Development land valuation accuracy in China – a case study of Beijing

Dou, M., Hemphill, L., & Lim, J. L-C. (2020). Development land valuation accuracy in China – a case study of Beijing. *Journal of Property Investment and Finance*, *0*(0), 1-24. https://doi.org/10.1108/JPIF-06-2020-0072

Published in:
Journal of Property Investment and Finance

Publication Status:
Published: 14/10/2020

DOI:
10.1108/JPIF-06-2020-0072

Document Version
Peer reviewed version

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Development land valuation accuracy in China – a case study of Beijing

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Received 9 September 2020
Revised 15 September 2020
Accepted 15 September 2020

Abstract

Purpose – The paper aims to quantitatively investigate vacant industrial land valuation accuracy in China, given the importance of the industrial market as an underlying pillar to promote urban growth especially in emerging economies.

Design/methodology/approach – In China, the government formulates a Land Benchmark Price (LBP) to serve as a price reference point to sell land rights. To gain an in-depth understanding of the valuation practice by LBP, this paper uses correlation analysis to investigate the varying dynamics between the transaction-based prices and LBP appraisal-based estimates. Furthermore, a margin of error examination investigates the distortion in LBP land appraisals, with an amended LBP presented to improve the accuracy of the current LBP method.

Findings – Different influencing factors are identified to impact the actual market transaction prices and the LBP construction, leading to a large discrepancy in industrial land appraisals. A systematic problem is recognised that the construction of the LBP follows urban bid curve theory, whereas the land transaction prices do not, demonstrating that an urgent LBP update is needed to capture the market dynamics for industrial market.

Practical implications – The paper sets out discrepancies in valuation accuracy surrounding the application of the LBP valuation approach in China. This has practical implications for valuers in terms of raising their awareness of the deficiencies in the approach and the pitfalls they need to guard against in their appraisals. It also has implications for developers and investors who rely on valuer appraisals to assess the viability of land purchases; hence, they need to express caution in the appraisal advice sought. Finally, the results demonstrate to the standard setters how they need to modify the LBP equations to better capture market dynamics.

Originality/value – The paper examines valuation accuracy in transitional economies, through valuation differentials between appraised price and the transacted price. The value of the work lies in the analysis of the fundamental differentials between market price and appraised value, which is of importance to investors/developers, practicing valuers, as well as government officials responsible for setting the valuation standards.

Keywords Land valuation accuracy, Margin of error, Land benchmark price, Industrial land, Real estate development, China

Paper type Research paper

1. Introduction

The majority of valuation accuracy studies have focussed on the commercial property sector for investment purposes, given its significant impacts on investment portfolio management, property performance and acquisition or disposal decision-making processes (Baum *et al.*, 2001; Kallio *et al.*, 2012; Adegoke, 2016). In recent years, there is an increasing focus on the residential sector, for bank lending and lowering financial risk (McGreal and Taltavull, 2012; Hu *et al.*, 2016; Glennon *et al.*, 2018). The industrial market in terms of high-tech development zones, logistics and warehouse sectors, however, has witnessed limited research on valuation accuracy. This is largely due to the relatively small investment allocation of industrial

Journal of Property Investment & Finance

1463-578X
DOI 10.1108/JPIF-06-2020-0072

properties compared to other investment assets such as office, retail and specialist sectors in developed economies, for example, the United Kingdom. While valuation accuracy has been predominantly emphasised in the income-producing commercial real estate sector, as well as mortgage-lending residential sector, studies concerning valuation accuracy of industrial development sites represent a research gap in the existing literature. Yet, valuation accuracy in this sector is important, as the industrial market linked to manufacturing and logistics helps to promote urban growth, especially in emerging economies (Deng, 2003).

This paper investigates valuation accuracy within vacant industrial development land in China. This is significant given that commercial real estate development helps bring active capital flows into property investment, hence contributes to economic growth (Newell *et al.*, 2010). Development site transactions in China accounted for almost 68% of global transactions from 2007 to 2014, with the total transaction value making up 80% of global transactions, highlighting the magnitude of Chinese development transaction activities (Newell and McGreal, 2017). Rapid development growth with increased demand for land resources requires the government to come up with an efficient pricing mechanism to maintain a sustainable market. Furthermore, as a world factory, China relies heavily on industrial development for the economic performance and growth, with various Industrial Development Zones established to attract Foreign Direct Investment (FDI) revitalising economic development (Huang *et al.*, 2015). The 2030 Sustainable Development Goals (SDGs) link the importance of the increasing access to industrial enterprises and resource-use efficiency in developing countries in achieving their goals (SDG 9). To this end, an accurate industrial land appraisal in China and other emerging economies will help enhance developers and investors' confidence in portfolio management and attract FDI by indicating the value which land holds while understanding the variations in industrial rents in the local market. According to Bencure *et al.* (2019), a reliable land valuation also assists in maintaining a sustainable government land-related transaction market including land reallocation, consolidation, expropriation and taxation, as well as sustaining efficient land administration and management. This investigation of vacant industrial land valuation accuracy, therefore, represents significant importance to ensure an appropriate site value and help the market maintain a sustainable pricing model in China.

Previous studies have tended to compare valuation estimates with the associated open market transaction price (Matysiak and Wang, 1995; Blundell and Ward, 2008). In contrast, this study considers valuation accuracy by quantifying the extent to which the application of the government-published benchmark price in appraisal estimates reflects market transaction prices. An important distinction of Chinese land appraisal is that, aside from the internationally recognised development valuation methods (market comparable approach and residual approach), the Chinese government adopts a Land Benchmark Price (LBP) approach to reflect the lack of transaction data to guide market transaction prices (Li and Walker, 1996). This LBP is characterised by an average land price allocated to each homogeneous land area in a city. A more specific land price determination for a particular land plot is calculated based on the LBP mathematical formula set by the local government department. Li and Walker (1996) note that the calculated LBP reflects a government-based hypothetical transaction price, which indicates the quality of land management and the income-earning potential of that particular piece of land. Ni (2014) comments that LBP is regarded as a common land assessment method for its ease of use and authoritativeness, especially for areas where the market is immature with low volumes of land transactions. However, there is a set of sophisticated and restrictive rules in applying LBP to land valuation which results in prescribed valuation practice within Chinese cities. The ability and reliability of the LBP to accurately represent the land market price, therefore, require careful investigation to ensure a sustainable Chinese land market.

The analysis in this paper employs a modelling-based approach drawing on an extensive database of market transactions. This paper empirically examines valuation differentials to determine the reliability of LBP appraisals from an industrial land perspective from 2010 to 2017 in Beijing, based on official data from the Bureau of Land and Resources. It fills the research gap of real estate valuation accuracy in a transitional market by investigating the impact of the government price setting approach (LBP) on the valuation accuracy. By highlighting the valuation (in)accuracy in the context of a transitional market, this paper seeks to answer the following research questions:

(1) Is the LBP able to closely track the market transaction price to act as a price guide?

(2) If not, by what percentage does LBP deviate from market transaction price?

(3) What dynamics are observed in the price differentials and how do these influence developers/investors, valuers and government standard setters?

(4) How can the accuracy of the current LBP method be improved?

2. Literature review

2.1 Dynamic pricing and bid–rent curve theory

A dynamic land price is associated with a set of driving forces reflecting the continuously adjusted supply and demand in an open market (Geltner, 2015). Measuring the land price change is hence at the core in understanding the fundamentals of the market (Li, 2011). Location has been long established as a crucial explanation to a dynamic real estate price construction, which is often characterised as the radial distance from the Central Business District (CBD), known as the urban bid–rent curve (Basu and Thibodeau, 1998; Garza and Lizieri, 2016; Li *et al.*, 2019). According to Alonso (1964), there is a spatial equilibrium between land price and land use from a locational perspective within a monocentric city, where the price and demand for real estate would decrease with the increasing distance to the CBD, given that land users, especially in retail, office and residential, would compete for the most accessible land. The competition among land users willing to pay higher rents in central areas will lead to steeper bid–rent curves and reflect the trade-off between transportation costs and land prices (Zou *et al.*, 2015; Li *et al.*, 2019).

Industrial land markets may appear to behave differently compared to residential and commercial land of office and retail uses, given its distinctive geographical feature and functional profile. Kowalski and Paraskevopoulos (1990) identified two dimensions to support the negative urban rent gradient, namely the quantification of location to CBD and property's exposure to the surrounding environment. Industrial real estate tends to locate within segmented submarkets to benefit from aggregation of neighbourhood effects and amenities (Ploegmakers and Vor, 2015; Zheng *et al.*, 2017). The monocentric-oriented measure of radial distance, hence, may fail to capture the price dynamics in the industrial market that takes the form of aggregated submarkets (Heikkila *et al.*, 1989). Colwell and Munneke (1999) further discovered that the size elasticity for industrial land is not statistically different with the increasing distance to the CBD in Cook County, Illinois, indicating the space demand of industrial real estate for assembly and warehousing activities. Consequently, industrial prices are found to be higher when location draws closer to the airport area in Illinois. Similar findings were drawn by Xiong and Tan (2018), who supported that the development of industrial land in Yiwu, China, a world-famous manufacturing base and international trade city, is more likely to happen when the location is remote from the CBD but closer to other industrial parks to benefit from additional land capacity. According to Hesse (2004), industrial real estate exhibits changing spatial and hence pricing dynamics to reflect the socio-economic framework emphasising space and distribution demand.

In China, industrial land price is closely related to urban expansion and economic growth, acting as a decisive driving force behind industrial development (Xiong and Tan, 2018). Zhang *et al.* (2018) noted that the change in the government-guided LBP is significantly associated with the government land supply strategy in Hangzhou, with a 1 RMB/m^2 increase in LBP leading to 0.2% odds of industrial land loss. The statistical significance of the LBP in explaining industrial land gain/loss indicates the imperative role of LBP in shaping the Chinese urban redevelopment structure. In contrast, Chen *et al.* (2018) regarded the government-guided price as a means of allocation mechanism and maintained there exists a transformation of the market-orientated industrial market in China, given the industrial price differential found between the land transaction price and the guide price on a national scale. Similar issue has also been captured in other markets outside China who adopt the concept of LBP in guiding the market price. Thu and Perera (2011) opined that the price distortion between government guidelines and market transactions in Ho Chi Minh, Vietnam, leads to an imbalanced market supply and demand of land, given the conflict between two prices creates complexity in compensation for land users and land acquisition for government. Furthermore, Shimizu and Nishimura (2006) discussed that the inaccurate land price published by Japanese authorities would inevitably affect land-related information such as property tax given its close linkage to LBP in Japan. As a result, unreasonable government-instructed land price can lead to inefficient use and hence waste of land resources (Ding, 2001; Lin, 2010) and restrictions in the optimal industrial space configuration and layout (Chen AQ: 5 *et al.*, 2018). It is hence anticipated that the accuracy of LBP can be improved and sit within a more rational range to help monitor the dynamics of the urban land price and maintain a sustainable environment for the Chinese urbanisation process.

2.2 Property valuation accuracy and valuation practice

Crosby (2000) defines valuation accuracy as the extent to which a valuer correctly estimates the transaction price of a subject property in an open market. Real estate valuation, however, is a complex task. It has been agreed that valuation appraisals cannot have pinpoint accuracy due to the difficulty of predicting the market, the accessibility of market information and the remoteness of the evidence (Babawale, 2013). In this respect, Mallinson and French (2000) considered how valuation accuracy is inevitably influenced by uncertainties arising from the market position in a cycle and the characteristics of the subject property. Furthermore, French and Gabrielli (2004) argued that valuation would only be certain when the future could be accurately predicted. Given this impossibility, the market transaction price will always differ from valuation estimates. According to McGreal and Taltavull (2012), even the most prescribed valuation approach is unable to reduce the bias and perceptions on the valuation.

While all valuation estimates carry bias to a certain degree, it is accepted that appraisals need to fall within a range, that is, margin of error, to avoid negligent valuation practice. In accuracy studies, Crosby (2000) differentiated between the concepts of valuation bias and valuation variation stating the former accounts for the relationship between the valuation and the associated market transaction price, whereas the latter concerns the valuation differences produced by more than two valuers for the same subject property. This paper focusses on the accuracy regarding the relationship between valuation and market transaction price, instead of behavioural influences on the individual valuation figure which are largely avoided in China due to the prescribed nature of the valuation standards.

Over the past few years, increasing interest has been devoted to analysing the margin of error in the real estate valuation especially in the developed countries such as the United Kingdom, USA and Australia. Crosby (2000, p. 138) justified that while "the artistic nature of real estate appraisal is accepted... the courts are not prepared to give free rein to this artistic licence". In his study which compared legal attitudes towards valuation, no universally accepted margin of error was identified across different countries due to the varying performance of expert witnesses. It is however agreed that real estate valuation is considered fairly accurate in the United Kingdom (Brown, 1986; Matysiak and Wang, 1995; Blundell and Ward, 2008) with a margin of error of ±10 to ±15%, or in exceptional cases of residual valuations up to ±20% (Crosby *et al.*, 1998) considered acceptable. Valuers in Australia are generally capable of valuing within the bracket of ±10% to ±15% (Skitmore *et al.*, 2007), whereas in the USA they tend to have more accurate valuations with a margin of error around 10% (Crosby, 2000).

Research to investigate valuation (in)accuracy in developing countries is limited. The shortage and reliability of property market information in developing countries remain the biggest obstacles, compared to developed countries where the institutions have developed rich and reliable data sets. Instead, focus has been largely placed on valuation practice. Adegoke (2016) examined the factors contributing to valuation (in)accuracy in Nigeria. The survey collected from local real estate companies showed that valuer's skill, judgement of the objective and experience are considered the most important factors to secure an accurate valuation, followed by the reliability of the market data and valuation methods. Awuah and Gyamfi-Yeboah (2017) assessed the impact of different approaches to valuation variation in Ghana via questionnaires. According to the authors, the choice of valuation methods depends on the nature of the property, the purpose of the valuation and the accessibility of the data. The valuers have the freedom to adopt a different method but the possibility to employ an inappropriate method may result in valuation inaccuracy. Their findings revealed that the comparable approach produces better valuation accuracy with lower coefficients of variation. In contrast, Adams *et al.* (1985) indicated that the comparable method might be less accurate in a limited transaction market or a declining economy. The latter justified that it is difficult to discern a general level of price as no single transaction is considered typical. As a result, the comparable method based on previous market evidence tends to produce a higher value in a declining market and vice versa. The inconsistency between Awuah and Gyamfi-Yeboah (2017) and Adams *et al.* (1985) suggests that the differences in the valuation process and the selection of methods in different countries might lead to different levels of valuation accuracy.

In the context of China, Lim *et al.* (2006) investigated the impact of behavioural influences on valuation practice. In their study, valuation methods applied by Hong Kong (HK) practising valuers were compared to appraise properties in mainland China and HK separately. The findings revealed a significant behavioural difference in selecting valuation techniques in the two locations. A greater investment-focussed valuation practice was identified in HK market, in contrast to a development perspective in China. Furthermore, regarding industrial property valuation, the comparable method was more popularly employed in HK-based locations, due to a richer accumulation of market data. The cost approach, on the other hand, was preferred by HK valuers to appraise industrial properties in China, suggesting that the lack of data in the Chinese real estate market, particularly in industrial sector, makes cost method more appropriate to assess the construction costs and account for depreciation and obsolescence. While serving as one of the pioneer investigations in Chinese valuation practice, a limitation of Lim *et al.* (2006) restricts the survey to HK-based valuers. Although the same valuation approaches are used in both HK and mainland China, valuation practice can differ from each other due to different regulations, which in turn influences the accuracy level. This paper, therefore, tries to measure valuation accuracy from a Chinese appraisal perspective, focussing on applying the LBP appraisal approach.

2.3 Land appraisal regulations and LBP in China

To gain a better understanding of the valuation practice standards governing the use of the LBP in China, three regulations were compared, that is, Regulations for Valuation on Urban Land (RVUL) [1], Code for Real Estate Appraisal (CREA) [2] and the manual of LBP [3] (referred to as the "manual" in this paper). It is worthwhile to notice that LBP is practised throughout China. This paper, however, only refers to Beijing as a case study area due to time and data limitations. Furthermore, it focusses on the LBP formulas in the Beijing manual which differs slightly from some other Chinese cities. It is anticipated that the examination of the LBP in Beijing will provide equivalent values to other Chinese cities, given the same rationale of a negative rent gradient is employed in industrial land markets on a national scale, hence making Beijing a useful case study.

RVUL and CREA are national standards applicable throughout China, whereas the manual is at the municipal level which differs from city to city (this paper refers to the manual used in Beijing). The regulations remain fragmented given the separation of land valuation and buildings prevalent in China. The RVUL emphasises land valuation and the process of benchmark assessment, while the CREA standard focusses on real estate appraisal of both land and buildings. Both RVUL and CREA standards, therefore, cover aspects of land valuation. In contrast, the manual specifies and directs the use of LBP including the geographical scope of homogeneous land areas in a city, the benchmark price of each land area and the coefficients of adjustment which must be applied.

The listed purpose of the LBP method is different among the three regulations (Table 1). T1 The RVUL specifies that the LBP method is used for assessing the resettlement of land assets from government-owned to a private company. Besides resettlement, the manual also adds that LBP can be further used for auditing government revenue from urban Land Use Rights (LURs) sale and auditing urban land leases. CREA, in contrast, has a wider remit citing that the LBP method can be used within the cities that hold government-published LBP data [4].

In addition, the number of valuation methods to be used is different in the three regulations. RVUL regulates that land valuation shall be assessed by at least two approaches. In the situation where there are limited transactions, extremely low marketisation or an absence of land income, land valuation can be assessed by one method under the agreement of the experts from land valuation committee at provincial or national level. The regulation

	RVUL	CREA	Manual
Application Government department	At national level Ministry of Land and Resource	At national level Ministry of Housing and Urban-Rural Development	At city level Beijing Municipal Commission for City Planning and Land Resources Management
Purpose of regulation	Regulates the land valuation and the process of land benchmark assessment	Regulates the real estate appraisal of both land and buildings	Directs the use of LBP
Listed purpose of LBP method	The resettlement of land assets from government-owned to a private company	LBP method can be used within the cities that hold a government-published LBP	(1) A benchmark reference point for LURs sale (2002) (2) The resettlement of land assets from government-owned to a private company (2014) (3) The audit of the government revenue from LURs sale and the audit of the urban land lease (2014)
No. of valuation methods to be used	At least two methods shall be used, only in exceptional cases with one valuation approach be applied	Advocate use of one valuation method	No specification on how many methods

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Table 1.
Comparison between the regulations

does not explicitly state which method to use in these extreme circumstances, but the LBP would be considered the most appropriate approach. In contrast, CREA does not stipulate the use of two valuation methods, but rather allows flexibility with the use of one valuation method. The manual does not mention the number of valuation methods, but the 2002 version used to indicate a minimum 30% weighting factor should be allocated to the LBP approach when reconciling with other methods, suggesting that at least two methods was preferred. This weighting factor has been removed in the latest 2014 version, which provides valuers with more freedom to adjust and reconcile the appraisals. The number of valuation methods used and the weighting factors applied are not uniformly treated across the regulations governing valuer practice, which is likely to cause at best valuation inconsistencies and more likely valuation inaccuracies unless resolutions are sought to reconcile values obtained from more than one method. This is concerning given the vagueness of the standards in specifying the use of more than just the LBP method and the problems that it could generate for international investors in terms of investor trust in the appraisals undertaken.

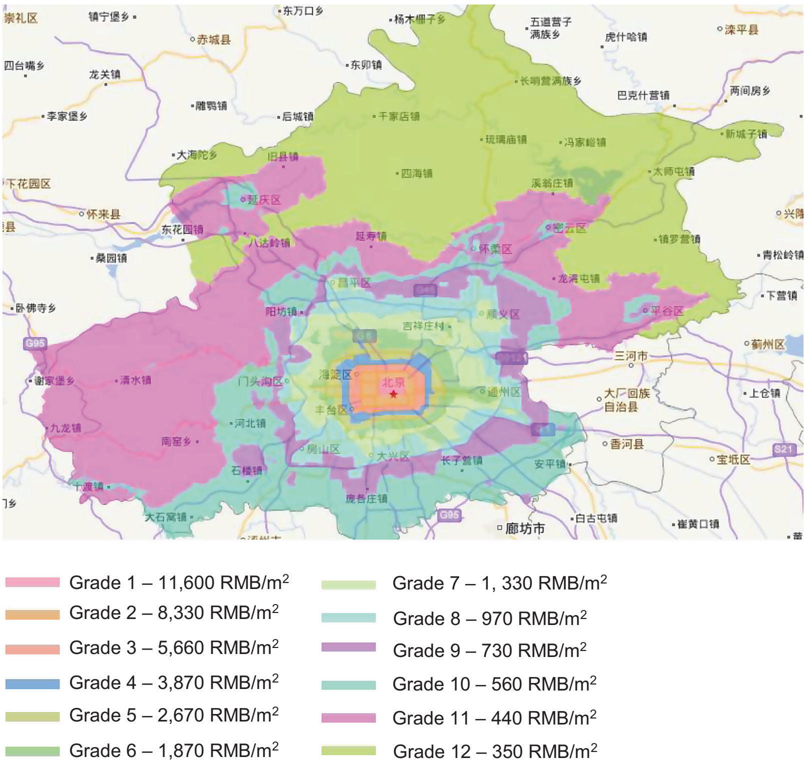
As indicated in Table 1, the benchmark applied in the Chinese real estate market refers to the government-published land prices for the purpose of guiding land sale (Beijing Municipal Government, 2002). This is different from the concept of benchmarking in Western countries which refers to measuring the investment characteristics of a property such as its risk and returns (Lim *et al.*, 2008). The rationale to create the LBP was driven by the lack of market data to form the basis of valuing the sale price of land in the late 1980s when the transfer of LURs was first introduced in the Chinese real estate market. Before the LURs reform, land resources in China were administratively allocated by local government without being valued in monetary terms because the property rights were controlled by government ownership under the centrally planned economy (Zhao *et al.*, 2009; Chow, 2011). The LURs reform separates the right to use land from the government ownership. Although the land is still owned by the state in name, land transactions to sell LURs have enabled a Chinese real estate market by means of invitation to tender, auction and private negotiation (Walker and Li, 1994; Chan, 1999).

The use of a government-published benchmark price as reference sell point is not unique to China and has been extensively employed in wider Asian countries. For example, a similar government-imposed Land-Price Framework (LPF) is practised in Vietnam for compensation, acquisition, allocation and taxation purposes (Thu and Perera, 2011). In Taiwan, every land plot is required to be assessed against a publicly Announced Land Value (ALV) by the government for the taxation purposes (Chao, 2018). Similarly, in Japan, the Public Notice of Land Prices (PNLP) serves as a benchmark price for land transactions and land appraisal (Shimizu and Nishimura, 2006). This government price-setting system in the form of LBP among Asian countries is a result of rapid land development tensions versus limited market information. However, where perhaps China differs is the use of the LBP in prescribed equations within the appraisal regulations to influence or control valuer practice (Hemphill *et al.*, 2014).

The LBP was first established in Beijing in 1993, followed by subsequent updates in 2002 and 2014. A key characteristic of the LBP lies in its reliance on homogeneous land areas, where it assumes that the impact of location is uniform across homogeneous areas. Specifically, land is graded into different levels based on land quality in a city by considering economic, social and natural attributes of land. In relation to industrial land, the factors used to quantify land grade (LG) include communication accessibility, environmental quality, population density and industrial aggregation (Ministry of Land and Resources, 2014). This evaluation of urban land grading is implemented by the Ministry of Land and Resources based on the *Regulations for Gradation and Classification on Urban Land*. The regulations further detail that industrial land can be divided up to eight grades [5] depending on the urban size, with LG 1 being the most optimal and LG 8 the least. In addition, the boundary between each LG can be divided by (with priority order) natural geographical features, for example, railway, road and administrative division.

Figure 1 shows the land grading for industrial land in Beijing, where grade 1 is located in F1
the core area, in contrast to grade 12 lying in the periphery. The land grading reflects an authoritative view on land price, where the central area is expected to have the most expensive land, given its optimal location with high demand yet scarce resources. This bid–rent curve behaviour can be especially true for commercial uses of office or retail, where the land value is expected to diminish with distance further away from CBD. However, such price gradients from an industrial land perspective may cause potential distortion in land appraisal estimates, because industrial land is usually in higher demand when located in the outskirts of cities near major transport hubs, as they require freight transport access. The heavy traffic congestion in central Beijing does not add value to an industrial location, and hence, having such a spatial grading system as the foundation for industrial land valuation appears less appropriate.

Since the LBP only provides a homogeneous value for the same LG, a more specific land price determination for a particular land plot is needed. The LBP mathematical formula
(Table 2) is used to facilitate individual land plot valuation, by adjusting factors including T2
appraisal date (C_{LPI}), floor-to-area ratio (C_{FAR}), infrastructure development (C_{ID}) and influencing factors (C_{IF}). The appraisal date is adjusted by using the government-published



Source(s): Land Price Monitor (2020)

Figure 1.
Land grades divisions for industrial land, Beijing 2014

land price index, given the index is updated on a yearly basis helping the LBP to track the market movement. Floor-to-area ratio (FAR), infrastructure development and influencing factor coefficients enable the adjustments for each vacant site to differentiate from the standardised benchmark in each LG and account for physical and environmental differences. Specifically, FAR impacts land appraisals through the density of constructed building on the land. Adjustment on the infrastructure development includes road connection, water supply and drainage, electricity, heat, gas and telecoms, whereas influencing factors account for environmental differences such as the aggregation extent of industrial development, accessibility of the location and the compatibility with the surroundings.

The LBP approach to calculating land value is not without its criticisms. Liu (2011) claims that it takes a long time and is costly to update LBP, given the complexity to update LGs. Indeed, the reassessment of urban LG based on a series of factors is a time-consuming process, which can fail to keep pace with the fast-urban expansion and regional growth, leading to delays in LBP updates and a widening of the time lag. The city extension and changes made to LGs in 2002 and 2014 make the LBP across these dates non-comparable. In this way, the LBP in each grade, despite being a necessary tool to enhance market data transparency and expand the data set from historical information, becomes inconsistent over time. In addition, Ding (2001) noted that FAR is a dominant factor in the benchmark approach influencing the land price, but modern urban economic theory suggests the opposite in that FAR should rely on the land price. The reverse of the dependency between FAR and land price potentially impacts on the land use efficiency under open market principles. Consequently, this land assessment dependence on FAR could result in land not reaching its highest and best use.

While the evaluation of the LBP approach remains predominantly qualitative in China, a quantitative analysis of the biases in appraisal land price information was carried out in Japan by Shimizu and Nishimura (2006) to look at the Japanese version of the government-published LBP. The authors placed importance on the ability to measure risk in a fully functioning real estate market. The disclosure of government-published benchmark land price, however, contributes little to the risk-related pricing information. Moreover, a clear time lag between the published price-based index and transaction price-based index was identified in Japan, resulting in an increasing magnitude of valuation error. In China, an initial effort to quantitatively investigate the impact of LBP on the real estate market is conducted by Du *et al.* (2016). The authors maintained that the LBP positively influences the urban land productivity in Beijing by stimulating more investment and better business management. Nevertheless, Du *et al.* (2016) employed land transaction price to denote the functioning of the LBP system. It remains unclear from existing research how effectively the LBP can represent urban land transaction price given the lack of the evidence of the valuation (in)accuracy in LBP method.

	2002	2014
Land estimates (FAR ≥ 1)	$= LBP*C_{LPI}*C_{IF}$	$= (LBP \mp C_{ID})*C_{LPI}*C_{IF}*C_{FAR}$
Land estimates (FAR < 1)	$= LBP*C_{LPI}*C_{IF}/FAR$	

Source(s): Beijing Municipal Government (2002; 2014)
Where: LBP = the Land Benchmark Price defined by the Government; C_{LPI} = the coefficient adjustment to reflect the appraisal date (instructed by the government); C_{FAR} = the coefficient adjustment for the Floor-to-Area Ratio (instructed by the government); C_{ID} = the price differentials between benchmark and valuation subject in different levels of infrastructure development (instructed by the government); C_{IF} = the coefficient adjustment of the influencing factors (can be subjectively adjusted by the valuer within certain percentage)

Table 2. Formulas of LBP method in industrial land appraisals, 2002 and 2014

To fill this research gap, this paper quantitatively measures the margin of error in land valuation, that is, how close the government-published LBP (as applied through the prescribed appraisal equations) can trace the land transaction price. It should be noted that the LBP is not designed to reflect the actual market transaction price, but rather act as a reference point with further adjustments needed for valuation purposes. Previous studies (Li and Walker, 1996; Xu and Li, 2014; Du *et al.*, 2016) employed the method to directly compare the LBP to market transaction price which automatically creates a price gap. The uniqueness of this research, in contrast, compares the LBP valuation estimates (rather than the LBP itself) to the market transaction price. Due to the market data limitations, the LBP estimates used in this paper were assessed manually by the authors, under the hypothesis that the valuation estimates conducted by the authors are able to substitute the practising valuers given that the same market transaction data, same LBP valuation method and the coefficient adjustments recommended in the LBP formula were followed. This strict prescription of LBP, consequently, enables the authors to replicate what valuers do, establishing a theoretical basis for the appraisal results. However, it must be recognised that some valuers may deviate from the formula and exercise their own professional judgement resulting in values which may differ to those presented affecting the accuracy differentials returned.

3. Research method

A two-step process is employed by this work to quantitatively investigate valuation accuracy. In the first step, a Pearson correlation is calculated to account for the dynamics between the identified independent variables (Table 3), market transaction price and valuation estimates by the LBP method. T3

The independent variables incorporated in this study are limited yet essential for the data analysis because these are widely and repeatedly used by other researchers, which justifies their selection. In total, seven indicators were used, covering the land attributes, social-economic factors and locational variables. Specifically, FAR and LG were selected given their importance in the LBP approach to determine the land value. Land area as a main physical

Types	Variables	References	Data source
Land attributes	Floor-to-area ratio (FAR)	Shimizu and Nishimura (2005); Deng (2009); Ding (2013); Garza and Lizieri (2016); Hu *et al.* (2016); Liu *et al.* (2017)	Bureau of Land and Resources (Secondary data)
	Land area	Basu and Thibodeau (1998); Zhu (2005); Lin and Zhu (2014); Chen *et al.* (2016); Wang and Hui (2017)	
	Land grade	Li (1996); Ding and Knaap (2001); Wei *et al.* (2006); Liu *et al.* (2008); Qu and Liu (2012); Xu and Li (2014)	
Social-economic factors	Urban fixed-asset investment	Chen *et al.* (2007); Li (2009); Tian and Ma (2009); Li *et al.* (2015); Chen *et al.* (2016); Du *et al.* (2016)	National Bureau of Statistics (Secondary data)
	FDI in real estate	Thu and Perera (2011); Hui and Chan (2014); He and Zhu (2016); Liu *et al.* (2016)	
	Interest rate	Leishman and Bramley (2005); Mavrodiy (2005); Koroso *et al.* (2013); McCord *et al.* (2016)	
Distance indicators	Distance to CBD	Basu and Thibodeau (1998); Fuerst *et al.* (2016); Garza and Lizieri (2016); Li *et al.* (2019)	Author own calculation (Primary data)

Table 3. Summary of Independent data

feature represents the development complexity which may exert influences on the valuation accuracy. The land area in China consists of two parts, that is, the constructed land area (CLA) and the compensation area (CA). The former was used for building construction and the latter for urban infrastructure development paid by developers. Both elements of land area were taken into consideration in this analysis. Regarding social-economic factors, urban fixed-asset investment was employed to represent the domestic investment in Beijing, whereas FDI in real estate was used to measure the capital inflows from outside China. The investment indicators were chosen given the close relationship between the investment and development markets and hence, their potential influence on vacant land valuation. Interest rate (IR) represents the developer's response to wider economic environment. Finally, the distance to CBD was used to measure the locational characteristic.

In the second step, this paper quantitatively identifies the valuation discrepancy by comparing the transaction-based price and the appraisal-based price using the LBP method. A total of 457 industrial land transactions were collected in the study period between 2010 and 2017. The valuation margin of error was calculated based on Equation (1).

$$\text{Margin of error } (\Delta V) = \frac{\text{LBP appraisal} - \text{transaction price}}{\text{transaction price}} \times 100\% \tag{1}$$

To capture the variables that give rise to the valuation differentials, an OLS model employed in this paper follows the structure advocated by McGreal and Taltavull (2012), who tried to conceptualise the valuation process by using the standardised value of variables (Equation 2). In following their concept, the difference between LBP appraisal estimates and actual market transaction price (i.e. ΔV) was employed as the dependent variable, rather than using either appraisal estimates or land transaction prices as largely used in the current literature review. In doing so, the OLS results were able to directly reflect the variables and dynamics underpinning the valuation differentials.

$$\Delta V = \alpha + \beta_i \ln X_i + \varepsilon = \frac{\text{LBP appraisal} - \text{transaction price}}{\text{transaction price}} \times 100\% \tag{2}$$

Where $\ln X$ denotes the vector of independent variables in log form; i represents the number of independent variables; βs the regression coefficients and ε the error term.

4. Empirical results and discussion

4.1 Step 1 – Correlation analysis

Correlation analysis among selected variables in the industrial sector was conducted to determine the market dynamics underpinning the transaction prices and LBP appraisal-based estimates (Table 4). LBP estimates exhibit a highly statistically significant association with land transaction price (LTP, $r = 0.804^{**}$), indicating a close relationship between two price variables with the government-imposed LBP having a positive association with the market transaction price. LG imposes different influences on transaction-based price and valuation-based estimates. The result demonstrates an insignificant association with transaction-based prices (0.039), in contrast to a significant negative impact on LBP estimates (−0.413**), demonstrating a varying market dynamic. Indeed, as discussed in the literature review of this paper, LGs serve as the foundation in the LBP approach where the lower the LGs (closer to the central area), the higher the LBP. This negative impact of LGs, however, is not necessarily found in the market transactions. This shows that the determination of land transaction prices in an open market does not rely on the formation of LGs, indicating a concerning bid–rent curve theory usage as the basis of LG value in the LBP method. Likewise, FAR illustrates no significant influences (0.046) on transaction-based prices, yet a

Table 4.
Correlation results for industrial land market

	ln(LTP)	ln(LBP)	LG	ln(FAR)	ln(CLA)	ln(CA)	ln(IR)	ln(UF)	ln(FDI)	ln(CBD)
ln(LTP)	1	0.804**	0.039	0.046	0.885**	0.066	−0.173**	0.186**	0.142**	0.100*
ln(LBP)		1	−0.413**	0.148**	0.840**	−0.133**	−0.104*	0.005	0.070	−0.094*
LG			1	0.100*	−0.019	0.274**	−0.266**	0.395**	0.021	0.263**
ln(FAR)				1	−0.001	−0.226**	−0.260**	0.287**	0.160**	0.045
ln(CLA)					1	0.118*	−0.102*	−0.001	0.106*	0.047
ln(CA)						1	0.048	−0.253**	−0.077	0.156**
ln(IR)							1	−0.619**	−0.364**	−0.009
ln(UF)								1	0.375**	0.156**
ln(FDI)									1	0.095*
ln(CBD)										1

Note(s): ** Denotes correlation is significant at the 0.01 level; and * at the 0.05 level positive association with LBP-based estimates (0.148**), showing another inconsistency between the market price and valuation estimates construction.

Regarding land size, area for building construction (CLA) is statistically significant to both transaction (0.885**) and LBP-based price (0.840**), demonstrating a larger building area promotes demand for competition and leading to a higher transaction price as well as valuation. Area for compensation (CA), on the other hand, albeit insignificant, is positively correlated with transaction prices (0.066), yet negatively with LBP estimates (−0.133**). This indicates that a parcel of land with more area for public amenities would have a marginal impact on transaction price. This increased market transaction price can be explained by the consideration of environmental impact of an industrial development over the long term, showing a realisation from developers that sustainable industrial development starts to shape the transaction price by minimising the ecological footprint and enhancing social amenities. In contrast, however, the corresponding appraisal price would decrease, given that the formula gives less consideration to the environmental impact, but rather focusses more on how the size of construction land area would impact on the appraisals. This inconsistency of the influence from CA on the market transaction and valuation estimates suggests that the formula-driven LBP method largely focusses on the indicators that can be expressed in numbers, whereas those non-numerically expressed influencing factors such as environmental impact are much less considered.

All three social-economic indicators (IR, urban fixed-asset investment and FDI in real estate) are evidenced to be statistically significant to market transaction price, illustrating the interaction between economy and the real estate market. An increasing IR normally triggers a reduced volume of transactions and hence leads to lower level of land transaction price (−0.173**), as the developers are under financial pressure to sell the development portfolios. The positive coefficients from investment market (0.186** and 0.142**) increase the transaction price, which is not surprising given the government depends on the industrial development as a powerful strategy to attract investment in competition with surrounding cities and to accumulate fiscal revenue. The economic impact, however, does not exert strong influence on valuation, indicating that the LBP method is ill-suited to reflect wider financial market dynamics.

Finally, distance to CBD displays conflicting correlations, evidenced by a positive parameter in transaction-based price (0.100*) and negative in valuation (−0.094*). Specifically, moving further away from the CBD increases land transaction price, due to the larger land area accessibility in urban fringe area for industrial development. In contrast, a decreased appraisal estimate is obtained, given that the urban fringe area is allocated with a lower LBP and hence a lower valuation. The results demonstrate the conflict that land transaction prices are higher in the urban fringe as it is in high demand, but this is not reflected in the LBP as the approach works on the principle that being close to the central core is optimal. The finding suggests that an LBP constructed on a bid–rent curve basis is not applicable to appraise transaction prices for the industrial market. As a result, the industrial land in the central core should be considered as less desirable to push up the LBP for LGs located in the urban fringe to reflect its demand.

4.2 Step 2 – Valuation accuracy analysis

The margin of error between LBP estimates and actual transaction prices was calculated from 2010 to 2017 (Table 5). An overall positive valuation differential is demonstrated in industrial land market, with LBP estimates substantially exceeding the market transactions by nearly 45%, intensifying the valuation accuracy concerns in using the LBP method. Before the LBP got updated in 2014, less than a quarter of the appraisals (16%, 24%, 16% and 16%) are within the accepted margin of error of ±20% in each year, with the majority (60%, 60%, 56% and 61%) of observations lying outside the bracket of ±40% from 2010 to 2013. In

Table 5.
Frequency table of margin of error industrial Market, 2010–2017

			Frequency					
Year	N	±5% (inc)	±5%–±10% (inc)	±10%–±15% (inc)	±15%–±20% (inc)	Sum within ±[illegible]	±20%–±30% (inc)	±30%–±40% (inc)	> ±40%
2010	89	9 (10%)	1 (1%)	3 (3%)	1 (1%)	16%	15 (17%)	7 (8%)	53 (60%)
2011	117	8 (7%)	10 (9%)	5 (4%)	5 (4%)	24%	14 (12%)	5 (4%)	70 (60%)
2012	89	7 (8%)	1 (1%)	3 (3%)	3 (3%)	16%	9 (10%)	16 (18%)	50 (56%)
2013	80	5 (6%)	3 (4%)	4 (5%)	1 (1%)	16%	7 (9%)	11 (14%)	49 (61%)
2014	37	5 (14%)	7 (19%)	2 (5%)	1 (3%)	41%	3 (8%)	6 (16%)	13 (35%)
2015	23	12 (52%)	1 (4%)	2 (9%)	1 (4%)	70%	3 (13%)	3 (13%)	1 (4%)
2016	13	1 (8%)	4 (31%)	1 (8%)	–	46%	–	6 (46%)	1 (8%)
2017	9	1 (11%)	–	1 (11%)	4 (44%)	67%	–	1 (11%)	2 (22%)
Average diff.	44 [illegible]								

AQ: 9

contrast, a distinct improvement of valuation accuracy can be observed after the update of LBP, where the range of appraisals falling within the ±20% bracket increases by 25% from 16% in 2013 to 41% in 2014. If viewed in an alternative way, however, there are only two years, namely 2015 (70%) and 2017 (67%) which demonstrate more appraisals falling within the acceptable ±20% bracket than outside it. In other words, use of the LBP method alone appears to result in poor overall accuracy compared to the recorded transaction price, although the update of LBP in 2014 shows some improvement in land appraisals. Moreover, the annual differentials falling outside the accuracy band of ±20% further confirm that the price adjustment via the land price index does not appear effective, given that the index should help reduce the impact of less frequent LBP updates.

T6 Having identified the substantial valuation discrepancy, Table 6 generates an OLS model to capture the variables contributing to the differentials. Overall, the model demonstrates that the variables return a statistically significant F-test. The R^2 value shows that 66% of the observed variation can be explained in industrial market. The fixed effect (43.967**) is indicative of a degree of a positive valuation differential, further confirming the result where LBP estimates are considerably above market transaction price.

Variables including LG (−0.512**), CA (−0.052**), IR (−2.467**) and urban fixed-asset investment (−4.295**) have a negative impact on valuation differentials. Specifically, LG is significant in explaining ΔV, due to its importance in land appraisal process. A lower grade (closer to central) is evidenced to increase valuation differentials. This is because more valuation uncertainty would be encountered when it comes to central core area, with a reduced amount of development and fewer transactions, which weakens the information accessibility. This further justifies the findings made earlier about the inappropriate view to regard the core central area as the optimal location for the industrial land market. In addition, a decreased IR promotes market demand, leading to larger valuation differences with a higher level of competition. Likewise, a drop in interest from an investment perspective (urban fixed-asset investment) would lead to a reduced amount of land supply, which in turn increases valuation differences. A pitfall is, therefore, shown that LBP is a highly idealised and conceptualised mass pricing model, with the formula-driven LBP method producing less accurate appraisals in markets with more fluctuation and uncertainty, given the method is unable to reflect the market mechanism of supply and demand changes. In contrast, the remaining variables of FAR (1.293**) and CLA (0.192**) show a positive effect, which act to exacerbate the valuation differentials. Both variables are indicative of a degree of land complexity. A higher level of valuation margin of error is observed in a complex valuation assignment with a higher FAR and a larger CLA.

The empirical results suggest that the urban bid–rent curve theory is not applicable to LBP in industrial land market because land transaction price does not demonstrate a diminishing effect with greater distance from CBD. In order to align the market dynamics to become more consistent with the transaction and appraisal-based prices, this paper flipped
T7 the LGs together with their associated LBP [6]. Evidenced by Table 7, after LG reallocation, the dynamics underpinning the LBP appraisals change significantly in terms of the coefficient signs and their associated significance. LG still shows a negative impact on LBP estimates (−0.392**), this indicates that the lower the LGs, now located further away from the central area, the higher the appraisal, reflecting the corrected demand in the urban fringe area for industrial land. Likewise, distance to CBD becomes positive in influencing LBP appraisals (0.026), further confirming the demand in urban fringe rather than the central area. Moreover, the rest of the variables, such as FAR, CLA, CA, IR, UF and FDI, are found to have same impact on transaction and appraisal-based prices in terms of the same direction of the coefficient signs, with social-economic indicators, specifically, starting to show significance in explaining LBP appraisals. These indicate that the amended LGs assist a more consistent market dynamic in forming open market transaction prices and appraisal construction.

		Dependent variable ΔV	
Multiple R		0.813	
R^2		0.660	
Adjusted R^2		0.654	
Std error of the estimate		0.934	
F test		107.94**	
Independent variables (Unstandardised)		**Estimated parameters Coe**	**Sig.**
(Constant)		43.967	**
Land indicators			
LG	(Land Grade)	−0.512	**
lnFAR	(FAR)	1.293	**
LnCLA	(Constructed Land Area)	0.192	**
lnCA	(Compensation Area)	−0.052	**
Economic indicators			
LnIR	(Interest Rate)	−2.467	**
lnUF	(Urban Fixed-Assets Inv.)	−4.295	**
lnFDIRE	(FDI in Real Estate)	−0.004	
Locational indicator			
lnCBD	(Distance to CBD)	−0.065	

Table 6. Regression model for valuation differentials in industrial market

AQ: 10

The correlation between transaction price (LTP) and LBP appraisals, however, drops from 0.804** to 0.245**, demonstrating a reduced relationship between two prices. This is because valuation accuracy adversely decreases given that most land transactions are reallocated with a higher LBP after the amended LGs, hence widening the valuation differentials. The results suggest that while the flipped LBP helped reflect the market dynamics, the LBP land value in each LG remains too high and needs to be reconsidered by the government. In this respect, for appraisals to fall within the accepted margin of error of ±20%, a sensitivity analysis (Table 8) was carried out to trial the adjustments needed to the LBP in each flipped LG. Given the limited transactions, the majority of transactions were clustered in the flipped LGs of 4, 5 and 6; hence this was the focus of the analysis. T8

A 5% reduction was applied to the flipped LBP value to test when the valuation differentials of each LG would fall within the ±20% accuracy bands. The results indicate that the valuation differentials would improve by around 17% each time a sensitised 5% LBP drop was applied in LG4, with 13% improvement in LG5 and 9% improvement in LG6. When the margin of valuation differentials got close to ±20%, a one percentage and, if necessary, 0.5% reduction of LBP value was applied. As a result, if adjustments were made to bridge the gap between the LBP appraisals and the market transaction prices, the flipped LG 4 shall be reallocated with amended LBP to around 1,410 RMB/m^2 (dropped by 63.5%) to fit in within +20% accuracy band [7]. Likewise, flipped LG 5 is expected to downwardly adjust to approximately 1,265 RMB/m^2 (52.5%), with grade 6 adjusting to 1,270 RMB/m^2 (33%). The amended LBP of grades 5 and 6, nevertheless, does not illustrate a distinct price gradient, which further brings up the concern for the land authorities on the necessity of LGs as the foundation in LBP system.

In summary, the empirical analysis of this paper demonstrates that for future LBP updates, it is not just about simply changing the homogeneous price in each LG, as the current

	ln(LTP)	ln(LBP)	LG	ln(FAR)	ln(CLA)	ln(CA)	ln(IR)	ln(UF)	ln(FDI)	ln(CBD)
ln(LTP)	1	0.245**	0.014	0.046	0.885**	0.066	−0.173**	0.186**	0.142**	0.100*
ln(LBP)		1	−0.392**	0.128**	0.151**	0.062	−0.225*	0.251**	0.105*	0.026
LG			1	0.013	0.073	−0.174**	−0.063	−0.031	−0.041	−0.096*
ln(FAR)				1	−0.001	−0.226**	−0.260**	0.287**	0.160**	0.045
ln(CLA)					1	0.118*	−0.102*	−0.001	0.106*	0.047
ln(CA)						1	0.048	−0.253**	−0.077	0.156**
ln(IR)							1	−0.619**	−0.364**	−0.009
ln(UF)								1	0.375**	0.156**
ln(FDI)									1	0.095*
ln(CBD)										1

Table 7.
Correlation results for industrial land market after land grades reallocation

AQ: 11

Flipped LG 4				Flipped LG 5				Flipped LG 6		
Sensitised LBP (RMB/m^2)			Diff. (%)	Sensitised LBP (RMB/m^2)			Diff. (%)	Sensitised LBP (RMB/m^2)		Diff. (%)
5% drop	1% drop	0.5% drop		5% drop	1% drop	0.5% drop		5% drop	1% drop	
3,870			235.3%	2,670			152.3%	1,870		78.7%
3,676			218.4%	2,536			139.7%	1,776		69.7%
3,483			201.5%	2,403			127.1%	1,683		60.7%
3,289			184.5%	2,269			114.5%	1,589		51.6%
3,096			167.6%	2,136			101.9%	1,496		42.6%
2,902			150.7%	2,002			89.3%	1,402		33.6%
2,709			133.7%	1,869			76.7%	1,309		24.6%
2,515			116.8%	1,735			64.1%		1,290	22.8%
2,322			99.9%	1,602			51.5%		1,271	20.9%
2,128			82.9%	1,468			38.9%		1,253	19.2%
1,935			66.0%	1,335			26.2%		1,234	17.4%
1,741			49.1%		1,308		23.7%	1,215		15.6%
1,548			32.1%		1,282		21.2%	1,122		6.5%
	1,509		28.8%			1,268	19.9%	1,028		−2.5%
	1,471		25.4%		1,254		18.7%	935		−11.5%
	1,431		22.0%		1,228		16.6%	841		−20.5%
		1,412	20.3%	1,201			13.6%			
	1,393		18.6%	1,068			1.0%			
1,354			15.2%	935			−11.6%			
1,161			−1.7%		908		−14.1%			
967			−18.7%		881		−16.6%			
		948	−20.4%		854		−19.1%			
						841	−20.4%			

Table 8.
Sensitivity analysis for amended LBP

LBP method shows a clear flaw given that the construction of LBP follows urban bid curve theory, whereas the land transaction prices do not. The inconsistency of price gradients would inevitably increase the magnitude of appraisal-transaction differentials. Furthermore, even if the mechanism of LGs changed, the analysis of this paper raises the question on whether it is necessary for authorities to create such grades. First, the reassessment of LGs as a result of fast urban expansion and regional growth can be time-consuming which leads to delays in the LBP updates. Second, varying boundaries and divisions of LGs in each LBP update make both LGs and LBP non-comparable to each other, resulting in an inconsistent historical market data approach despite the efforts and time the government devote to making such a benchmark price. Third, urban land price gradients should reflect the changing equilibrium of market demand and supply. The current government's view on dividing industrial land homogeneous areas inevitably violates market mechanisms, resulting in the distortion in the appraisals. As a result, this paper recommends for government and land authorities to consider a more market-orientated division of land, where the assessment of LGs in the industrial market is ideally based on automated valuation models that more accurately reflect the market transaction price, rather than bid–rent curve behaviour judged on the distance from the CBD.

5. Conclusion

This paper is an extension of previous valuation accuracy studies on the real estate market, focussing from a developing country's perspective using the LBP method. The findings derived from this paper can serve as a reliable lesson for the rest of the Chinese cities and other emerging countries, if considering adopting or currently practising land benchmark valuation due to the limited market information and potential market distortions it can exhibit.

A primary finding of this work identifies the controversial role of LGs as the fundamental basis of LBP method. The urban land transaction price in the industrial market is found not to follow the urban bid curve theory, which the construction of LGs and associated LBP are based upon. The conflicting pricing mechanism inevitably brings distortion and leads to a significant discrepancy in appraisal estimates. The varying dynamics in explaining transaction and appraisal-based prices are further evidenced in the correlation analysis where the LBP method fails to take account of the wider social economy for the appraisal construction. Instead, the method puts an emphasis on the LGs and FAR, which exert little influence on the market transaction price. Furthermore, the LBP method gives a higher importance and hence larger weighting on the indicators that can be expressed in a numerical way, whereas those non-numeric influencing factors such as environmental impact are much less considered. The inconsistency of varying dynamics between transaction-based price and LBP appraisal-based price causes a disparity between how an open market and the government respond to aspects such as economic development and green space within their price constructs, leading to valuation inaccuracy using LBP.

By breaking down the valuation discrepancy in each year, this paper illustrates that the update of the LBP in 2014 improves the land valuation accuracy. However, the percentage falling within the accepted margin of error of ±20% is still moderate compared to developed countries. As a result, practising valuers need to be aware that the appraisals undertaken by LBP method may substantially deviate from the market transaction prices. It is, therefore, suggested that the LBP method should be utilised alongside either the comparison method or as part of a wider automated valuation model approach to ensure that a higher proportion of valuations can fall within the ±20% accuracy margin.

By adopting the OLS method, this paper captures the variables that contribute to the valuation differentials between LBP estimates and market transaction price. The OLS model confirms the importance of the land-related, social-economic and locational indicators on the valuation accuracy performance. A further key finding derived from this work focusses on the distortions between the valuation practices and formula-driven LBP. The work demonstrates that the LBP method is unable to reflect market supply and demand, which, consequently, affects valuation accuracy. As a highly idealised and conceptualised mass pricing model, LBP tends to function better with less complex valuations characterised by a low building density (FAR), which demonstrates its limitation in land valuation for areas such as Beijing with high density.

This paper argues that the LBP represents the market price from the past. It will inevitably create valuation differentials no matter how sophisticated an equation is applied. While the Chinese land market only has a three-decade history (post 1989) transitioning from the free allocation by the central government to a market-orientated system, LBP in this transitional period can still serve as a valid valuation method. Moreover, LBP will continue to be of great importance in areas where there is limited public data. The prescribed LBP method, however, is inherently unable to measure and represent market dynamics compared to internationally recognised valuation methods, which could affect developer/investor trust in the appraisals undertaken. The changes suggested by this paper to improve the valuation accuracy could compensate and overcome the accuracy problem to some degree. However, as the market gradually matures and market information progressively improves, this paper suggests LBP will probably be better served to represent historical market data rather than as a dedicated valuation method in the future. Both valuers and standard setters in China need to be aware of and react to the market distortions that over-reliance on the LBP approach could have. Furthermore, valuers need to rationalise their appraised values where possible with comparable market evidence to dilute the impact of LBP distortions, while standard setters need to evolve the LBP method to reflect LG changes and market maturity through more regular updates. AQ: 6

Notes

1. Produced by Ministry of Land and Resources.
2. Produced by Ministry of Housing and Urban-Rural Development.
3. Produced by Beijing Bureau of Land and Resources.
4. According to Land Price Monitor in China, there are at least 116 cities utilising the LBP to indicate land price.
5. Despite the stipulation of up to eight land grades in industrial market, the LBP in Beijing, however, was changed to 12 grades in 2014, due to the fast urbanisation pace of the city.
6. Lower land grades and their associated higher LBP now indicate locations further away from central core area.
7. Given the land for industrial is already overvalued to a large degree, the adjusted LBP value primarily considers the accuracy band of +20%.

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