real income and standard of living. Due to data limitations, however, there is no study so far that incorporates housing expenses into the consumption basket. Our estimation of the long-run house price index and house values provides a benchmark that scholars can use to estimate house expenses for Beijing residents in the Qing dynasty, thus allowing more reliable estimates of costs of living and standard of living in that period in China.

Many scholars have, of course, studied housing prices, indeed for many places, using hedonic methods. Such studies covering short intervals of time are common.[5] Long-period studies, in contrast, are very few in number.[6]

One which comes close is Case and Shiller (1987). The Case/Shiller index, in widespread use in the U.S., is based on repeat sales of the same property and starts in the late 1980s.[7] Shiller (2005) combines these data with other long term data series, including construction costs, to create series beginning in 1890. Linking these indexes, Shiller finds that until the recent run-up of prices in the U.S. starting in the mid-1990s, housing prices adjusted for inflation were basically constant.

The only other study that we are aware of that covers a long historical period, and the only study that covers a period comparable to ours, is Eichholtz (1997). That paper introduces a biennial historic index of real estate values for the period 1628 through 1973 for Amsterdam based on the transactions of the buildings on the Herengracht, one of the

[5] For example, Nicholas and Scherbina (2010) collect house transaction data from the *Real Estate Record and Builders' Guide* and construct a hedonic price index for the Manhattan area between 1920 and 1939.
[6] For example, Moorhouse and Smith (1994) constructed a hedonic house price index to study the effects of the row house on house prices in many US cities in the 19th century. Margo (1996) collected house rental data from newspaper ads in New York City and constructed a hedonic house rental price index for New York City between 1830 and 1860.
[7] See http://www.standardandpoors.com/indices/sp-case-shiller-home-price-indices/en/us/?indexId=spusa-cashpidff--p-us----.

main canals in Amsterdam and finds, similarly to Case, that housing prices essentially do not change much when viewed over extended periods.

Our resources differ from those of Eichholtz in two respects. First, our index is temporally much coarser due to the relative paucity of reported transactions o which we have access to in this period. Second, we are not able to track repeated sales. Instead, we construct a hedonic index with the usual dummying strategy for time.[8] Controlling for a variety of property characteristics including location, we construct a price index from the coefficients on the time variable, as is standard in the hedonic price index literature.

Measuring prices for same-house sales over time nearly perfectly controls for house characteristics. In the absence of such rich information, the standard method for constructing house price indices involves including house characteristics directly in regressions and estimating price indexes over time from the coefficients of dummy variables for time. This method has been shown to produce robust price indices. But we believe that estimation of such an equation for a 200 year period is unique. The equations perform well in part due to the availability over time of data on a number of attributes. The estimates throw light on the importance of these property characteristics, including size of property, location of the property, the availability of onsite water supply, building materials, and whether or not there had been formal legal registration of the property sale.

The paper is organized as follows. Section 2 introduces the historical background of Beijing's house market during our sample period. Section 3 explains in detail how we extracted variables and processed the data from original contracts. Section 4 explains

[8] For a recent discussion of the hedonic regression methods, see Diewert (2003) and the sources cited therein.

how using these data, we construct a house price index for Beijing with hedonic methods. Section 5 shows several robustness checks we do for our hedonic regressions. Section 6 compares our house price index with price indices for other consumption goods and wages. Section 7 offers a brief conclusion.

2. Historical Background

In ancient China, a city's central function was as a military fortress and it was usually surrounded by walls and moats. Beijing, as the capital city, had the most complicated structure of all Chinese cities. The perimeter of the city lay about where the Second Ring Road runs today. It enclosed an area of about 63 square kilometers, more precisely 15,561 acres.[9] As shown in Figure 1, the city of Beijing comprised two parts, the Inner City (the upper square) and the Outer City (the lower square), both surrounded by city walls. These two parts were separated by three main gates, Qianmen (the Front Gate), Xuanwu Gate and Chongwen Gate. The Forbidden City, where the royal family lived, was located in the middle of the Inner City, and was separated by the walls with four main gates: Dong'an Gate, Xi'an Gate, Tian'an Gate, and Di'an Gate.[10]

[Figure 1 about here]

As the capital of this vast empire, Beijing was certainly not only a military fortress and a political center: it had many other functions. Beijing was one of the biggest commercial centers in China, a fact we will consider below. There were also a number of temples inside the city, with many of them dedicated to the government's ritual services such as the famous Temple of Heaven. There were and are several rivers

[9] Beijing now has six concentric ring roads.

[10] This is why an old Chinese proverb refers to "seven gates in the Outer city, nine gates in the Inner city, and four gates in the Forbidden city".

and lakes in the city, and a number of gardens were built along them, although most of the gardens were not accessible to the public at the time.[11] There were certainly schools and academies in the city. But there was no public schooling system in that era and these schools and academies were for an elite group of people rather than the general public. To summarize, the activities most relevant for the everyday life of the mass of local residents in Beijing in the Qing dynasty went on in the political and commercial districts.

Beijing became the capital city of the Chinese empire when the Mongolians occupied China in the thirteenth century. Beijing then became one the largest cities in the world in terms of both area and population. The population of the city of Beijing in the mid-fifteenth century was nearly one million (Han, 1996). During the Manchu-Han Civil War and the peasants' rebellions of the early seventeenth century, the city became dilapidated and its population decreased substantially. Once the Manchus took over Beijing in 1644 and set it up as the capital city of what became known as the Qing Empire, however, the population stabilized and began to grow. As Table 1 shows, the Manchus were a majority of the residents in the Inner City in 1647. The Manchu population of the Inner City grew rapidly until a decline in the eighteenth century while the Han population in the Inner City kept declining. In the Outer City, both the Manchu and the Han population grew substantially over this period. In the late eighteenth century, when the Qing Dynasty reached its heyday, the population of Beijing exceeded 750,000, making Beijing once again one of the largest cities in the world.

[Table 1 about here]

[11] Some of the gardens have survived. These gardens were privately owned in the Qing dynasty but are now open to the public and are famous places. Princess Gong's Garden (*Gongwangfu*) is one prominent example.

The most popular type of residential architecture in Beijing at that time and throughout the rest of our period was a "quadrangle".[12] As shown in Figure 2, a quadrangle is a Chinese traditional rectangular courtyard with buildings on four sides. There are still many quadrangles inside the 2nd Ring of today's Beijing. The gate was usually on the south side of a quadrangle, and the rooms on the same side of the gate were usually for servants or nannies. The room on the north side, facing the south gate, was the master room. The rooms on both sides were other living and bedrooms. The sizes of quadrangles could vary a great deal. Usually a quadrangle was occupied by one (extended) family; occasionally they were shared by a few families. Some particularly large properties were composed of many connected quadrangles with two, three or even more courtyards. These were occupied by particularly large (extended) families.[13] Of course, only the quite well-off could afford such properties.

[Figure 2 about here]

The institutions of the real estate market in Beijing changed drastically after the Manchus took Beijing in 1644. In the early years of the Qing dynasty, the housing market in Beijing was very primitive and operated under tight regulation. In order to provide dwellings for Manchu troops and officials, the Manchu government occupied all the lands and houses in the Inner City and ordered that all the Han people, officials and merchants, move out to the Outer City.[14] The Manchu government took over the houses in the Inner City and allocated many to Manchu military and government officials

[12] In this paper we use interchangeably the terms "house", "properties", and "quadrangles".
[13] The families in question were multi-generational, including grandparents, parents, siblings and their children.
[14] As Table 1 suggests, there were some exceptions to this policy. Certain Han residents, such as those who were admitted to the Eight Banners, who worked and lived in government office buildings, and who worked for religious organizations, were still allowed to live in the Inner City.

according to rank. The residents remaining only had the right to use, but not to own, their residences. Buying and selling of the properties in the Inner City became illegal. Han people were allowed to enter the Inner City in the daytime but were not allowed to stay overnight. They were only allowed to own properties in the Outer City.

In contrast to the system in the Inner City, properties in the Outer City were under unambiguous private ownership and it was legal for Han people to sell these properties to other Han people though purchase by the Manchus was restricted. Starting in the late seventeenth century, as the economy recovered from Manchu-Han civil war and the peasant rebellions, a growing number of Han merchants came to do business in the Inner City. Some of these rented properties from Manchu people. Some even discretely purchased properties.

As time passed, the Qing government gradually relaxed the official prohibitions. Manchu people were allowed to buy houses in the Outer City from 1681 on. In 1733 the government officially allowed the Manchu people to buy government-owned properties and issued deeds to the owners, marking that the Manchu people's ownership right was legally acknowledged. In 1758, all property transactions between Manchu people in the Inner City and Outer City were allowed. In 1782, the government began to allow property transactions between Manchu and Han people. Although the process was slow, it is very clear that a well-functioning real estate market gradually emerged in Beijing and that private property ownership gradually became established.

In the Qing period a sophisticated transaction system developed. In this system, the buyer and the seller signed a contract with the help of a real estate agent ("*Fang Ya*"). The main responsibilities of a real estate agent were to provide house information and

market suggested prices, collect taxes for the government, and help resolve disputes. The agents were licensed by the government, and the license was renewed every five years.[15] The agents signed their names on the contracts in order to be responsible for these transactions. The profession of real estate agents was usually inherited. In this way the agent families could be held responsible for the house sales contracts for a longer time horizon.

The government imposed controls on house sales. In order to regulate the house sales market and collect contract taxes, the Qing government provided standardized house sales contracts with serial numbers on all these contracts. The transaction tax, formally a stamp tax, was 3 percent of the total value. Once the contract was signed, the agent would send the contract to the government, pay the tax, and government would stamp the contract in red wax and keep a record. This type of contract was known as a "red contract". Sometimes there were white contracts, that is, contracts for transactions in which the buyers and the sellers reached an agreement and signed a contract but did not report the sale to the government and pay the tax. Such contracts were known as white contracts due to the absence of the distinctive government stamp. White contracts were not legal, and the law clearly stipulated fines for the use of white contracts.[16] However, both red and white contracts were, in the event, used for transactions.[17]

Aside from the regular house sales, there was another type of transaction in the Qing dynasty: pawn ("*Dian"*). Pawn usually took place when a debtor was not able to pay back the debt to his/her creditor, and transferred the house to the creditor. If the

[15] See Zhang (2000) for more details about real estate agents in the Qing dynasty.
[16] The Grand Law of Qing Dynasty stipulated that "those who do not pay house contract taxes receive 50 spanks and pay the fine of half the contract amount" (Zhang, 2000).
[17] It remains unclear to what extent and under what circumstances such contracts were enforced in this period. See Zhang (2000) for more detailed, if not dispositive, discussions.

house is under a rental lease, the rental income was given to the creditor as the interests of the debt. Under the pawn contract, the creditor had the rights to use, change and transfer the houses, and the only right that the debtor kept was the redemption right when the contract was over. Therefore, pawn was a type of transaction reflecting partial transfer of property rights.

3. Data

Our study is based upon actual property transaction contracts now preserved in the No. 1 Historical Archive of China, the Chinese Academy of Social Sciences, and the Peking University Library. These contracts are the only large-scale primary source for information on the history of the housing market in Beijing in any detail. Unfortunately, a large number of the original contracts have been lost over time. (We know, for example, that fire was on at least one occasion a problem.) We do not now know enough about the losses to assess in any systematic way whether they created any artificial structure in the data.

We hand-copied all the surviving contracts. The contracts were hand written in traditional Chinese and without punctuation, so our creation of a machine-readable database from them was no small task. We extracted from the database a number of variables useful for studying real estate prices. For the period we study in this paper (1644-1840), we utilize all 498 of the sale contracts. [18]

[18] There are about 100 contracts in the database not included in our study. These contracts are called Dian (pawn) instead of Mai (sale), because they allow buybacks for a prescribed period of time. For a detailed study about the differences between these two types of contracts, see Ellickson (2011).

These sale contracts are the legal documentation of house transactions in the era we study. The information contained in the contracts is highly detailed and complete. A typical contract includes the date of the transaction, information about the buyer and the seller, the transaction price, the location of the house, information about the size of the house, information about the building materials, information about certain features of the house such as the presence of a garden or a well, information about whether the house was to be used for business or residence, and so on. We extracted a set of variables from the contracts and coded them for use in hedonic regressions. We discuss the regression variables one by one below.

1) Transaction Price

The transaction price is the central data series for our study. But the raw data require treatment. This is because currencies used in these transactions varied, even at specific moments in time, and conversion rules remain unknown. The Qing government adopted bimetallism, which is to say that silver and copper coins were in circulation. But there was never a standard exchange rate series for the two currencies. What makes the conversion particularly complex is that there were many different types of silver taels.[19] There is no standard or established method to convert prices expressed in these different coinages into those in a single currency. We used several different methods to convert all these currencies into the official standard silver tael (*Shiping Zuseyin*). We discuss the details of currency conversion in the Appendix. We then ran hedonic regressions and

[19] A tael is a standard weight of silver sycee (or ingot), usually corresponding to about 30 grams (See accompanying picture in Figure 3). For transactional purposes, silver coinage was usually "sycee", which had standard shapes and weights. Copper coin was also in principle standardized. Theoretically, the exchange rate was 1 tael of silver for 1000 copper coins. But this rate kept changing in actual practice, perhaps due to problems of inconsistent purity, and the changes could be of significant proportions. The Appendix discusses these matters in greater detail.

compared results. The different methods led to ~~quite~~ similar outcomes. IS THIS SUFFICIENT OR DO WE NEED ONE MORE SENTENCE SAYING WHAT ALL IS IN THE APPENDIX (GIVEN WHAT WE SAY IN FOOTNOTE 19)? [I THINK THIS IS OK]

These transaction prices are in nominal terms i.e. not adjusted for changes in the general price level. Since there is no extant price index for the Qing dynasty period, we constructed an index of overall consumer prices (discussed below) to better understand house price fluctuations in long run perspective. Using this index to correct for changes in the overall level of prices, the summary statistics report that the mean real price is 492 taels, with a standard deviation of 812 taels. The minimum price is 10 taels, and the maximum price is 7631 taels.

2) Transaction date

The transaction date was recorded unambiguously in every contract. Our limited sample size does not allow us to construct an annual housing price index. So we have grouped our contracts to 25-year periods. This yields us eight periods from 1645 to 1840. Table 2 reports the distribution of contracts (price observations) over these eight periods. As shown in the table, transactions in early years are few but the numbers increase over time. This is true not only because recent contracts are more likely to have survived but also because the number of transactions increased over time as a result of population growth (see Table 2 above) and rapid developments in the economy and commerce in Beijing as we discuss below.

[Table 2 about here]

3) Number of rooms

Information on the square footage of the transacted units, the quadrangles, is not available.[20] We use the total numbers of rooms as a proxy for the size of the units. Table 3 reports the distribution of units by number of rooms in our sample.

[Table 3 about here]

The assumption behind using the number of rooms to proxy the size of the transacted property is that all the rooms are roughly of equal size. This is surely untrue. First of all, rooms with different functions also typically had different sizes. For example, the master room of a house provided for a third-ranked official was about 75 square meters, while other rooms were only about 48 square meters. Furthermore, according to historical archives, room sizes of government-provided houses varied with the status of the owners. For example, rooms of a house provided for sixth-ranked officials (usually prefecture leader) are roughly 60 square meters, while those provided for common government employees are only about 16 square meters (Li *et al*, 2002). For all the potential problems with this measure, however, there is no better alternative. To minimize the problems in our study, we introduce the variable "courtyard numbers" to control for variations in room size, as discussed below.

4) Courtyard number (进, *Jin*)

As we stated earlier, the main form residential houses took was that of a quadrangle. Quadrangles typically were made up of four buildings.[21] Size, structure, and quality of residential houses varied a great deal and one of the biggest factors affecting

[20] Many hedonic studies use the number of rooms in this way and the variable is viewed even in the literature on current periods as a good proxy for size. For an example from the historical literature, Margo (1996) adopts this proxy in his study on the house rental prices in New York between 1830 and 1860.

[21] In this paper we use the word house as a synonym for quadrangle (in the sense of the sentence in the text—the Chinese symbol for quadrangle means both the architectural formation and the geometric shape). This is a slightly technical usage and does not quite correspond to that in ordinary English (in which 'courtyard' and 'quadrangle' are roughly synonymous). The unit in our data is the sale of a "quadrangle".

the value of a house was how many courtyards the house contained.[22] A small quadrangle usually contained a single courtyard surrounded by rooms on four sides. A medium-sized quadrangle would have contained two or three courtyards, each surrounded by buildings (or chambers). A large quadrangle would have had more than four courtyards. Large quadrangles were usually very expensive and, as noted above, only very rich merchants and high-ranked officials could afford to own them. The number of courtyards a property possessed was recorded clearly in the contracts. Table 4 reports the distribution of courtyard numbers in the quadrangles in our sample. The table shows that about 2/3 of the transacted properties had only a single courtyard and only 6.63 percent of the houses had four courtyards.

[Table 4 about here]

One attractive feature of number of courtyards as a variable is that it seems likely to have been highly correlated with average room size. In this period, quadrangles with more courtyards were usually luxurious properties owned by members of the upper class and such properties usually had bigger rooms. So we construct a "number of courtyards" variable for our hedonic regressions to control for unobserved variations in room size.

5) Contract type

In the Qing dynasty, as noted above, there was a legal requirement that every property transaction contract be endorsed (via the red stamp) by the government and that at that time a transaction tax of 3 percent of the transaction value be paid. A red contract is a complete legal document, and private ownership established by a red contract was fully protected by the government. However, as described above, some buyers and

[22]In a large family residence, as was noted above, several of what might otherwise be quadrangles might be connected together, so that the property had several courtyards. Such properties could sell as a single unit.

sellers agreed not to send the contracts to the government for endorsement so as to avoid paying the transaction tax. Such "white contracts" were not, strictly speaking, complete legal documents and private property ownership interests associated with these contracts were at least in principle not fully recognized and protected by the government. Whether a contract was red or white might have affected the market value of the estate. In our data set 24.1% of the contracts are white contracts. We included this variable in our hedonic analysis to check whether any significant price difference between two types of contracts, all else equal, can be observed.

6) Location

Location is, needless to say, a key attribute of any property. There are usually a relatively small number of types of important functional centers in a city, particularly a large one, such as commercial districts, political centers, and education centers, and this was the case in historical Beijing. Adjacency to these functional centers is likely to have a significant influence on the demand for individual properties and thus on their prices.

In order to measure the distances between our sample properties and major commercial and political centers, we need to first position our properties and these major centers on a map. We spent a great deal of time consulting surviving historical materials attempting to locate these addresses precisely. The idea was then to mark these addresses on a digitized historical map of Beijing city. The historical map we used is a famous one called "A Complete Map of the Capital City in Qianlong Period" (*Qianlong Jingcheng Quan Tu*). Completed in 1750, the original of this map is about 14 meters long and 13 meters wide, with a scale of 1/650. The map is considered to be very reliable and is

probably the most widely used historical map of Beijing city for the early and middle Qing period.

Because many addresses recorded in the contracts changed over time (as areas were redeveloped, houses were renumbered, and individual street names sometimes even came and went), it was not possible on a consistent basis to attach precise locations to all house properties for which we have contracts. But the situation is better than this may make it sound. It was possible to divide the map into 17*13=221 grid cells, each of which encloses a relatively compact area of about seventy acres, and to locate each of the properties in a specific cell. The grid map is illustrated in Figure 3 (compare Figure 1).

It will be helpful to inscribe some features of the city on the grid map. The biggest commercial district in Beijing city during the Qing dynasty, an area which is still commercially very active today, was Qianmen (the front gate). Located in the Outer city, the Qianmen area was not simply a commercial district but was also the biggest center of the financial industry and other service industries such as dining, performance art, and hotels. Caishikou was another major commercial district in the Outer city. The Inner City was designed as a political center in the beginning of the Qing dynasty, and commercial activities in the Inner city declined significantly in the early Qing period. From the late seventeenth century onwards, commerce revived in the Inner city and a few large markets came into existence. Longfusi, Huguosi, Dongsi and Xisi were four biggest markets in the Inner city. These main commercial districts are marked in Figure 3.[23]

[Figure 3 about here]

[23] Close readers of the Figure will note that some areas on the map are identified as uninhabitable and others "blank". Uninhabitable cells are largely taken up by rivers, lakes, or temples. Figure 1 shows inter alia that the city walls did not enclose a precisely rectangular shape. Blank areas are outside the city walls.

The most important political center in Beijing city during the Qing dynasty was of course the Forbidden City. The Forbidden City, also known as the Palace City, was where the royal family lived and worked. The Forbidden City was located at the center of the Inner City. Outside the Forbidden City was the area where many central government departments located. This was called the Royal City. The Forbidden City and the Royal City were political centers throughout the dynasty. Their cells are marked with the number 1 in Figure 4.

[Figure 4 about here]

With all the addresses, the commercial districts and the political centers inscribed on the grid map, we need to create variables measuring the distances between the properties and these centers. We do this in a stratified rather than continuous fashion. We assign variable values according to the distances to the nearest commercial district as follows: 1 corresponds to the cell including a commercial district; 2 corresponds to the cells adjacent to a commercial district cell; and 3 corresponds to the cell neither including a commercial district nor being adjacent to one which does. In this way, every property in our sample is assigned a value measuring its distance to the nearest commercial district according to which cell in the map grid it occupies. Of course this measure is a variably accurate proxy for the actual distance: we are obliged to adopt this method because the precise distances could not consistently be measured. Table 5 reports the summary statistics of distance to the commercial districts on this basis. It shows that about 85% of real estate transactions took place in or close to the commercial districts, demonstrating that distance to commercial districts is indeed a critical factor in determining demand for the properties, the imprecision of our measure notwithstanding.

[Table 5 about here]

We use a similar method to create a variable to measure the properties' distances to the political centers and assign a value to this variable according to its distance to the Forbidden City: 1 if the property was inside the Royal City, 2 if the property was not in the Royal City but in the Inner City, and 3 if the location was in the Outer City. Table 6 reports the summary statistics of distance to the political centers. The table shows that about 2/3 of our sample transactions took place in the Outer City, which was far from the Forbidden City.

[Table 6 about here]

7) Construction materials

Most houses in Beijing during the Qing dynasty were built of brick with roofs covered in tile. Bricks and tiles had been in wide use since the Ming dynasty, and houses built with these materials withstand bad weather better. However, the materials and workmanship required were expensive. A small number of houses in Beijing were only built from limestone clay. Building from limestone clay was much less expensive at that time despite the materials not providing sufficient warmth in the cold weather of winter. If a house was built with limestone clay, its market value would be seriously affected. We find that only 3.6 percent of our sample properties were built with limestone clay.

8) Usage of house

Our data set covers both residential and commercial properties and the contracts record clearly whether the houses were for commercial use or not. About 85% of our samples are residential properties. All else equal, a commercial property might be more

expensive due to the prospective profits from the commerce.[24] We put a variable showing house usage into our hedonic regressions and control for the effect in estimating house prices.

9) Conditions of the Properties

Some properties in our data set were in poor repair.[25] In particular, summary statistics show that 7.43% of our sample properties were recorded as in poor condition. The market value of a property was certainly adversely affected if this was the case. We control this factor in our hedonic regressions to better estimate house prices.

10) Having a water well

Some properties in our data set came with an on-site water well. Water supply was not easy in such a big city in this pre-modern period. Most families in Beijing had to fetch water from public wells or buy water from water suppliers. Therefore, having a private well in house provided huge convenience and such properties were usually in great demand. Although only a small number of properties had a well, we find it helpful to control this factor in our regressions.

4. Empirical Analysis

The first objective of this paper is to construct a house price index for Beijing for the period we study. In order to obtain this index, we use hedonic regressions to adjust for changes in the attributes of the sample over time (for example, different sample sizes in different periods), as well as to control for characteristics of the individual transactions.

[24] In this period, urban life seems to have been much more desired than relatively rustic tranquility. We see no evidence of grand estates away from the center of the city.

[25] The properties that were marked as "in poor condition" were inhabitable but usually needed further renovation. The extent of the renovation these properties needed, of course, varied; and we have no independent means of capturing this.

The dependent variable is the log price of each transacted estate, and the independent variables are period dummies as well as the characteristics of these estates: distance to commercial district, distance to political center, room number, courtyard number, contract type, building materials, commercial or residential estate, whether it was in poor condition, and whether it had a well. The regression specification is below:

$$\log p_{it} = \alpha_0 + \alpha_t D_t + \sum_{n=1}^{N} X_{in}\beta_n + \varepsilon_{it},$$

where $\log p_{it}$ is the log price of estate i in period t; α_0 is the constant term; D_t is the period when the contract was signed. We have 8 periods from 1645 to 1840, 25 years for each period; X_{in} is a series of attributes of the quadrangles mentioned above; and ε_i is the error term. The first column of Table 7 reports the results.

[Table 7 about here]

The regression shows that house prices increase significantly with the number of rooms and the number of courtyards. One more room increases house price by 5%, and one more courtyard increases house price by 32%. This confirms that the size of a property is a critical factor in determining its market value.

Our regressions also indicate that the price difference between red and white contracts is not significant. This is surprising at least in principle because presumably the estate price in red contracts could be higher because this type of contract was fully recognized and protected by the law. Certainly we need further study into this issue before we can explain this result with any confidence. But it is an established fact that in some lawsuits in the Qing dynasty a white contract was still accepted as a proof of property ownership (Xu, 2009). Therefore, for a buyer and owner, signing a white contract did not absolutely hamper sale and ownership. Whatever the dangers to

unregistered ownership were, they may have been small. This is possibly the reason why the price difference between the two contracts is insignificant.

It is clear from our regressions that location is extremely important for a property's market value. We use two dimensions to measure location premium: distance to commercial districts and distance to political centers. We find that the properties close to commercial districts were about 26% cheaper than those in commercial districts, and the properties far away from commercial districts were about 32% cheaper than those in commercial districts. In terms of distance to political centers, our regressions show that as long as the property was in the Inner City, prices did not significantly differ from each other. This is probably because many other important government offices located in different parts of the Inner city. Therefore, although the Forbidden City was where the central court located, being adjacent to the Forbidden City did not bring substantial price premium as long as the property was in the Inner City. In sharp contrast to that finding, our regressions confirm that it made a huge difference whether the house located in the Inner or the Outer City. Houses in the Outer city were about 30% cheaper than those in the Inner city. This shows that the entire Inner City was the political center and brought the properties inside the Inner City a significant location premium.

Commercial properties were 23.5% more expensive than residential properties, according to our regression analyses. Our regression also shows that the prices of the properties built with clay material were 67.5% lower than those built with brick and tile. Houses in poor repair were about 33.3% cheaper than the houses that were in good condition. Having a well brought 75.6% premium to the market value of a property, according to our regression results.

While our dataset contains fewer observations than we might like, we are able to successfully estimate a hedonic house price model for the entire period with a relatively high degree of explanatory power. Our results show the characteristics that contributed to the value of Beijing housing. The inclusion of a time variable enables us to construct a housing price index for Beijing over the time period.

5. Robustness Check

We calculate four different specifications of our regressions. In the second column of Table 7 we use only the contracts from the Outer City. We do this because the real estate market in the Outer City was much more active than in the Inner City, and the market there was less regulated by the government. In the third column we drop a few outlier contracts in which room number was either more than 100, or only 1. We drop these few outliers for a robustness check. As Table 7 shows, the results are quite similar to the regression result when we use the full sample, which is reported in the first column. This shows that our hedonic estimation is quite robust.

In the above specifications, we use the number of courtyards to control for unobserved differences in room size, because historical evidence suggests that they are positively correlated. As population grew in Beijing over time, demand for more housing became acute. One simple method of increasing housing supply is dividing a courtyard into more rooms. This would imply smaller room sizes over time and, if this factor is not controlled for, an underestimate of the housing price index would be underestimated if this factor is not controlled. Our data indicated this was true. In the 17^{th} century, each courtyard had about 4.5 rooms, in the 18^{th} century each courtyard had about 6 to 7 rooms,

and in the early 19th century each courtyard had about 10 rooms. Therefore, it is reasonable to believe that there is a negative correlation between room size and number of rooms per courtyard. By this token, as a robustness check we use number of rooms per courtyard instead of the variable "number of courtyards" to control the unobserved differences in room size. The regression result is reported in column 4 of Table 7. As we expect, the coefficient of number of rooms per courtyard is significantly negative. The coefficient of number of rooms remains significantly positive after we control the room size factor. The coefficients of other house attributes are similar to those in previous regression specifications. Such results indicate that our hedonic regression is robust.

In our main regression specifications, we estimate the house price index for every 25 years. This is a quite coarse partition, and we do this because of our small sample size. However, we also group our sample into 10-year intervals and check if the hedonic regression results are significant different. As Column 5 of Table 7 shows, the results are quite robust even if we group our samples into 10-year intervals. We also plot the house price index using 10-year interval method in Figure 5 and compare this with our main index. As the figure suggests, the general patterns of the two house price indices are quite similar.[26]

All the previous regressions treat dates of transactions as dummy variables. Alternatively, we treat years of transactions as a continuous variable to check if the estimation results from this specification are significantly different from the results of dummy regressions. The results are reported in Column 6 of Table 7. The estimated coefficients of other attributes are quite similar, and the coefficient of the variable "year"

[26] Our discussion is based on the 25-year partition due to concern about small cell sizes with the finer partition.

is significantly positive, indicating a moderate rising trend of house price. This is consistent with the results using 25-year interval dummy and 10-year interval dummy.

In all previous specifications, we pool all the house sales contracts together and treat different periods as dummies or one single continuous variable. In order to check the robustness of our estimation results, we divide the contracts into two groups: 1645 to 1750, and 1751 to 1840, and estimate house prices by these two periods separately. Table 8 reports the results. The first column of Table 8 is the same column 1 of Table 7, which reports the results of the pooled regression, and Columns 2 and 3 report the estimation results for the two periods respectively. Table 8 shows that the estimated coefficients of major attributes remain roughly the same when we divide our sample into two parts. For several attributes such as “close to commercial center”, “far from commercial center”, etc., the estimated coefficients for the first period are not significant, and the main reason is because there is no enough sample points in this period. Therefore, we are confident to conclude that the estimated house price trends are robust.

[Table 8 about here]

6. A Housing Price Index

One of the main objectives of doing the above hedonic regressions in this paper is to estimate the coefficients of 8 period dummies and obtain the housing price index. We report the index values in Table 9. In Figure 6 we plot out the estimated coefficients of the period dummies obtained in our first regression specification.

[Table 9 about here]

This house price index is not inflation-adjusted. There is no extant consumer price index-like series price index for Beijing or for China in the period we study. That being the case, we first compare our house price index with a rice price index. Secondly, we construct a new consumer price index for Beijing for the eighteenth and nineteenth centuries and compare our house price index with this CPI. In this way we can better understand the economic implications of the fluctuations of the real estate prices.

[Figure 6 about here]

Rice was probably the most important commodity in pre-modern China. According to Peng (2006), expenditure on grain was on average no less than 55% of the total expenditure for Chinese families in the eighteenth century, and a large portion of this expenditure was on rice. Because of its importance, the Qing government collected rich data on rice prices across the country, and these data provide us with a benchmark in estimating house price levels in Qing dynasty. Some scholars have utilized these grain price data to study various aspects of the economy in Qing dynasty.[27] Peng (1954) presents gives? a national average rice price series for the Qing dynasty, and we use this data. We index the data, report the rice price index in Table 9, and plot the index in Figure 6.

The price of rice is of course only a partial proxy for the general level of consumer prices. A comprehensive estimation of price levels requires more information. In order to better understand the changes in the real estate prices, we construct a consumer price index for Beijing in the Qing Dynasty. Our CPI starts from 1738 because the only price data available before 1738 concern rice alone. Between 1738 and 1840, however, we obtain price data of 14 main consumption goods for Beijing from Allen *et al*

[27] See, for example, Wong (1975), Li (1992), Shiue (2002), Shiue and Keller (2007).

(2011).[28] Suitable weights for these commodities are available in Yan (2008). Combining these, we generate the CPI for Beijing over our sample period which is reported in Table 10 and plotted in Figure 6 (above).

[Table 10 about here]

To examine the changes in the housing prices relative to the general price level more precisely, we deflate the nominal house price index by the rice price index and the CPI, and obtain the two real house price indices which are plotted in Figure 7.

[Figure 7 about here]

It is evident from Figure 6 that the trend of the nominal house price index is roughly consistent with the rice price and our proposed CPI from the early eighteenth century to the end of our sample period. This is more clearly shown in Figure 7. As we see from the figure, the real house prices, deflated by both rice prices and CPI, were relatively stable in this period.

The situation was quite different in the first half of the period we study, from 1650 to 1750. Figure 6 shows that in this period the trend of our nominal house price index differed from that of the rice price index and CPI. The trend of the rice price index indicates that the price level remained very low from 1640 to 1725. Then the price level in terms of rice began to rise markedly, suggesting substantial economic growth. However, our estimation shows that house prices soared in the late seventeenth century, and plummeted in the early eighteenth century. Real house prices increased about three times in the late seventeenth century and dropped about the same amount (in rice price terms, less in terms of the CPI) in the early eighteenth century (See Figure 7). Such

[28] Allen *et al* (2011) does not publish the price data in the paper. Instead, the price data are published on the website of Global Price and Income History website (http://gpih.ucdavis.edu/Datafilelist.htm).

drastic changes in the price of housing may not have been caused by the state of the economy but rather by government policy.

Starting in the mid-seventeenth century, the economy gradually recovered and the population of Beijing, particularly the Manchu population, increased very briskly (See Table 1). The government began to relocate the Manchu population from the Inner City to the Outer City, to suburban areas and even to other cities and provinces. Retired officials were ordered to move back to their home towns. Quite apart from the planned relocations initiated by the government, a large part of the Manchu population voluntarily moved out of the city due to soaring living expenses. According to Han (1996), at least two hundred thousand people moved out of the Inner City overall. The government also enforced tight control over the ability of people from other provinces to move to Beijing. In addition, according to Li *et al* (2002), seeing that the low-income Manchu people were not able to afford expensive houses in the Inner City, the government built a great number of new houses in the Inner City and the suburbs very close to the Inner City and allocated them to the low-income Manchu people in the late 17^{th} and the early 18^{th} centuries, and also encouraged the Han people to build new houses in the Outer City. These policies alleviated population pressure in Beijing and drove down house prices in the early eighteenth century. Historians have speculated about these population shifts, political pressures, and resulting policy shifts. Here we confirm that house price decreases did occur in this period, evidence that is certainly consistent with the implementation of such policies.

7. Were Houses Expensive in Qing Dynasty?

A natural question following on our study of the real estate market and estimation of house price index in the Qing dynasty is: were houses expensive in Qing dynasty? One benchmark we use to answer this question is recent house prices in Beijing. According to the data released on the website of Beijing Municipal Commission of Housing and Urban-Rural Development, the average price of second-hand apartments in Beijing for October 2011 is 21,852 Yuan per square meter.[29]

Another benchmark one might use for comparisons is the house prices in Beijing around 2002. The Chinese government commenced housing market reform in 1998 and a well-functioning market was in place by 2002, four years after the reform began. House prices in major Chinese cities began to soar after 2002. It is estimated that in megacities such as Beijing and Shanghai between 2002 and 2010, nominal growth rates in the price of housing were over 20 percent per annum.[30] We therefore also compare the house prices in the Qing Dynasty with the prices before this recent house price run-up so that we can form a more robust notion of how expensive the houses then from today's perspective.[31] According to the data source noted in the previous paragraph, the average price of second-hand apartments in Beijing for 2002 was 4,467 Yuan per square meter.

Our data allow us to compare house prices for Beijing in recent years with those in the past. In order to do so, we first need to estimate the market value of one square meter of an average house in Beijing in the Qing dynasty. An average house in our study is defined by averaging all the house attributes we discuss in the hedonic regressions. By

[29] See http://www.bjjs.gov.cn/publish/portal0/tab1094/.
[30] The data of property prices are obtained from "the Property Price Indices of 70 Large and Medium Cities" and "Report on Property Developments in 35 Large and Medium Cities" compiled by the National Bureau of Statistics. We use geometric average in calculating these indices. Note that these property indices may have underestimated the actual rises of property prices because they simply use property sale data and fail to take into account various characteristics of properties such as location.
[31] We would prefer to use 1998 as the later year for these comparisons. But transactions only began that year and the market was relatively small and thin.

this principle, a hypothetical "typical" house in Qing dynasty had the following attributes: 8 rooms, 2 courtyards, red contract, in the commercial district of the Outer City, residential house, made in tile, not in major disrepair, no on-site well. As we noted, the size of a usual room in Qing dynasty varied from 20 to 50 square meters. In this way we estimate the price of one square meter of a typical house in different periods. Table 11 reports the market values of this house in different periods.

Given that we try to compare the house prices over two hundred years and over these two centuries there was drastic political and economic changes in China, we cannot deflate the house prices with a single price index. Instead, we try to estimate how expensive the houses were over the two centuries by comparing them with wages and the prices of some representative consumption goods.

A representative consumption good that we use to compare how expensive the houses were in different periods is rice. Rice has been one of the most important staple foods in China in past centuries, and the rice price is available throughout our sample period.[32] The retail price of common rice in Beijing was about 5 Yuan per kg in 2011 and 2002. One square meter of house in Beijing was therefore worth about 4370kg of rice in 2011, and about 893kg of rice in 2002. For the house price relative to rice during the Qing dynasty period, we report estimation results in Table 11. We find that in the early eighteenth century one square meter of house was worth 168 to 419 kg of rice. Measuring with the price of rice, today's house price is at least 6 times as high as that in Qing dynasty. The upper bound could be 40 times.[33] Comparing the price of housing in the Qing dynasty to housing prices in Beijing in the pre-run-up year of 2002 we find that

[32] As we note before, the rice data are obtained from Peng (1954).

[33] Of course the typical house that sells today is of far better quality than that in the Qing Dynasty, so even this range surely represents an underestimate.

the housing price measured by rice roughly doubled between the early eighteenth century and 2002.

[Table 11 about here]

Using the price of a single commodity to compare house prices is clearly insufficient. Quality improvement in today's houses remains an issue too.[34] Moreover, the long-run decline of rice price and share of rice in today's consumption budget undermines the utility of our estimation. Alternatively, we compare the relative price of housing in terms of the wage level in different periods.

According to *the Statistical Yearbook of Beijing 2011*, the average annual wage for urban employees in Beijing then was 65,683 Yuan in 2011.[35] It would therefore take an average employee about 120 working days to earn enough to purchase (without a mortgage) one square meter of housing in Beijing. The same data source indicates a 2002 average annual wage for urban employees in Beijing of 21,852 Yuan. It therefore would have taken an average employee about 73 working days to earn enough to purchase (without a mortgage) a square meter of housing.

We also attempt to compare house prices with wage levels in the Qing dynasty. Unfortunately, we do not have anything resembling a time series for wages for the early- and mid-Qing dynasty—we can only collect a few observations to form rough estimates. These scattered wage records are reported in Table 11 as well. According to "Collection of the Cases of Imperial Statutes" (*Qinding Daqing Huidian Shili*), the daily wages of ordinary workers in palace building projects was 0.14 silver tael between 1645 and 1669.

[34] Today most residents in Beijing live in apartments instead of quadrangles. If we focus on single houses in Beijing today to make the comparison between the past and the present more reliable, the house price today would be even higher, and our result would be more significant.
[35] See http://www.bjstats.gov.cn.

A typical house in that period was worth 111 silver taels. It would therefore have taken 793 working days to earn enough to purchase the typical home and 2-5 working days to earn one square meter of house in that period. Between 1720 and 1744 the daily wage of an unskilled laborer was about 0.12 silver tael. A typical house in those years was worth 216 silver taels, implying that it would have taken about 4.5-11 working days to purchase one square meter of a house.

For the late eighteenth century, Peng (2006) records from *Wuliao jiazhi zeli* ("Regulations and precedents on the prices of materials") that a regular laborer in Zhili province, the province surrounding Beijing city, earned about 34 to 55 copper coins a day, worthy of 0.038 to 0.061 silver tael. A typical house in this period was worth 181 silver taels, i.e., about 0.45 to 1.13 silver taels per square meters. Therefore, in this period it took about 10 to 40 days for a regular laborer to earn one square meter of house.

Gamble (1943) recorded some wage observations in Beijing in the early nineteenth century. According to this record, the daily wage of unskilled workers in that period was about 0.083 silver tael. Thus it would then have taken about 8.5-20 working days to buy a square meter of house. If we compare these estimates with 73 working days for one square meter in 2002, we find that the price change is consistent with a doubling or tripling of the price of a home relative to wages between 1840 and 2002.

8. Conclusion

With 498 surviving real estate transactions contracts, we use hedonic regression methods to estimate a long-run house price index for Beijing between 1645 and 1840. We are able to explain a large amount of the variation in housing prices by the characteristics of the properties, including the number of rooms and location. We also

create rice- and more broadly based consumer price indices. We compare the house price index results with these series and estimate real house price series. We find that real house prices increased in the second half of the seventeenth century, declined in the first half of the eighteenth century, and then remained relatively constant in real terms. We are in this study limited in our data over this approximately 200 year period and thus we estimate values at intervals of 25 years. Nonetheless the observations we do have for the second half of the seventeenth century indicate that price increases are consistent with the rapidly growing economy and urbanization that historians have attributed to the period. The decline of house prices that we observe in the first half of the eighteenth century is consistent with a government policy change that allowed the construction of new homes and deregulated housing markets.

We briefly compare house prices in the Qing dynasty with prices in 2002 and in 2012. It is well known that house prices increased dramatically between 2002 and 2011. Even in 2002, prior to the run-up, we see that prices appear to have increased between 1840 and 2002. While this increase raises questions about more recent price trends, our results for the period 1644 to 1840 are consistent with the findings in Shiller (2005) and Eichholtz (1997) which show no significant price increase in real terms, for 150 years in Shiller and for nearly 350 years in Eichholtz.

References

Chinese language references

Bank Weekly (*Yinhang Zhoubao*), No. 11, volume 1, August 17, 1917, Shanghai.

Dai, Yi, eds., History of Qing Dynasty: the Currency System (*Qingshi, Qianfa Zhi*), unpublished manuscript, 2012.

Han, Guanghui, Historical Demographic Geography of Beijing (*Beijing Lishi Renkou Dili*), Peking University Press, 1996.

Hou, Renzhi, The Historical Geography of Beijing City (*Beijing Chengshi Lishi Dili*), Beijing Yanshan Press, 2000.

Li, Xun, Degui Zhao, Yufang Zhou and Hong Xue, The General History of the Eight Banners (*Baqi Tongzhi*), Jilin Press of Culture and History, 2002.

Liu, Xiaomeng, The Banners' Society of Beijing in Qing Dynasty (*Qingdai Beijing Qiren Shehui)*, China Social Science Press, 2008.

Liu, Gaoyong, A Study of Business Contracts in Qing Dynasty (*Qingdai Maimai Qiyue Yanjiu*), Ph.D dissertation, China University of Law and Politics, 2008.

Liu, Xiaomeng, A Study of The Banners' Property Transactions in Beijing in Qing Dynasty from House Contracts (*Cong Fangqi Wenshu Kan Qingdai Beijing Chengzhong de Qimin Jiaochan*), *Historical Archives* (*"Lishi Dangan")*, vol 3, 1996.

----, Configuration and Changes of the Distribution of Residents in the Inner City of Beijing in the Qing Dynasty (*Qingdai Beijing Neicheng Jumin de Fenbu Geju yu Bianqian*), *the Academic Journal of the Capital Normal University*, vol 2, 1998.

----, The Study of the Real Estate Contracts in Manchu Language for Manchu People in Beijing in the Early Qing Dynasty (*Qing Qianqi Beijing Qiren Manwen Fangqi Yanjiu*), *Researches on Ethnicity Groups*, vol 4, 2001.

Peng, Xinwei, History of Chinese Currencies (*Zhongguo Huobi Shi*), Shanghai: Qunlian Publishing House, 1954.

Peng, Kaixiang, Grain Prices since the Qing Dynasty: Historical Explanations and Re-explanations (*Qingdai Yilai de Liangjia: Lishi Xue de Jieshi yu Zai Jieshi*), Shanghai: Shanghai People's Press, 2006.

Xu, Guangxian, Study on the Property Laws in the Qing Dynasty (*Qingdai Wuquanfa Yanjiu*), doctoral dissertation, Chinese University of Politics and Law, 2009.

Yang, Duanliu, Drafted History of Money and Finance in the Qing Dynasty (*Qingdai*

Huobi Jinrong Shigao), Wuhan: Wuhan University Press, 2007.

Zhang, Xiaolin, A Study of House Contracts in Urban Beijing in Qing Dynasty (*Qingdai Beijing Chengqu Fangqi Yanjiu*), China Social Science Press, 2000.

Zhao, Jin, A Study of the History of China's Urban Real Estate Industry, 1840-1949 (*Zhongguo Chengshi Fangdichan Ye Shilun,1840-1949*), Nankai University Press, 1994.

Zhuang, Lingjun, Study on the Management of Urban Real Estate and Land Transactions in the Qing Dynasty (*Qingdai Chengshi Fangdi Jiaoyi Guanli Yanjiu*), master thesis, Sichuan University, 2006.

English language references

Allen, Robert C., Jean‐Pascal Bassino, Debin Ma, Christine Moll‐Murata and Jan Luiten Van Zanden, "Wages, prices, and living standards in China, 1738–1925: in comparison with Europe, Japan, and India," *Economic History Review*, vol. 64(s1), pages 8-38, 2011.

Case, Karl E. and Robert Shiller, Prices of Single-Family Homes Since 1970: New Indexes for Four Cities, *New England Economic Review*, September/October, 46–56, 1987.

Diewert, W. E., Hedonic Regressions: A Consumer Theory Approach, University of Chicago Press, 2003.

Eichholtz, Piet M.A., A Long Run House Price Index: The Herengracht Index, 1628-1973. *Real Estate Economics*, 25, 175-192, 1997.

Ellickson, Robert C., The Costs of Complex Land Titles: Two Examples from China, Yale Law & Economics Research Paper No. 441, 2011.

Pomeranz, Kenneth, The Great Divergence: China, Europe, and the making of the modern world economy, Princeton University Press, 2000.

Ma, Debin, Economic growth in the lower Yangzi region of China in 1911–1937: a quantitative and historical perspective, *Journal of Economic History*, 68, (2008), pp. 385–92.

Ma, Debin, Money and Monetary System in China in the 19th-20th Century: An Overview, Working Papers No. 159/12, Department of Economic History, London School of Economics, 2012.

Margo, Robert A., The Rental Price of Housing in New York City, 1830-1860, *Journal of Economic History*, 56(3): 605-625, 1996.

Moorhouse, John C. and Margaret S. Smith, The Market for Residential Architecture: 19th Century Row Houses in Boston's South End, *Journal of Urban Economics*, 35: 267-277, 1994.

Naquin, Susan, Peking: Temples and City Life, 1400-1900, University of California Press, 2000.

Nicholas, Tom and Anna Scherbina, Real Estate Prices during the Roaring Twenties and the Great Depression, UC Davis Graduate School of Management Research Paper No. 18-09, 2011.

Rawski. Evelyn S., The Last Emperors: A Social History of Qing Imperial Institutions, University of California Press, 1998.

Shiller, Robert J., Irrational Exuberance, Princeton University Press, 2005.

Yan, Se, Real Wages and Skill Premia in China, 1858 to 1936, doctoral dissertation, UCLA, 2008.

Table 1 Population in the Qing Dynasty

Year		1647	1656	1686	1711	1781
The Inner City	Manchu	315,000	341,700	393,300	511,600	496,100
	Han	80,000	70,000	60,000	55,000	45,000
	Total	395,000	411,700	453,300	566,600	541,100
The Outer City	Manchu	85,000	85,600	86,700	108,400	153,800
	Han	35,000	36,300	39,000	43,700	56,900
	Total	120,000	121,900	125,700	152,100	210,736
Total		515,000	533,600	579,000	718,700	751,836

Source: Han (1996).

Table 2 Sample Distribution over Periods

Period	Sample Size	Percentage of Total
1645-1669	20	4.02
1670-1694	26	5.22
1695-1719	24	4.82
1720-1744	32	6.43
1745-1769	49	9.84
1770-1794	112	22.49
1795-1819	130	26.1
1820-1840	105	21.08
Total	498	100

Table 3 Distribution of Number of Rooms

Room Numbers	Sample Size	Percentage
$N \le 3$	73	14.66
$3 < N \le 5$	94	18.88
$5 < N \le 10$	137	27.51
$10 < N \le 15$	92	18.47
$15 < N \le 50$	102	20.48
$50 < N \le 100$	10	2.01
$N > 100$	2	0.40

Table 4 Distribution of Courtyard Numbers

Courtyard Numbers	Sample Size	Percentage
1	331	66.47
2	72	14.46
3	62	12.45
4	33	6.63

Table 5 Summary Statistics of Distance to Commercial Centers

Distance to commercial centers	Number of observations	Percentage
At commercial centers	222	44.58
Close to commercial centers	202	40.56
Far to commercial centers	74	14.86

Table 6 Summary Statistics of Distance to Political Centers

Distance to political centers	Number of observations	Percentage
Close to the Forbidden City	42	8.43
Other areas in the Inner City	125	25.1
the Outer City	331	66.47

Table 7 Hedonic Regression Results

	(1)	(2)	(3)	(4)	(5)	(6)
No. of rooms	0.0499***	0.0502***	0.0626***	0.0934***	0.0492***	0.0494***
	(0.0029)	(0.0035)	(0.0039)	(0.0063)	(0.00262)	(0.00274)
No. of courtyards	0.320***	0.330***	0.269***		0.322***	0.330***
	(0.0454)	(0.0471)	(0.0459)		(0.0407)	(0.0422)
No. of rooms per courtyard				-0.486***		
				(0.0069)		
Red contract	0.0790	0.0958	0.0242	0.0652	0.0455	0.0217
	(0.0948)	(0.1210)	(0.0940)	(0.0880)	(0.0853)	(0.0865)
Close to commercial Center	-0.261***	-0.264***	-0.245***	-0.225***	-0.237***	-0.231***
	(0.0851)	(0.0944)	(0.0842)	(0.0794)	(0.0766)	(0.0795)
Far from commercial center	-0.318**	-0.853***	-0.278**	-0.343***	-0.386***	-0.369***
	(0.1270)	(0.2150)	(0.1280)	(0.1187)	(0.114)	(0.117)
Forbidden city	-0.0142		-0.0428	-0.0894	-0.0775	-0.151
	(0.1560)		(0.1540)	(0.1457)	(0.139)	(0.145)
Outer city	-0.302***		-0.220**	-0.306***	-0.374***	-0.378***
	(0.1070)		(0.1080)	(0.0980)	(0.0962)	(0.0996)
Clay material	-0.675***	-0.679***	-0.473**	-0.782***	-0.705***	-0.690***
	(0.2040)	(0.2570)	(0.2100)	(0.1898)	(0.182)	(0.189)
Commercial estate	0.235**	0.1510	0.276**	0.1929*	0.0911	0.204**
	(0.1110)	(0.1500)	(0.1100)	(0.1034)	(0.101)	(0.104)
In poor repair	-0.333**	-0.2910	-0.391***	-0.329	-0.355***	-0.339***
	(0.1430)	(0.1860)	(0.1400)	(0.1330)	(0.128)	(0.133)
Having a well	0.756***	0.640*	0.507*	0.743***	0.719***	0.699***
	(0.2710)	(0.3350)	(0.2690)	(0.2527)	(0.243)	(0.253)
Year						0.0037***
						(0.0008)
Constant	3.893***	3.606***	3.817***	4.343***	3.967***	-1.723
	(0.2390)	(0.2240)	(0.2400)	(0.2171)	(0.228)	(1.438)
N	498	331	488	498	498	498
R^2	0.5220	0.5830	0.5130	0.5492	0.601	0.540

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Table 8 Hedonic Regression Results for Robustness Checks

	(1)	(2)	(3)
No. of rooms	0.0499***	0.0459***	0.0493***
	(0.0029)	(0.00918)	(0.00280)
No. of courtyards	0.320***	0.355***	0.323***
	(0.0454)	(0.0875)	(0.0526)
Red contract	0.0790	0.169	-0.00325
	(0.0948)	(0.263)	(0.0919)
Close to commercial Center	-0.261***	-0.243	-0.250***
	(0.0851)	(0.178)	(0.0874)
Far from commercial center	-0.318**	-0.451	-0.391***
	(0.1270)	(0.389)	(0.122)
Forbidden city	-0.0142	-0.339	-0.0982
	(0.1560)	(1.016)	(0.140)
Outer city	-0.302***	-0.637	-0.341***
	(0.1070)	(0.528)	(0.0988)
Clay material	-0.675***	-0.794	-0.835***
	(0.2040)	(1.045)	(0.186)
Commercial estate	0.235**	0.00341	0.205**
	(0.1110)	(0.526)	(0.101)
In poor repair	-0.333**	-0.387	-0.310**
	(0.1430)	(0.363)	(0.138)
Having a well	0.756***		0.706***
	(0.2710)		(0.239)
Constant	3.893***	4.079***	4.684***
	(0.2390)	(0.625)	(0.186)
N	498	113	385
R^2	0.5220	0.578	0.566

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Table 9 House Price Index and Rice Price Index

Period	House Price Index	Period	Rice Price Index
1645-1669	100.00	1641-50	100.00
1670-1694	201.78	1651-60	95.12
1695-1719	271.83	1661-70	67.80
1720-1744	194.84	1671-80	51.60
1745-1769	163.07	1681-90	68.39
1770-1794	229.33	1691-1700	58.37
1795-1819	276.77	1701-10	76.44
1820-1840	253.20	1711-20	73.30
		1721-30	69.71
		1731-40	79.32
		1741-50	90.62
		1751-60	129.61
		1761-70	136.32
		1771-80	120.46
		1781-90	127.38
		1791-1800	155.55
		1801-10	172.21
		1811-20	170.22
		1821-30	153.77

Table 10 Consumer Price Index in the mid Qing Period

Year	CPI	Year	CPI	Year	CPI
1738	100	1773	115.96	1807	128.65
1739	103.91	1774	114.95	1808	130.13
1740	107.24	1775	114.5	1809	134.33
1741	107	1776	117.99	1810	137.02
1742	109.05	1777	115.63	1811	141.55
1743	108.84	1778	114.94	1812	145.48
1744	113.17	1779	117.03	1813	143.67
1745	115.85	1780	117.77	1814	143.47
1746	116.82	1781	116.51	1815	144.07
1747	116.73	1782	118.7	1816	141.13
1748	116.6	1783	123.16	1817	142.46
1749	117.16	1784	122	1818	141.98
1750	112.4	1785	120.09	1819	142.1
1751	110.31	1786	120.69	1820	140.81
1752	108.65	1787	121.67	1821	140.88
1753	111.73	1788	122.91	1822	139.53
1754	111.69	1789	123.35	1823	138.34
1755	118.2	1790	121.77	1824	136.36
1756	122.67	1791	122	1825	136.52
1757	127.21	1792	121.41	1826	136.97
1758	122.5	1793	117.55	1827	136.25
1759	122.97	1794	116.88	1828	137.65
1760	119.66	1795	116.62	1829	136.76
1761	116.29	1796	113.91	1830	137.69
1762	117.31	1797	113.95	1831	137.12
1763	117.2	1798	116.11	1832	133.27
1764	115.69	1799	119.16	1833	133.62
1765	113.08	1800	122.5	1834	134.24
1766	114.25	1801	124.24	1835	134.83
1767	114.36	1802	125.31	1836	133.87
1768	111.24	1803	127.55	1837	133.4
1769	110.08	1804	124.3	1838	131.74
1770	109.94	1805	129.32	1839	129.56
1771	112.53	1806	130.55	1840	125.79
1772	115.45				

Table 11 House Price relative to Rice Price and Wage (in silver tael)

Period	Value of House	Value of One Square Meter	Rice Price (1kg)	Kilograms of rice per square meter of House	Daily Unskilled Wage	Days needed for one square meter of house
1645-1669	111	0.28-0.69	0.0055	50 -126	0.14	2-5
1670-1694	224	0.56-1.40	0.0038	147 -368		
1695-1719	302	0.76-1.89	0.0045	168 -419		
1720-1744	216	0.54-1.35	0.0049	110 -276	0.12	4.5-11
1745-1769	181	0.45-1.13	0.0078	58 -145		
1770-1794	254	0.64-1.59	0.0082	77 -194	0.038-0.061	16-26
1795-1819	307	0.77-1.92	0.0107	72 -179		
1820-1840	281	0.70-1.76	0.0110	64 -160	0.083	8.5-20

Figure 1 the Main Commercial Centers in Beijing in the 18th Century

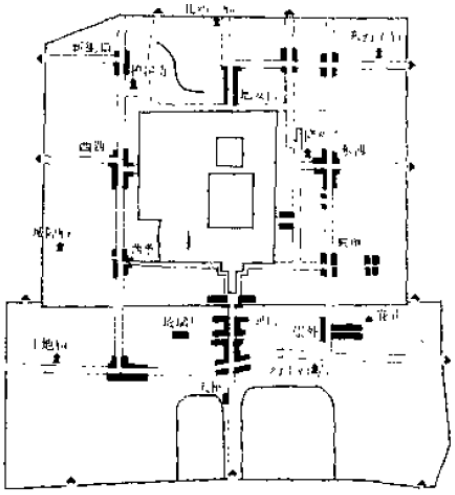


Figure 2 Diagram of a Quadrangle

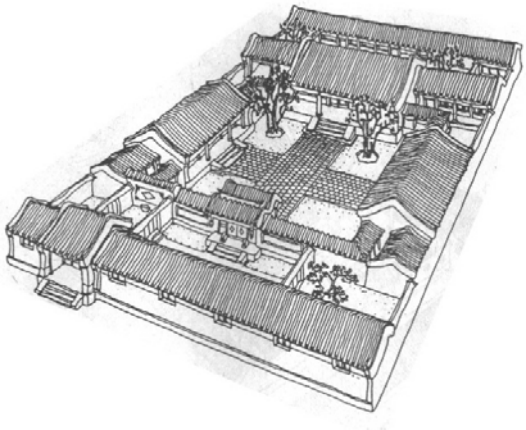


Figure 3 Commercial Centers in Beijing

	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII
I		3	3	3	3	3	3	3	3	3	3	3	
II	3	3	3	3		2	2	2	3	2	2	2	
III	3	3	2	2	2	2	1	2	3	2	1	1	
IV	3	3	2	1	2	2	2	2	3	2	2	2	
V		3	2	2	2		3	2	2	2	2	3	
VI	3	3	2	1	2			2	1	1	2	3	
VII		2	2	2	2			2	2	2	2	3	
VIII	3	2	1	2	3			3	3	2	2	2	
IX	3	2	2	2				3	3	2	1	2	
X	2	2	2	2	2	2	2	2	2	2	2	2	
XI	2	1	1	1	1	1	1	1	1	1	1	1	2
XII	2	1	1	1	1	1	1	1	1	1	1	1	2
XIII	2	2	2	2	2	2	2	2	1	2	2	2	2
XIV	3	2	1	1	2	3	3	2	2	2	3	3	3
XV	3	2	2	2	2						3	3	3
XVI	3	3	3	3	3						3	3	3
XVII	3	3	3	3	3						3	3	3

1 Commercial center

2 Areas close to commercial centers

3 Areas far to commercial centers

Restricted areas

Figure 4 Political Centers in Beijing

	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII
I		2	2	2	2	2	2	2	2	2	2	2	
II	3	2	2	2		2	2	2	2	2	2	2	
III	3	2	2	2	2		2	2	2	2	2	2	
IV	3	2	2	1	1		1	1	2	2	2	2	
V		2	2	1	1		1	1	2	2	2	2	
VI	3	2	2	1	1			1	2	2	2	2	
VII		2	2	1	1			1	2	2	2	2	
VIII	3	2	2	1	1			1	2	2	2	2	
IX	3	2	2	1				1	2	2	2	2	
X	3	2	2	1	1	1	1	1	2	2	2	2	
XI	3	2	2	1	1	1	1	1	2	2	2	2	3
XII	3	3	3	3	3	3	3	3	3	3	3	3	3
XIII	3	3	3	3	3	3	3	3	3	3	3	3	3
XIV	3	3	3	3	3	3	3	3	3	3	3	3	3
XV	3	3	3	3	3						3	3	3
XVI	3	3	3	3	3						3	3	3
XVII	3	3	3	3	3						3	3	3

1 Royal City

2 Inner City

3 Outer City

Restricted areas

Figure 5 House Price Indices for 25-Year Interval and for 10-Year Interval

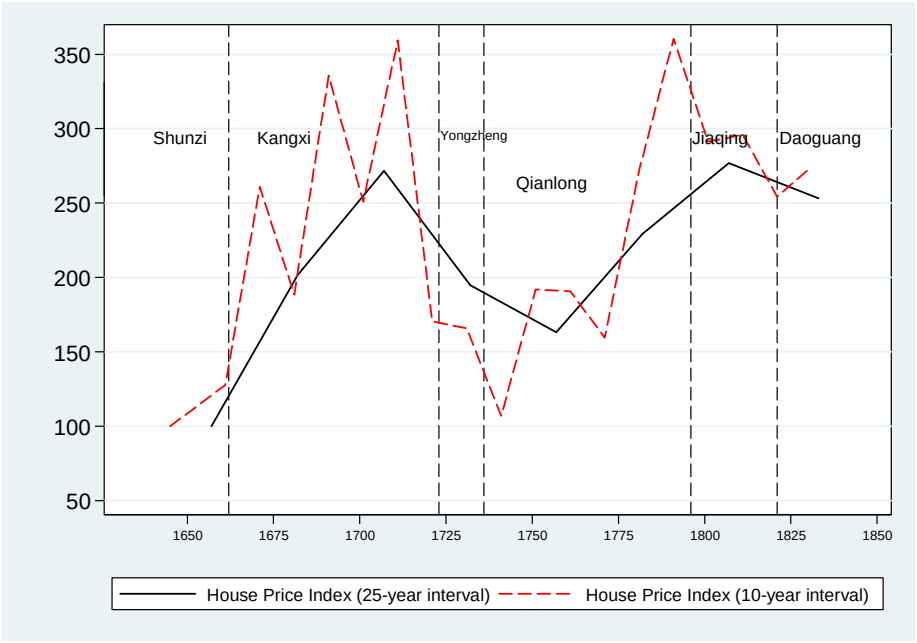


Figure 6 House Price Index, Rice Price Index and CPI

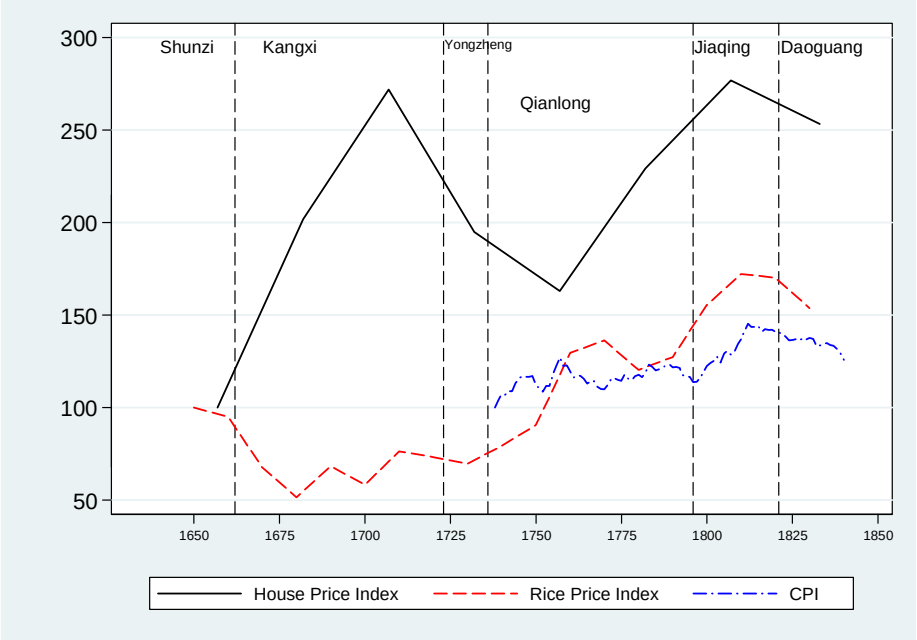
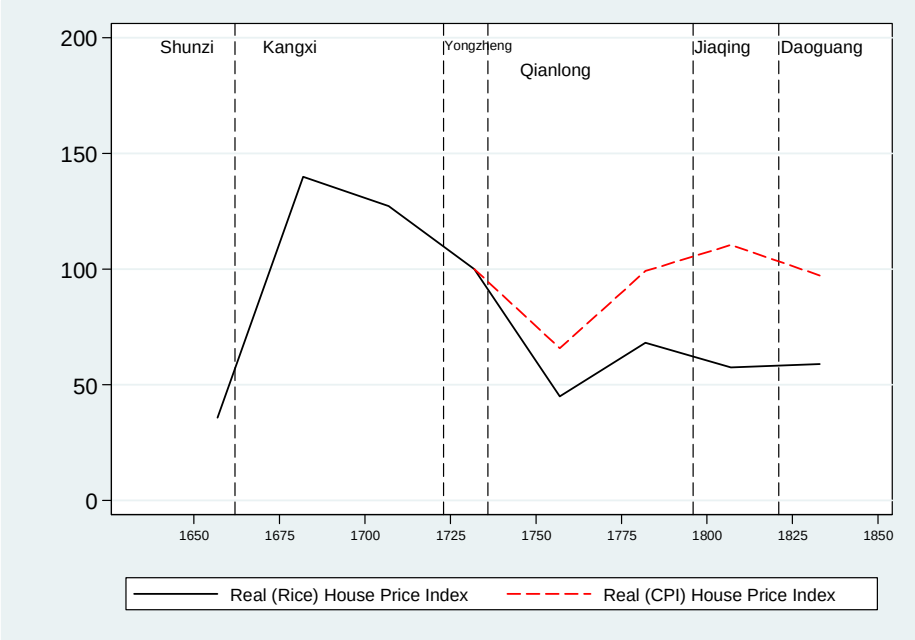


Figure 7 Real House Price Indices Deflated by Rice Price Index and CPI



Appendix Conversion of Currencies Occurring in the House Sales Contracts

It is critical for the calculations of the text that we convert all housing prices into a standard unit. In this appendix we provide background and an explanation for the conversion methods we used.

The currency system in pre-modern China was complex. The Qing government used a bimetallic system. The two currencies in circulation were silver ("ying") ingots ("sycee") and copper ("qian") coins. Large transactions were carried out mainly in silver, daily transactions in copper. Silver was exclusively used for tax collection and government expenditure in the Qing period. In the house sales contracts, the use of both currencies can be observed.

Despite the importance of silver in the monetary system, the Qing government did not have a centralized and unified coinage and issuing system for silver. Silver ingots with different weight and purity systems were in circulation. There were two aspects to the value of silver currencies in the Qing dynasty: weight ("ping") and purity ("se"). We discuss these in turn.

The basic unit of weight in premodern China was the "tael". The main official weight measure used by the government was called "Kuping".[37] A tael of Kuping was 37.30g. Many different types of weight standards were adopted in the market transactions in different provinces of China; again, this does not concern us here. Sometimes different measures were in use even at one place the same time. In the Beijing house sales contracts two weight measures were most commonly used: "Shiping" and "Jingping", with a tael of silver in these measures weighing 35.86g and 35.16g, respectively.(Yang, 2007, p80) Of the two, Shiping was most popular (ibid.). So we use Shiping as the benchmark.

In terms of purity, silver with highest purity was usually called "Zuseying" or "Zuying", and the purity of this was about 99.2%. Circulation of this type of silver was predominantly limited to government purposes, and the silver used to pay the land tax was generally of this type. We used it as the benchmark of currency conversion. Silver ingots of different (and lower) purity levels were in more general circulation. One popular purity system used in the housing market was "Wenying", and Wenying was valued at about 94% of Zuseying.

[37] Other official weight measures were in use including "Guanping" and "Caoping" for customs and land tax collection purposes respectively (Ma, 2012). But these do not concern us here.

Silver ingots with other purity standards were identified by the premium relative to Wenying for every 50 taels of this ingot. For example, a "Two Four Silver" ("Ersibao") meant that 50 taels of this ingot equals 50+2.4=52.4 taels of Wenying (*Bank Weekly*, 1917). In our calculations, we convert the silver ingots with these different purity standards to Zuseying (the highest purity in the Qing period) to achieve a common base. We report the different names of these and the exchange rates between these sycees and the Zuseying in Appendix Table 1.

One problem remains. Many of the house sales contracts do not have explicit statements of which currency is to be utilized. In these cases, we assume that the intended currency was "Shiping Zuseying," the benchmark silver. Silver of this type of weight and purity measure was the most popular currency in Beijing in the Qing period (Yang, loc. cit.)) and we believe there would be no need to mention currency type in the contract if this is what it was. In some contracts, settlement in copper coins was explicitly indicated. In contrast to its treatment of silver, the Qing government implemented tight control over the copper coinage and the weight and copper content of the coins was standardized. In principle then, there are no weight or purity problems involved in valuing copper coin payment sums analogous to the difficulties involved with silver ones. Because of copper's low value relative to silver, copper coins were strung together for large transactions. A standard size string of copper coins was called "Diao". Theoretically one Diao corresponded to 1000 coins (though in practice a Diao might comprise only 980 copper coins or even a smaller number). A Diao was sometimes also called a "Quanqian", "Manqian", or "Jingqian". Appendix Table 1 gives some other names as well as conversion values.

As both silver ingots and copper coins were in circulation in the Qing period, a critical issue is the exchange rate between them. The government stipulated that one Diao of copper coins, meaning 1000 copper coins, was to be considered equal in value to one tael of standard silver. In practice, however, because of varying supply conditions of silver and copper, the exchange rate fluctuated. Starting in the middle of the18th century, silver prices relative to copper gradually rose, though they remained relatively close to the official exchange rate of 1000:1. Starting in the late 18th century, however, the exchange rate started to increase drastically and was as high as 2000:1 in the mid 19th century (Peng, 1954). As both currencies were utilized in the house sales contracts we study, we convert the values measured by copper cash to those in standard silver. As there is no single widely agreed-upon exchange rate series, we compare calculations using three different

candidate exchange rate series to ensure our estimates are robust.

The first exchange rate we use derives from the sales contracts, themselves. Some of the contracts using copper cash explicitly indicate the exchange rate. They are direct rates that we can use to convert copper cash to silver ingot. For example:

September 4, Qianlong Year 51 (1786), Wang Zhaofeng sells the house at the price of Manqian 520 Diao, valued at 260 silver taels.

September 9, Jiaqing Year 10 (1805), Ding Maozong sells the house at the price of Qingqian 350 Diao, valued at 175 silver taels.

If the contracts provided the equivalent silver values for transactions conducted in copper cash, this was certainly the best exchange rate and we used it. But in many contracts this information is not available. In these cases, we used the exchange rates recorded in the contracts that were in closest in date to the contract in question. This, of course, quite a rough and ready approach and we would not place great faith in it ex ante.

The second exchange rate series we use is the one given by Peng (2006). In this volume Peng combines several sources of data and presents an annual exchange rate series between 1721 and 1931 for North China.

The third exchange rate series we use is given by the unpublished manuscript of “History of Qing Dynasty: the Currency System” edited by Dai Yi. Since 2002, the Chinese government has compiled the official history of the Qing dynasty. (As of the date of this publication, most topics have been completed but the entire project has not yet been completed.) We report the exchange rate data in the section of “the Currency System” of the project in Table 2.

We compare the second and the third exchange rate series in Figure 1 and find that they are broadly consistent with one another. This being so, one might imagine it would not matter to any substantial extent which series we used to estimate the trend of house prices in Beijing. In fact, it does not: the results are not significantly different. Because the third series provides the exchange rate dates back to the beginning of the Qing dynasty, we use it to convert all the transaction values to standard silver Shiping Zuseying and estimate the changes of house prices in Beijing in the Qing dynasty using that.

Appendix Table 1 Conversion Table for Various Currencies Occurring in the Contracts

Metal	Type	Other Names	Conversion Rate
Silver Tael	Standard Silver	Zu Ying, Zu Wenying, Zuse Wenying, Shizu Wenying, Shizu Lao Baiying, Yinsezu Wenping	1
	Wenying	Shiping Wenying, Faping Dui Wenying	0.94
	Jingping Wenying	Wenying Erliang Ping, Jing Wenying, Erliang Ping Wenying	0.94/(1+2%)=0.922
	Erliang Ping Zuse	Shizu Wenying Erliang Pingying, Erliang Ping Zu Wenying, Erliang Ping Zuse Wenying, Erliang Ping Ying	1/(1+2%)=0.98
	Ninety Five Se Ying		0.95
	Ninety Six Se Ying		0.96
	Ninety Seven Se Ying	Ninety-Seven Chengse Yin	0.97
	Ninety Eight Se Ying	Ninety-Eight Ying	0.98
	Ninety Nine Se Ying		0.99
	Ninety Eight and Half Se Ying		0.985
	Erliang Ping Ninety Five Se Ying	Erliang Ping Ninety-Five Yuansi Ying	0.95/(1+2%)=0.931
	Erliang Ping Ninety Eight Se Ying	Erliang Ping Zuse Ninety-Eight Silver	0.98/(1+2%)=0.961
	Erliang Ping Ninety Nine Se Ying	Jingping Ninety-nine Silver	0.99/(1+2%)=0.971
	Erliang Ping Ninety Four Se Ying	Jikai Erliang Shiping Kou Ninety-four Se	0.94/(1+2%)=0.922
Copper Cash (“Qian”)	Standard Qian	Qian, Quanqian, Qingqian, Qingmanqian, Manqian, Jing Shiqian, Jingqian, Manjingqian	1
	Ninety-eight Qian	Ninety-eight Diqian	0.98
	Eight Diqian	Bagedi Qingqian, Bage Diqian, Ba Diqian, Meidiao Duan Diqian Bawen, Qian Meidiao Badi	0.992
	Twelve Diqian	Twelve Diqian	0.988

Sources: Authors’ calculation based on *Business Weekly* (1917) and Yang (2007).

Appendix Table 2 Exchange Rate between Silver and Copper Cash

Period	Exchange Rate
1644	700
1645-1646	New cash 700, old cash 1400
1647-1689	1000
1690-1701	>=1000
1702	New cash 1000, old cash 1429
1670-1678	1250
1679-1683	1250-1428
1684-1689	800-900
1690-1704	1000
1705-1719	1400-1500
1720	880
1721-1728	780
1729-1730	<=1000
1731	1000
1723-1725	800-845
1726-1732	900-980
1733-1735	800-840
1736-1737	820-800
1738	755
1739-1747	800-850
1748-1749	755-790
1750-1765	805-890
1766-1777	910-985
1778-1779	850-870
1780-1785	910-985
1786-1795	1000-1150
1796-1802	1120
1803-1807	917
1808-1809	1000
1810-1817	1099
1818-1837	1300
1838-1844	1600-1700
1845	2000

Source: Dai (2012).

Appendix Figure 1 Comparison of Exchange Rates from Two Sources