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The Occurrence, Landing, and Prevention of Pricing Bubbles in China

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The Occurrence, Landing, and Prevention of Pricing Bubbles in China[1]

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Abstract

Examining the yearly ratio of housing prices to rent for 1994–2018, we found bubbles in the housing market in Beijing and Shanghai; similarly, expanding the analysis to 1981–2018, we found bubbles in the land prices in Taipei. To avoid a financial crisis, it is necessary to deflate a bubble gradually via macroprudential or tax policies. To test a hypothesis on the prevention of land price bubbles, two historical policy events from early 20th century China were examined. First, anti-speculation policy in Tsingtao, when it was a German colony, significantly decreased land prices compared with Shanghai, where speculation was permitted by the British and other European colonies during 1899–1911. Second, after President Sun Yat-sen introduced the anti-speculation Land Law of the Republic of China, which was first implemented in Zhejiang in 1931, judicial power could be exercised to curb or prevent land price bubbles from occurring.

JEL classification: D46, D84, G18

Keywords: Anti-speculation, land and housing bubble, prevention and landing, Land Law of the Republic of China, Tsingtao, Shanghai, Beijing, Taipei

1 Introduction

President Xi Jinping argued that China should control housing bubbles, as shown in Figure 1 (Xi, December 22, 2016). Similarly, on March 25, 2018 Yi Gang, Chairman of the People's Bank of China, argued that China should introduce a long-term method to prevent real estate and financial risk-taking (Yi, March 25, 2018).[3] Why have Chinese political and financial leaders mentioned risk in the context of the housing market? Presumably, the reason is that a previous housing bubble caused overinvestment in, and overcapacity of, housing-related industries, such as steel and coal, as argued by Qiu and Wan (2018). Another reason is that a housing bubble increases nonperforming loans in the banking sector (Wan 2018b) and speculative savings in the household sector (Wan 2015, 2016). Qiu and Wan (2018) also pointed out that the collapse of steel prices on the international market caused by the oversupply of housing-related products, including steel, in China was an indirect reason for the current economic conflict between China and the USA. Hence, housing bubbles are currently a very important issue in China and the rest of the world.

From an international perspective, housing bubbles have been a serious economic issue since the 1980s.[4] For example, a housing bubble caused overinvestment in Japan in the 1980s (Chirinko and Schaller 2001), as well as excessive debt and non-performing loans in Japan (Ogawa and Wan 2007, Ogawa 2009), and the subprime loan crisis in the USA (Brueckner *et al*. 2012). Consequently, a new core mission of macroprudential policy

[3] See details at http://cn.chinadaily.com.cn/2018-03/25/content_35913395.htm

[4] Land and stock bubbles were also the reason for the crash of 1929 in the USA (White 1994).

for the central banks in every country is how to prevent housing bubbles or control housing prices (Hanson *et al*. 2011).

This study first examines whether there were bubbles in the housing markets in Beijing and Shanghai, and in land prices in Taipei, using the most recent data. Then, we discuss how to deal with the problem if bubbles are identified; for example, should the bubble be brought to a hard or soft landing, based on the proposals of Wan (2018a, c).

Next, we discuss how to prevent a bubble from occurring, according to the perspective of Wan (2018a, c), because bubbles are serious problems that negatively affect economic stability and efficiency (Xiong 2013; Hirano, Inaba &Yanagawa 2015; Miao *et al*. 2015).[5] It is also important to prevent new bubbles in Chinese cities where bubbles have not occurred. Here, we use two datasets to perform an empirical analysis and test the bubble prevention hypothesis proposed by Wan (2018a, c): 1) the land prices in Tsingtao and Shanghai for 1899–1911 and 2) the land prices by county in Zhejiang in the 1930s.

The first Land Law of the Republic of China was based on the Land Law of Tsingtao when it was a German colony, while the Land Law of Tsingtao was based on traditional land transactions in China. The anti-speculation Land Law of Tsingtao was subsequently adopted in Germany and the German colony Cameron, and then in almost all European countries and British colonies (Zhu 2007, Kumano 2011, Xu 2012, Zhang 2014). In the 19th century, speculation in the land market in Germany was very popular. For example, land prices increased by over 1,000% in the 10 years from 1889 to 1899 in the

[5] A bubble harms the balance sheets of firms, banks (Ogawa 2009; Wan, 2018c), and households (Ogawa and Wan 2007; Wan 2015, 2016). Bubbles are analyzed using an overlapping generation model in Tirole (1985).

cities of Cottbus and Heidenau. Subsequently, prices remained stable after the anti-speculation law of Tsingtao was introduced in 1904 (Zhu 2007, page 144). Therefore, considering historical data for Tsingtao, Shanghai, and Zhejiang, we can examine whether anti-speculation policies, such as taxes, decreased land prices. The results should be instructive for modern China and the rest of the world.

Using the yearly ratio of housing prices to rent, we identified bubbles in the housing markets in Beijing and Shanghai; similarly, using the yearly ratio of land prices to rent, we identified a bubble in land prices in Taipei. We also found that the anti-speculation policy adopted in Tsingtao when it was a German colony significantly decreased land prices compared with Shanghai, where speculation was permitted by the British and other European colonies during 1899–1911. Furthermore, after President Sun Yat-sen updated the anti-speculation rule to enact the first Land Law of the Republic of China, which was first implemented in Zhejiang in 1931, the law could be used to curb or prevent bubbles in land prices from occurring.

The remainder of this paper is organized as follows. Section 2 presents the conceptual framework for the occurrence, prevention, and deflation of bubbles. Section 3 performs three empirical analyses of city land and housing prices. Section 4 presents the concluding remarks.

2 Conceptual framework of the occurrence, deflation, and prevention of bubbles

Wan (2018a) introduced the concept of a bubble premium into Blanchard and Watson (1982), which outlined the basic framework of a rational bubble.[6] There are two types of assets in any economy: safe and risky assets, like land. The market is assumed to have no opportunity for arbitrage. A risk-neutral investor or an asset owner considers the following risky asset-trading problem: where r is the constant interest rate of a risk-free asset; and d_t and p_t are the dividend and market price of the risky asset at time t, respectively.

We further assume that r is consistently positive over the time horizon. The risk arises from the infinite time horizon, which is considered to be a type of "*certain uncertainty*" (Wan 2018a). This risk is "*uncertain*" because we do not know the ending point of either the time horizon or the investors, while we say that it is "*certain*" because every investor is familiar with this type of uncertainty. Under the no-arbitrage condition, the following equation should be satisfied in an equilibrium market,

$$1 + r = \frac{E_t[p_{t+1} + d_{t+1}]}{p_t} - \gamma\, E_t\left[\frac{p_t - d_t/r}{p_t}\right] \tag{1}$$

where E_t is the expectation operator. For simplicity, we assume that $E_t[d_{t+1}] = E_t[d_{t+j}]$ for any $j \in [1,\infty)$. The forward-looking solution of p_t in Equation (1) is,

[6] Wan (2018a) uses the coefficient γ to capture the default risk as a bubble premium. Bubble premiums can be identified empirically using a natural experiment approach, and based on the example of the South Sea Bubble of 1710–1714. When the South Sea Bubble crashed, Isaac Newton lost about 4 million US dollars (adjusted for inflation) (Wan, 2018c).

$$p_t = E_t\left[\frac{d_{t+1}}{r}\right] + \underset{T\to\infty}{E_t}\left[\frac{p_{t+T}}{(1+r+\gamma)^T}\right], \tag{2}$$

where the second term of Eq. (2) is the bubble term. Here, the bubble term is shown to grow faster than the interest rate *r*. Wan (2011, 2018a) shows how capital gains and land value taxes can prevent a bubble from occurring, in line with the argument of Stiglitz (1989). Especially, the fixed period of land-use rights in modern Mainland China should prevent a land or housing bubble from occurring, as noted by Wan (2018a). Nevertheless, Wan (2015, 2018b) found housing bubbles in major cities in China.

However, the circumstances regarding the bubble in China noted by Wan (2016, 2018b) and the bubbles in the UK, Singapore, and Hong Kong as reported by Giglio *et al*. (2016), are not consistent with the theoretical predictions of Wan (2011, 2018a).[7] To overcome this contradiction, Wan (2018c) developed a new framework for modeling bubbles within a period that introduces sufficient risk-neutral investors. For simplicity, by assuming a zero time span, the interest rate of a risk-free asset should be zero. Under the no-arbitrage condition, the following equation should be satisfied at market equilibrium for an investor as a sequential trade,[8]

$$1 = \frac{E_n[p_{n+1}]}{p_n} - \gamma_0 E_n\left[\frac{p_n - f}{p_n}\right] \tag{3}$$

where E_n is the expectation operator of investor *n*, and $1 \le n < \infty$ and $f = d/r$ if we assume that $E_t[d_{t+1}] = E_t[d_{t+j}]$ for any $j \in [1,\infty)$. The forward-looking solution of p_n in Equation (3) is,

[7] Huang and Shen (2017) also reported a housing bubble in Hong Kong.

[8] For a period *t*, the bubble premium would be the function $\gamma_t = f(\gamma_0, t)$, then for one period $\gamma_1 = f(\gamma_0, 1)$.

$$p_n = \frac{E_n[p_{n+1}]}{1+\gamma_0} + \frac{\gamma_0}{1+\gamma_0} f \tag{4}$$

where $1 \leq m < \infty$, and when $m \rightarrow \infty$, the result is,

$$p_n = f + lim_{m\rightarrow\infty} E_n \left[\frac{p_{n+m}}{(1+\gamma_0)^m}\right]. \tag{5}$$

The first and second terms on the right-hand side of Equation (5) are the fundamental values of income gain and the bubble term of the risky asset, respectively. Wan (2018c) showed that the bubble premium in Eq. (4) is the necessary condition for a bubble to occur, and also that taxation is useful for preventing a bubble or producing a soft landing. Furthermore, Wan (2018c) modeled bubbles in a scenario with multiple speculators within multiple periods, and showed that they can be prevented or landed softly. Within this framework, even with the fixed period of land-use rights in China and land leaseholds in the UK, the occurrence of land or housing bubbles is explainable.

3 Empirical analyses of city land and housing prices

3.1 Housing prices in Beijing and Shanghai, and land prices in Taipei

We obtained data on housing prices and rents in Beijing and Shanghai for 1994–2018 from the Real Estate Statistical Yearbook of China, and on land prices and rents in Taipei during 1981–2018 from the Statistical Yearbook of Taipei. Data during other periods are not available, and the data for 2018 were estimated from the data for January to November 2018. Based on these data, we determined the changes in housing prices in Beijing and Shanghai, and in land prices in Taipei, as shown in Figure 1. From this figure, we can see that Taiwan experienced a sharp rise in housing prices during the 1980s, during the same period as the Japanese bubble, as also noted by Wan (2018a, d). In addition, Chang *et al*. (2009) reported that 47~54% of the cost of housing in Taipei was attributable to a bubble. However, unlike the Japanese bubble, which burst, the housing prices in Taipei have not changed markedly since the 1990s. Wan (2018a) considers the Taipei's case to exemplify a successful soft landing of a housing bubble. We can also see that the housing prices in Beijing and Shanghai increased much faster than those in Taipei, and predict that these two cities also experienced bubbles.

Empirical specifications and results

As shown in Eq. (2), if the price includes a bubble, the ratio of price to rent would undergo an explosive transition. Following Phillips *et al*. (2015) and Wan (2015, 2018b), we tested whether there were bubbles in the above three time series, which are summarized in Table 1a. We first performed the unit root test and then the bubble test.

Unit root test

We performed unit root tests for the ratio of housing prices to rent in Beijing and Shanghai, and the ratio of land prices to rent in Taipei. The results are summarized in Table 1b. The null hypothesis (the series has a unit root) cannot be rejected at the conventional significance level. Hence, we conclude that there are unit roots in the three time series.

Bubble tests for Beijing, Shanghai, and Taipei

We tested for bubbles using the rolling (RADF), supermum (SADF), and generalized supermum (GSADF) augmented Dickey–Fuller tests of the ratio of housing prices to rent in Beijing and Shanghai, and the ratio of land prices to rent in Taipei following Wan (2015, 2018b). Table 1c summarizes the empirical results. The null hypothesis (the series has a unit root) can be rejected at the conventional level of significance, so we conclude that there are bubbles in the three time series.

3.2 Land Prices in Tsingtao and Shanghai, 1898–1911

Tsingtao became a German colony in 1898. Before the institution of counter-speculation laws, serious speculation regarding land purchases in Tsingtao occurred, with prices jumping sharply by over 1,000% (Yang, 2012). After the German colonial government introduced a new counter-speculation institution based on Tsingtao traditions, and new policies on March 6, 1898, such as a 6% land value tax and 33.3% capital gains tax, as well as prioritizing governmental purchases, the land prices stabilized and a new railway to Jinan and a new port were built. By contrast, Shanghai was a colony of the UK and France and land speculation was allowed. Consequently, the land prices in Shanghai differed markedly from those in Tsingtao (Figure 2), although the total volume of exports and imports in the Port of Tsingtao obviously increased compared with the neighboring Port of Yantai (Figure 3).

Empirical specifications and results

We use a pooled ordinary least squares (OLS) model to determine whether there was a significant decrease in land prices in Tsingtao compared with Shanghai during the same period. Table 2a shows the summary statistics for the land prices in Tsingtao and Shanghai, where the latter are estimated based on Du (2012). We pooled the data for these two cities and created dummy variables: *Tsingtao* = 1 and *Shanghai* = 0. We also made an *after1904* dummy that equaled 1 after 1904, but was 0 otherwise. The coefficient of the interterm of *Tsingtao* and *after1904* is the difference in difference (DID) estimator. We performed the OLS with robust standard errors and obtained the empirical results presented in Table 2b. The coefficient of *Tsingtao*, and the coefficient of *Tsingtao* × *after1904* was significantly negative, which implies that the anti-speculation policy significantly decreased the land prices in Tsingtao.

3.3 Land prices and land value tax in Zhejiang in 1931

On visiting Tsingtao, President Sun Yat-sen was impressed by the land institution and construction (Sun 1922; Trescott, 1994, Kumano 2011). Then, President Sun invited Wilhelm Ludwig Schrameier, who drew up the Land Law of Tsingtao, to draw up a land law for the entire country (Zhu 2007, Kumano 2011, Zhang, 2014). Eventually, they produced the Land Law of the Republic of China. The primary purpose of this law was to prevent land speculation (Zhu 2007, Kumano 2011, Zhang, 2014).

The Land Law of the Republic of China was enacted on June 30, 1930. It instituted a land tax based on the market value of land. A land owner had to self-report the land value to the government, and 1.5–5.5% of the self-reported value was to be paid as the land tax. The land owner had an incentive to underreport the value, but if the difference between the self-reported value and the governmental assessment exceeded 20%, the government had the option to buy the land for the self-reported value. Figure 4 plots the self-reported and governmental assessment values by county in Zhejiang Province in 1931.

Empirical specifications and results

Table 3a summarizes the land values. Table 3b shows the results estimated with the OLS model, with robust standard errors. The coefficient of the government assessment value was significantly positive, and the value 0.497 (marginal effect) means that the self-reported value was about half of the government assessment. The total self-reported and government assessment values for Zhejiang Province in 1931 were 1,583,265,837 and 2,226,002,582 Yuan, respectively, and the ratio of the former to the latter was 0.711 (average effect). One explanation for this result is that the land value tax was capitalized, and that the land owner reported the land value after tax, while the government assessed the land value without tax. If these suppositions were true without a bubble occurring, the implied interest rate would be as follows.

The land value before tax without a bubble would be $p = d/r$, while the value with tax rate τ would be $p_\tau = d/(r + \tau)$, where d is the dividend. We obtain $p_\tau/p = r/(r + \tau) = 0.711$. By solving the equation for the interest rate, r is 5.359 to 19.651% for land value tax rates of 1.5 to 5.5%, respectively. The average interest rate would be 12.505%. This implies that the yearly interest rate was close to the yearly deposit rate of 10.800% in Nanking in 1931 (for interest rates in major cities, see p.32, vol. 12, Summary Statistics of the Republic of China, 1935). An alternative explanation is that the government also assessed the land value with tax, and that the land owner underreported 29.9% (= 1 – 0.711) of the land value after tax. Even when the difference between the self-reported and governmental assessments exceeded 20%, the government rarely exercised its purchase option, or had to incur a transaction cost as large as about 0.45% (= 5% × 9%) of the land value. If one of the above two explanations is correct, the behaviors of land owners and the government were rational based on the theory of land value with tax.

4 Conclusions and implications

We discovered bubbles in the housing prices in Beijing and Shanghai using the yearly ratio of housing prices to rent for 1994–2018, and that there were bubbles in land prices in Taipei using the yearly ratio of land prices to rent for 1981–2018. We also found a soft landing in the land market for Taipei, and that the nominal housing prices in Beijing and Shanghai stabilized after increasing sharply. Therefore, Beijing and Shanghai also experienced successful soft landings as a result of macroprudential or tax policies, as argued by Wan (2015, 2018, 2018a–d).

To test the land price bubble prevention hypothesis, we used two historical policy events from the early 20th century in China. We found that the anti-speculation policy in the German colony of Tsingtao significantly decreased land prices compared with Shanghai, where speculation was permitted in the British and other European colonies during 1899–1911. After President Sun Yat-sen visited Tsingtao, he used the anti-speculation rule to devise the first Land Law of the Republic of China, which was implemented in Zhejiang in 1931, and subsequently in Taiwan since 1947. As predicted by the Land Law of the Republic of China and the bubble prevention hypothesis, the land owner's self-reported land value was significantly lower than the government assessment, which implies that land owners have a strong incentive to lower the price of land to reduce their tax burdens, and that land value tax can be used to curb or prevent the occurrence of land price bubbles.

These historical facts are important for current and future China, to prevent land price bubbles and the consequent housing price bubbles via anti-speculation policy, such as taxes. Finally, future studies should conduct analyses based on micro-level data.

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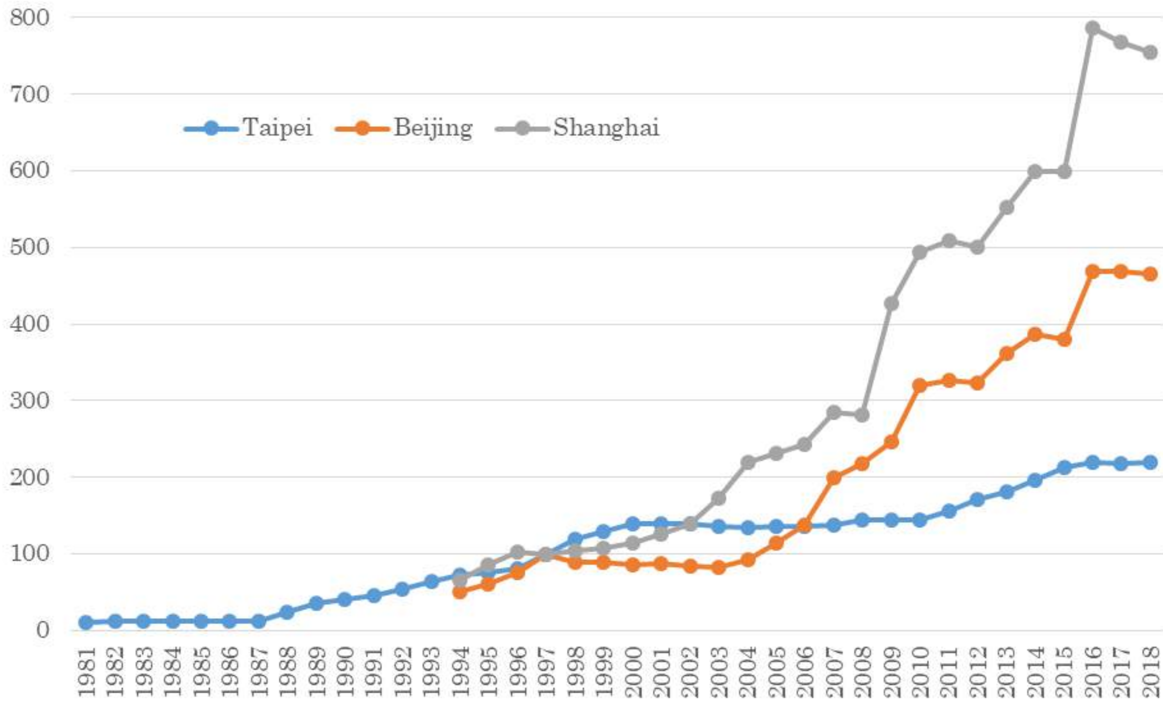
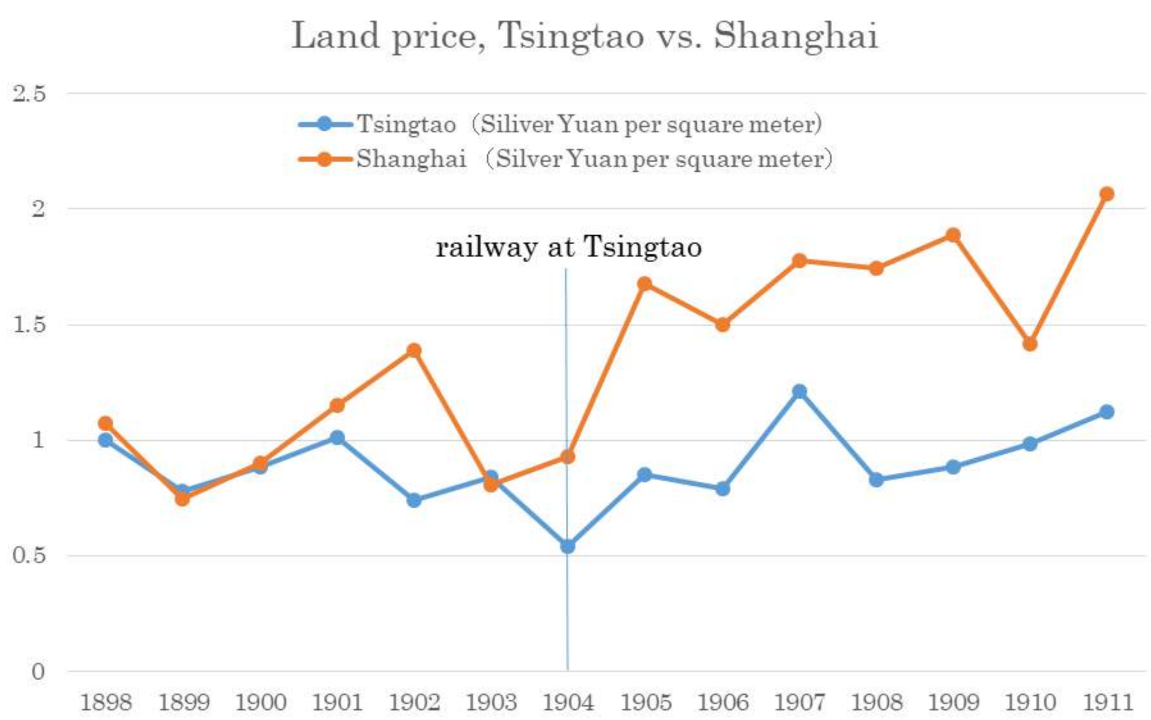
Figure 1: Nominal Housing Price Index in Beijing and Shanghai during1981-2018 Nominal Land Price Index in Taipei during 1981-2018 (1997=100)



Source: Data are from Real Estate Statistical Yearbook of China, and the Statistical Yearbook of Taipei City, and data in 2018 is estimated from Jan. – Nov. 2018.

Figure 2: Land prices at Tsingtao and Shanghai, 1989-1911

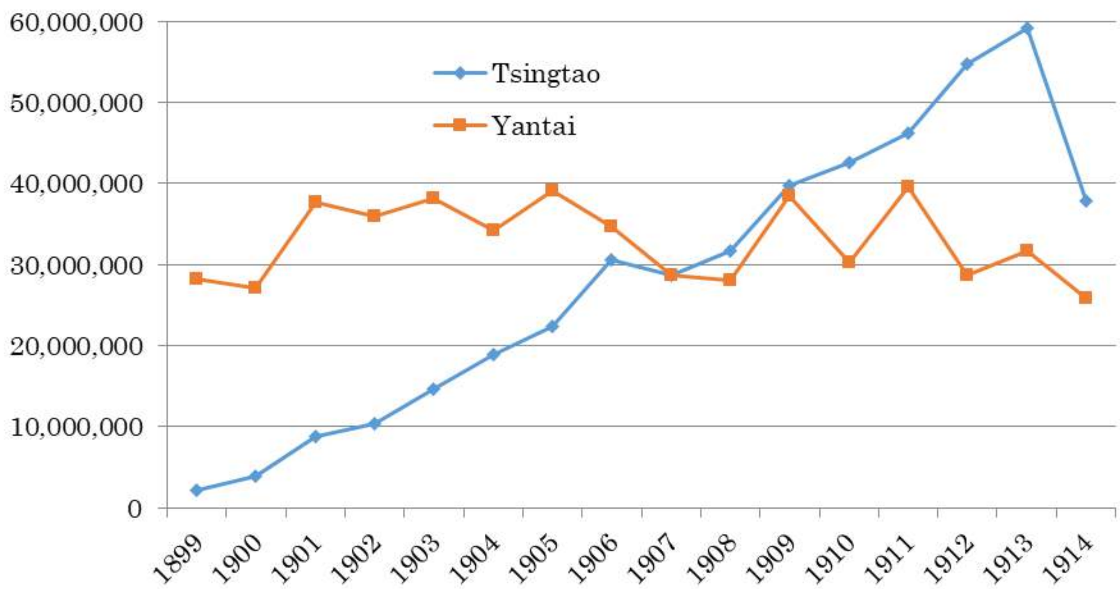


Year

Source: See the text.

Figure 3: Total volume of import and export in Tsingtao and Yantai ports, 1899-1914

(unit: Guanpingliang in Chinese, Customs Silver)



Source: Author's figure based on the data by Yang (2010).

Figure 4: Self-reported value vs. governmental assessment value in Zhejiang in 1930

Governmental assessment value

Source：Drawn by the author, based on Summary Statistics of Republic of China in 1935.

Table 1a: Summary Statistics for Beijing and Shanghai during 1994-2018, and Taipei during 1981-2018

Variable	Obs	Median	Mean	Std. Dev.	Min	Max
(Beijing and Shanghai)						
Year	25	2006	2006	7.360	1994	2018
Ratio of housing price to rent (1997=100, Beijing)	25	100.000	127.191	57.897	58.371	217.367
Ratio of housing price to rent (1997=100, Shanghai)	25	170.265	193.434	92.595	88.680	341.924
(Taipei)						
Year	38	1999.500	1999.500	11.113	1981	2018
Ratio of land price to rent (1997=100)	38	100.053	104.694	49.917	36.477	212.871

Note: Data in 2018 is estimated from reports during Jan. – Nov. 2018.

Table 1b: Unit root tests for Beijing, Shanghai, and Taipei

Beijing

A: Unit root test		
Ratio of housing price to rent (1994 –2018, 25 observations)		
Null Hypothesis: The series has a unit root		
	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-0.339	0.905

*MacKinnon (1996) one-sided p-values.

Shanghai

A: Unit root test		
Ratio of housing price to rent (1994 −2018, 25 observations)		
Null Hypothesis: The series has a unit root		
	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-0.381	0.898

*MacKinnon (1996) one-sided p-values.

Taipei

A: Unit root test		
Ratio of housing price to rent (1981 –2018, 38 observations)		
Null Hypothesis: The series has a unit root		
	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	0.465	0.983

*MacKinnon (1996) one-sided p-values.

Table 1c: Bubble tests for Beijing, Shanghai, and Taipei

Beijing

The RADF test, SADF test, and the GSADF test of ratio of housing price to rent

Null hypothesis: The series has a unit root

Yearly ratio of housing price to rent
(1994 – 2018, 25 observations)

	RADF	SADF	GSADF
Test statistics	1.550	1.787	1.816
p-value	0.050	0.015	0.051

Right-tailed test.
Note: Critical values of tests are obtained by Monte Carlo simulation, the author's calculations.

Shanghai

The RADF test, SADF test, and the GSADF test of ratio of housing price to rent

Null hypothesis: The series has a unit root

Yearly ratio of housing price to rent
(1994 – 2018, 25 observations)

	RADF	SADF	GSADF
Test statistics	1.480	1.200	1.480
p-value	0.056	0.044	0.086

Right-tailed test.
Note: Critical values of tests are obtained by Monte Carlo simulation, the author's calculations.

Taipei

The RADF test, SADF test, and the GSADF test of ratio of housing price to rent

Null hypothesis: The series has a unit root

Yearly ratio of housing price to rent
(1981 – 2018, 38 observations)

	RADF	SADF	GSADF
Test statistics	5.599	1.678	9.363
p-value	0.000	0.022	0.000

Right-tailed test.
Note: Critical values of tests are obtained by Monte Carlo simulation, the author's calculations.

Table 2a: Summary statistics of land prices in Tsingtao and Shanghai

Variable	Obs	Mean	Std. Dev.	Min	Median	Max
land price of Tsingtao	14	0.892	0.168	0.542	0.869	1.214
land price of Shanghai	14	1.363	0.432	0.745	1.405	2.064
Year	14	1904.500	4.183	1898.000	1904.500	1911.000

Table 2b: Land prices in Tsingtao and Shanghai, pooled OLS estimation with robust standard errors

	Dependent variable = land price							
Tsingtao	-0.471		-0.471		-0.471		-0.136	
	(0.124)	***	(0.101)	***	(0.103)	***	(0.123)	
after1904					-0.047		0.247	
					(0.225)		(0.258)	
Tsingtao*after1904							-0.587	
							(0.170)	***
year			0.047		0.052		0.052	
			(0.013)	***	(0.028)	*	(0.025)	*
constant	1.363		-88.872		-98.244		-98.412	
	(0.115)	***	(24.177)	***	(53.197)	*	(48.143)	*
R^2	0.36		0.59		0.59		0.73	
N	28		28		28		28	

Robust standard errors in parentheses.

* p<0.1; ** p<0.05; *** p<0.01.

Table 3a: Summary statistics of county land value with and without tax

Variable	Obs	Mean	Std. Dev.	Min	Median	Max
self-reported value	59	15,100,000	12,800,000	358,749	10,600,000	58,000,000
government assessment value	59	27,000,000	18,300,000	3,548,970	23,800,000	69,600,000

Table 3b: Land values with and without land value tax, OLS estimation with robust standard errors

	Dependent variable = self-reported value
government assessment value	0.497
	(0.075)***
Constant	1,733,681.618
	(2,260,870.619)
R^2	0.504
N	59

Robust standard errors in parentheses.

* p<0.1; ** p<0.05; *** p<0.01.