Habitat International 46 (2015) 138–146

Contents lists available at ScienceDirect

Habitat International

journal homepage: www.elsevier.com/locate/habitatint

Polycentric urban structure and housing price in the transitional China: Evidence from Hangzhou

Haizhen Wen [a, b, *, 1], Yunlong Tao [a, b, 1]

[a] Civil Engineering Department, Zhejiang University, Hangzhou 310058, China
[b] Center for Real Estate Studying, Zhejiang University, Hangzhou 310058, China

ARTICLE INFO

Article history:
Available online 10 December 2014

Keywords:
Urban center
Housing price
Price elasticity
Spatial hedonic price model

ABSTRACT

With the rapid urbanization, the urban spatial structure has undergone great changes in China. The urban spatial structure of some big cities such as Shanghai, Beijing, and Guangzhou, has developed from monocentric to polycentric. Taking six administrative districts in Hangzhou as study areas, we collected housing data in 2003, 2008, and 2011 and then established traditional hedonic price models and spatial models to empirically analyze the dynamic impacts of three urban centers on housing price in Hangzhou. Results show that Hangzhou is becoming a city with a three-center urban spatial structure, and urban centers significantly affect housing price. The West Lake (landscape center) plays a major role in the spatial structure of housing price; the price gradient and the influence degree of the West Lake is much larger than those of Wulin Square (traditional CBD) and Qianjiang New City (new CBD). On the whole, the influence of urban centers on housing price gradually increases. Price elasticity and price gradient both increase from 2003 to 2011. The findings also reveal that the urban development has a history inertia, and the urban planning policy and the market forces drive the polycentric urban development in Hangzhou.

Introduction

China's urbanization process and urban construction have made notable achievements in the past 30 years. Since the reform and opening-up policy in 1978, the rapid economic development has promoted urbanization. From 2000 to 2011, the urbanization ratio increase from 36.2% to 51.3%, and the average ratio per year reaches 1.4%. Under the background of urbanization, many cities start a tide of city reconstruction and new zone development. With the process of suburbanization and inner-city redevelopment, the spatial differentiation in terms of social diversification, economic functions, and urban built form also occurred (Qin & Han, 2013). Overall, the transformation of the old district is good to the revival of the old urban area, and also beneficial to the economy development. The planning and construction of new urban areas opens up a new space for the economy of cities and also creates a new landscape of urban space, such as Binhai New Area in Tianjin, Liangjiang Area in Chongqing, and Qianjiang New City in Hangzhou, which become the new center of each city and greatly change the urban spatial structure.

Post-1978 reforms have fundamentally transformed the nature of Chinese cities as a consequence of the convergence of a multitude of economic, political, and social processes of different scales in the cities (Ma, 2006). Rapid social and economic diversifications are arising in China, and they have an important influence on the urban development of Chinese cities. Particularly, the land reform in 1987 introduces a policy of the paid transfer of land use rights, which has significantly promoted urban redevelopment, and considerable changes are taking place in the urban spatial structure of Chinese cities (Wu & Yeh, 1997; Yeh & Wu, 1995). As a result, land development behaviors have transformed from the centrally planned economy to a socialist market economy transition. The land rent/price gradient is emerging in Chinese cities through the pursuit of maximum land-use profit, which greatly accelerates urban spatial restructuring in the inner city (He, Li, & Wu, 2006).

The changing urban spatial structure raise empirical questions: Does a polycentric spatial pattern has emerged in large cities, and

* Corresponding author. Civil Engineering Department, Zhejiang University, Hangzhou 310058, China.
E-mail addresses: ningduwhz@hotmail.com (H. Wen), 770235146@qq.com (Y. Tao).
[1] Address: Anzhong Building Room A523, Zijingang Campus of Zhejiang University, Hangzhou, 310058, China.

http://dx.doi.org/10.1016/j.habitatint.2014.11.006
0197-3975/

how a polycentric urban structure affect housing prices in the transitional China. This paper takes Hangzhou, China as a case, and uses hedonic price models to analyze the dynamical influence of the various urban centers on housing price. This methodology identifies urban centers directly from housing price variations rather than indirectly through population densities. Previous studies examine spatial variations of housing price in Hangzhou, and reveal the negative relationship between distance to urban centre and housing prices (Wen, Jia, & Guo, 2005; Wen, Zhang, & Zhang, 2014). However, no attempt has been made to study how the emerging urban centers affect housing prices over time using a consistent model. The standard urban economic model (Alonso, 1964; Mills, 1972; Muth, 1969) makes the monocentric assumption that employment is located in the Central Business District (CBD). The polycentric urban models are also found to be more suitable for urban development in Western countries (Gordon & Wong, 1986; Kloosterman & Musterd, 2001; McDonald & McMillen, 1990; Ottensmann, Payton, & Man, 2008; Qin & Han, 2013; Waddell, Berry, & Hoch, 1993). In Hangzhou, the Wulin Square is the traditional CBD, the Qianjiang New Center is a new gradually maturing CBD, and the West Lake is the urban landscape center. These urban centers are different from those in theories because they aren't employment centers. A question is how such centers perform in hedonic models under the background of Chinese rapid urbanization. Our empirical study will present important evidence and provide a better understanding of the relationships between location characteristics and house prices in such setting.

The paper is organized as follows. Following this introductory section, Section 2 reviews the literature on hedonic price models and its application in identifying the relationship between urban centers and housing price. Section 3 describes details of the data and variables used in the analysis and model specification. Section 4 reports and discusses the empirical results. Finally, conclusions are stated in Section 5.

Literature review

Hedonic price model and spatial dependence

The hedonic price model, for which Lancaster (1966) and Rosen (1974) provide the theoretical foundation, has been popularly used to estimate the price of housing attributes, calculate price indexes adjusted by quality, and determine the shadow price of housing components (McGreal & de La Paz, 2013). Lancaster (1966) argued that the demand for the product was not based on the product itself, but on its characteristics. Given that housing characteristics are non-separable and traded in bundles, real estate is usually treated as a heterogenous good, and the level of utilities depended on the quantity of different characteristics. Therefore, the product price is made up of hedonic prices, with each product characteristic having its own implied price, and all hedonic prices form a price structure. Under the condition of perfect competition market, with maximizing consumer's utility and producer's profit as the goal, Rosen (1974) theoretically analyzed the long term and short-term equilibrium of the heterogenous product market. Based on Rosen's work, econometrics method can be used to estimate the hedonic price function, get implicit prices of product characteristics, and then analyze the demand of product characteristics.

The literature on hedonic price models is well established, and Malpezzi (2003) and Sirmans, Macpherson, and Zietz (2005) provided two comprehensive reviews. In the existing literature, housing characteristics can be generally divided into three types: structure characteristic, neighborhood characteristic and location characteristic. Usually the hedonic price model is in linear and log forms, and is estimated by means of multiple regression analysis. The log form model is often used as it has better goodness-of-fit and the advantage of correcting for heteroscedastic tendencies. Moreover, the estimated coefficients could be interpreted as the price elasticity of independent variables.

The potential problem in hedonic price models, arising from spatial effects, has attracted a significant amount of attention in the academic literature (Anselin, 2003; LeSage & Pace, 2009). Due to the spatial feature of housing transactions, spatial dependence occurs when houses close in proximity tend to be correlated. The standard ordinary least squares (OLS) specification violates the assumption that the housing transactions are independent in traditional hedonic regressions, which results in largely erratic and inefficient estimated parameters (Anselin, 1999; Tse, 2002). Hedonic regressions that control for well-defined spatial locations may still have house price residuals exhibiting spatial dependence (Dubin, 1998; Pace, Barry, & Sirmans, 1998). In order to avoid the bias generated by spatial dependence, different econometric techniques have been developed. In particular, spatial regression models (Spatial lag model or Spatial error model) have been widely utilized to avoid parameter misestimating. Model comparison exercises generally show better performance of spatial models relative to the traditional hedonic specification (Can, 1992; Case, Clapp, Dubin, & Rodriguez, 2004; Militino, Ugarte, & Garcia-Reinaldos, 2004; Osland, 2010; Pace et al., 1998).

Urban center and housing price

Location within an urban area is assumed to be a determinant of housing prices within standard urban economic models, which reveals that the urban spatial structure has a significant impact on housing price. Based on the trade-off between land rent and commuting cost, Alonso (1964), Mills (1972) and Muth (1969) established the bid rent model with a monocentric distance-decay function, which expressed an inverse relationship between distance to the urban centre and housing price. The location variables provide a direct connection between the urban spatial structure and housing price. Therefore, the spatial variation of housing price in the urban space offers a measuring tool to identity the spatial structure of cities.

A simple method is to present spatial expression with GIS tools, for example, some scholars plot the contour maps of the spatial distribution of housing price in Chinese cities, and found the housing price in urban center around has the tendency of gradient descent to the peri-urban (Li, Zhang, & Zhang, 2004; Ma, Lv, Feng, 2008; Wang, 2002; Wen, Zhang, & Peng, 2010; Xu, 1997; Zheng, 2001). This method is very intuitive, but the relationship between urban center and housing price is difficult to quantitatively analyze. Another method is the hedonic price model, which is widely used in real estate research. One or more measures of urban location are frequently included in hedonic housing price models. In general, hedonic applications to Chinese cities are limited because of data availability, as China's free housing market has existed for only 10 years (Liao & Wang, 2012). Some Chinese scholars tried to take into account the heterogeneity of housing products and used hedonic price models to study the influencing factors of housing price based on the monocentric hypothesis (Hao & Chen, 2007; Ma & Li, 2003; Wang & Huang, 2007; Wen et al., 2005). These studies are conducted in a specific city and mainly focused on the static cross-section market, but proved that the application of hedonic price models is also feasible in China housing market.

Polycentric urban development is emerging in some Chinese cities. Specifically, the adoption of the new land leasing system in 1987 has led to the transformation of the urban internal structure in China. Wu (1998) empirically examined land-use changes in