Industrial land price between China's Pearl River Delta and Southeast Asian regions: Competition or Coopetition?

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Abstract

The planned economy system's previous form of industrial land market control in China has led to current market failure because of a large amount of industrial land being sold at a very low price, causing extensive overuse of land and negative effects on land management. As the "World Factory", the Pearl River Delta (PRD) is well known for its rapid urbanization largely driven by Foreign Direct Investment in labor intensive industries. A lowland price strategy has been commonly adopted by the local government in order to attract industrial investment. In the past decade, the PRD has increasingly faced the increasing competition from its neighboring competition from its neighboring countries in Southeast Asia that have established preference policies to attract FDI and foreign enterprises. Despite a growing body of literature on the internal forces of industrial land in China, little is known of the external forces involved except for the importance of FDI and the intensity of interregional competition between China and other countries in attempting to attract foreign investment. This research fills the knowledge gap by modelling the situation in the form of an international cooperative game model aimed at revealing the industrial land price formation mechanism between the Pearl River Delta region and Southeast Asian regions. The conditions of industrial land in the area and several Southeast Asian countries are first analyzed for their industrial land price movements in recent years. A game theoretic model is then built that exhibits similar characteristics. The result indicates that the governments' low land price strategy and the competition between the PRD and its neighboring countries have created unnecessarily high social and environmental costs Policy suggestions are made to encourage a more appropriate use of industrial land in China, the most important being the need for a mindset shift from industry competition towards coopetition between the China Pearl River Delta and Southeast Asian regions.

Keywords: Industrial land price; coopetition; external force; game theory model; China

Introduction

There has been a historic leap in industrialization in China since 1992, with its development being generally regarded as an important strategy for achieving higher economic growth (Zhang, 2006; Choy et al. 2013). The economic growth has been largely attributed to economic liberalization, monopoly and industry specialization, and foreign direct investment (FDI) (Xian and Wen, 2008). Of particular relevance are the considerable efforts made to attract investment (e.g. Luo and Lin, 2003; Qin et al., 2005; Wu, 2007). Numerous tax breaks, low-level premiums, preferential policies and start-up funds have been provided by local governments (Ling 2006). There is also a huge increase in the competition of investors between cities and regions (Qin et al., 2005; Wu et al., 2014). To attract more foreign investment, local governments have adjusted their premiums to leverage increased industrial areas, enabling the development of a considerable amount of extra urban land for construction and industrial use (Xiao, 2004). A low-price strategy has also been adopted in industrial land

development (Luo and Lin, 2003; Zhang, 2006). Another emphasis on industrial land development, particularly in special economic zones (SEZs), can be traced back to 1979, when the Central Committee of the Communist Party (CCCP) formally proposed establishing 'experimental' special economic zones on the south China coast, with the state carving out large tracts of coastal zone land for industrial use (Cartier, 2001). Since then, SEZs have gradually become symbols of nationalist reform ideology, which has brought about unplanned widespread 'copycats' of the special zone concept and actions (Yang, 1997) resulting in the proliferation of low-level industrial zones in China. For example, in the Su'nan area of Jiangsu, 70% of the 389 local settlements at the village and township level had their own 'small zones' [*xiaoqu*] by mid-1993 (Zhu and Sun, 1994). Of these, more than 1800 enterprises had utilized foreign investment (Cartier, 2001).

Industrial land use has therefore become one of the most dominant forms of land use in China today. Much of this originates from the transfer of designated rural land to urban status. This is quite a complex process in China, where all rural land is owned by the village collective (people), while all urban land is owned by the state. Rural land marked for industrial development must first be transferred to state ownership; whereupon the state sells the development rights to the private sector enterprises. The first transaction of a land use right in this way occurred in Shenzhen SEZ in 1987, which effectively brought about the marketization land transfers in China (Zhu, 1994). Following this event, land development became widely understood as a highly profitable channel throughout the country at all levels. However, this has resulted in a major imbalance between industrial land and other land, such as farmland for food production (Xiao, 2004; Hong et al., 2007), and many adverse consequences to the market and management of industrial land (e.g. Ling, 2006). The amount of agricultural land is decreasing overall and there is a growing concern over reduced national food supply (Wu et al., 2014). This problem is exacerbated by conversion of farmland to industrial land being a virtually irreversible process (Xiao, 2004). Moreover, together with the illegal use of land in some areas, there is an increasing amount of unused or wasteland (Xiao, 2004).

Establishing a cooperative inter-regional pricing mechanism offers a very important means of correcting the situation (Wu et al., 2014). This needs to take into account the fierce competition currently raging for international investment (Qin et al., 2005). Therefore, in the process of setting prices, there is also a need to consider the pricing strategies of neighboring countries (Ding, 2003). Currently, the threats to China's FDI are mainly from Southeast Asian countries, especially Vietnam, Thailand and Malaysia, which have a great potential for attracting international investment. International competition is increasingly having a significant impact on the price of industrial land in China.

Despite a growing body of literature on the internal forces of industrial land price, such as internal competition (Wu et al., 2014) and land property rights (Lai et al., 2014), little is known of the external forces involved except for the importance of foreign FDI and the intensity of interregional competition in attempting to attract foreign investment. There is also a lack of research into the application of quantitative methods and models to analyze the industrial land price mechanism in China. In response, this paper uses game theory - the study of mathematical models of conflict and cooperation between intelligent rational decision-makers - to reveal the industrial land price formation mechanism involved. This is applied to the example of the Pearl River Delta (PRD), where the process of urbanization and industrialization has been largely influenced by foreign capital and currently faces fierce competition from proximate Southeast Asian countries. The aim is to identify the external

driving forces of industrial land prices in the PRD in order to improve the effects of international competition on land prices and identify potential means for improving the industrial land price mechanism involved.

The paper proceeds as follows. Firstly, the key literature on industrial land price and game theories is reviewed. Both qualitative and quantitative research methods (e.g. mapping, description, statistics) are then used to study the external forces that impact on the industrial land price in the PRD and a game model is developed to analyze the competition between the PRD and Southeast Asian countries. The main findings of this analysis are finally presented and policy suggestions are made to encourage a mindset shift from being 'competitive' towards 'coopetitive' for both China PRD and Southeastern Asian regions in the future.

Literature review: industrial land price

As early as the beginning of the 20th century, Weber's (1929) in-depth research on industrial land provided the theory of industrial location in systematically elaborating the industrial and enterprise location problem. Later Ohlin's (1935) studies of the regional equilibrium of industrial land in the areas of trade and international trade from a trade perspective/theory were most influential in the analysis of multilateral markets. Early work also considered the price of industrial land space balance (Lind, 1973; Southey, 1974). Krugman's (1991) work on geography and trade also contributed to the theory of industrial localization, although focusing mainly on the analysis of labor, intermediate inputs and technical inputs, rather than on land issues. Other relevant work includes violence against farmers' interests (Peng Yi, 2004), the efficiency of industrial land (Xiong and Brown, 2000) and industrial land speculation (Wang and Huang, 2004).

In developed countries, there have been many empirical studies of industrial land prices and a variety of methods used. A popular approach is to analyze the urban industrial land price formation mechanism through data models. Canadian economists Capozza and Helsley (1989) have proposed a dynamic model of urban land prices to identify the driving forces of industrial land price changes. Goldberg and Chinloy (1984) carried out a series of system analyses on the demand for industrial types of land as well as urban land supply and price. They also developed a balanced model of the land market. Similarly, Brueckner and von Rabenau (1981) established a land price model to examine the spatial distribution rules and the impact of different investment conditions on industrial land prices in different cities. Zhu (2000) found that changes in labor and property prices in Singapore contribute indirectly to changes in industrial land prices and structure during a period of changes in the nature of the country's manufacturing industry due to their influence on production costs. In addition, the potential liability for contaminated land in the USA makes its sale difficult, driving down industrial real estate prices and increasing the amount of idle land (Sigman, 2009).

In China, the industrial land price mechanism has not received any academic interest until recent years, while the introduction of a land market in 2002 has led to land price increases all over the country. However, as reported in 2005, after years of high prices, industrial land prices have trended downward, with negative growth of industrial land prices in some cities (Ling, 2006). Transfer prices of industrial land in Nanjing and Hangzhou, for example, have steadily declined (Qin et al., 2005), while insufficient land supply and falling industrial land prices, with many plots selling at below cost prices, were reported in southern Jiangsu Province in 2006 (Ling, 2006). The same theme continued nationwide in 2007 and 2008, when Local Government industrial land was transferred mainly by agreement and with

competing prices even below the land transfer price. In this context, the total revenue from industrial land transactions could hardly be sufficient enough to maintain or change ‘raw land’ into ‘cultivated land’. The final land transaction price can therefore be formed with 0 plus/minus land values or even negative land values (Wu, 2007) and even negative land price premiums (Cao et al., 2005). The fall in price level is attributed to 'the old way' of land supply, in which cities compete to lower land prices in order to attract more foreign investment (Ling, 2006). Facing competition from other Chinese regions, the land transfer price of the Yangtze River Delta region, for example, had been low for some time (Qin et al., 2005). This has involved the establishment of economically developed regions, the provision of financial subsidies and tax breaks and a better investment environment.

There are a number of internal and external forces influencing the change of industrial land prices in China. In terms of internal forces, the supply and price of industrial land is determined by the rule makers (i.e. local governments) (Ling, 2006), with competition among local governments enlarging their "incentives variation" and "agent variation" to reduce price (Lin, 2005a) by using industrial land transfer agreements (Cao et al., 2005). Industrial agglomeration is also influential, being more significant in the China eastern region than the central and western regions (Wang et al., 2012). Similarly, the level of economic development, population density and transportation facilities are important (Qin et al., 2005; Wang et al., 2012); the urban land use differences in the socio-economic environment (Qin et al., 2005); industrial policies, aiming to make the city more attractive to investors (Qin et al., 2005); different location factors of land use and economic conditions leading to investor preference for each city (Qin et al., 2005); and incomplete property rights over collective land resulting in low industrial land prices (Lai et al., 2014).

Much less is known of the external forces involved except for the importance of FDI and the intensity of interregional competition in attempting to attract foreign investment (Wu, 2007; Wu et al., 2014). The economic development of the Yangtze Delta. for example, has in recent years ha been greatly influenced by such exogenous developments and foreign capital (Qin et al., 2005).

Most research into China's industrial land price mechanism focuses on the origins and issues of the government's low-price strategy. In the process of industrialization, industrial land needs are very great, which has intensified the contradiction between the supply and demand of China's land resources (Xiao, 2004). To aid this process, the government has adopted a low land price strategy intervention of cheap land transfer policies, which has had the effect of increasing the industrial land transfer area (Qin et al., 2005). However, this policy, together with efforts to attract investment, has been subject to considerable criticism of being an "imperfect system" (Ji-Wei, 2010) of industry land administration over the last decade. There has been an awareness of existing problems concerning the industrial land price mechanism (Ling, 2006), which is claimed to be causing a great deal of harm (Wu, 2005). These problems include low levels of construction investment (Ling, 2006) and extensive land use which in turn leads to a violation of farmers' interests through the expropriation of large amounts of cultivated land (Wu, 2007), and the growing problem of reduced food supply (Wu et al., 2014). The low-price strategy can also lead to the waste of industrial land and inefficient land use (Choy et al., 2013), as local governments sell excessive amounts of industrial land (Wong and Tang, 2005; Lin and Liu, 2008). Finally, this can cause industrial land to be permanently enclosed, occupied, abandoned and idle (Ling, 2006).

Game models for investigating the industrial land price mechanism

Various solutions and methods have been proposed to deal with the issues concerning industrial land development, ranging from a modified version of the current regulated system to advocating a free industrial land market. Lin and Liu (2008), for example, argue that raising prices could result in a dramatic rebound, although this would take some time and curb land supply. Recognizing the discrepancy between the supply and demand for land resources, Xiao (2004) point out that reinforcing the intensification of land utilization could achieve a dynamic equilibrium of industrial land. Jia et al. (2010), on the other hand, indicate that a new monitoring and regulation system for industrial land is required for land use supervision, while Qin et al. (2005) argue that there is a need for advancing the industrial land market, establishing a system of freedom of information, developing trans-regional territorial planning, improving the land management system and building a new land tax system. Through a comparison of industrial land selling and profit-oriented land selling, Liu and Liang (2006) suggest that the central government, as the owner and administrator of state-owned land, need to make full use of the price mechanism, the competition system and the supply and demand mechanism, to realize the greatest value of the land.

Such considerations have led to a closer examination of the rationality/objectivity of industrial land prices. Liu (2008) views the objectivity of lower levels of industrial land prices in China from the perspectives of industrial land use, economic performance, investment risk and regional competition; finding that the current government intervention approach, which emphasizes the spatial competition between different land uses, economic development and regional balance, largely determines the standard of industrial land prices. He also suggests that the subjective factors in the assessment of industrial land price could be overcome by applying scientific approaches and methods, including cost accounting of industrial land use, reduction in differential land revenue, industrial property renting and price stripping, as well as the current price amendment of public bidding, auction and listing for industrial land use. However, such a combination of market and planning strategies has received very little systematic research to date (Wu et al., 2014).

The use of game theory models offers a means of conducting such research. Game theory is the study of mathematical models of conflict and cooperation between intelligent rational decision-makers (Myerson, 1991), the basis of which was developed as long as 2,000 years ago in General Sun Tzu's military treatise The Art of War, containing a profound ideology for rational decision making in situations of conflict (Sunzi and Giles, 1910). Following some *ad hoc* work on minimax solutions to two-person games (e.g. Borel and Ville, 1938), the field was fully established as a unique discipline in Von Neumann and Morgenstern's (1944) Theory of Games and Economic Behavior, With John Nash's work on non-cooperative games and subsequent award of the Nobel Memorial Prize in Economic Sciences, game theory research entered its mature period of development, particularly in the last decade. Now it is well known that in a two-person-game, when one player’s strategy is given, whatever strategy the other side selects, each player can choose their own optimal strategy to achieve maximum utility. Nash equilibrium refers to the situation where there is a strategy balance such that, for each player, as long as other players do not change their tactics, they will not be able to improve each of their situation. In other words, provided someone else’s behavior is determined, the competitor can have the best strategy, and a stable equilibrium exists.

In quantitative studies, game theory is a common approach in research concerning land price

mechanisms. One manifestation of the preferential land policies in attracting investment is the Prisoner's Dilemma (e.g., Macmillan, 1974; Southgate and Runge, 1990; Wengert and Graham, 1977; Smith, 2013). For China, Qin et al. (2005) built up an empirical 'game among cities' model to describe the internal mechanism of industrial land price in the Yangtze River Delta region, believing that industrial land prices arise out of a game between the local governments. Following this, Wu (2007) used game analysis to establish that individually rational local governments pursue maximum interest in their own district. Therefore, when their benefits outweigh the costs initiated by cutting the land price, local governments would rather lower the price to attract investment. Most recently, Wu et al. (2014) use a centipede game model to explicate the driving forces as well as causes behind the burgeoning release of industrial land in Jinyun county in Zhejiang Province from the perspective of land transfer prices. They argue that, although the individual strategy of each local government is locally rational, the intensity of competition is such that the combined effect of all the local governments involved is non-rational. They also propose an alternative approach that aims to establish cooperative relationships between different regions in China to reduce the intensity of the competition. However, there is a lack of research into the application of game theories in studying the land price mechanism in the PRD, which has specific industrial development mechanisms and faces competition from adjacent Southeast Asian countries. This paper bridges that research gap by using game theories to reveal the industrial land price formation mechanism involved.

External driving forces for industrial land development in the PRD

The Pearl River Delta is located in South China and is in close proximity to Hong Kong and Macau (Figure 1). The zone is formed of the cities of Guangzhou, Shenzhen, Foshan, Zhuhai, Jiangmen, Zhongshan, Dongguan, four districts and counties of Huizhou and four districts and counties of Zhaoqing. Since the country's 'Opening and Reform' policy initiated in 1978, the PRD has become "the world's factory floor" and one of the most rapid economically dynamic regions in China. The industrialization of the Delta's regional economy has been fueled primarily by the dramatic expansion of its rural industry (Lin, 2001). Since 1980, the rural industry has recorded not only the highest growth rate but also the biggest proportional increase in total industrial production (ibid). This industry is mostly low-tech, small-scale and labor-intensive (Byrd and Lin, 1990; Ho, 1994), widely scattered in the countryside and has functioned as the most important absorber of surplus rural labor for the past 25 years.

<Insert Figure 1 here>

Both internal and external forces have been operating in the PRD to lead to this transformation (Sit and Yang, 1997). These include the household responsibility system that allows farmers to plan their crop mix and farm activities to be more aligned with market forces, and the establishment of township and village businesses to absorb excess rural labor, as well as the pursuit of foreign-investors. The rapid economic development and urbanization in the Delta is not a "trickle down" effect from the core of large cities but mainly a result of local initiatives and the active involvement of local authorities (Zhu, 1999). The Delta has been gradually transformed from an agricultural-dominated society to a major manufacturing center and one of the leading economic regions in China (Table 1). From 1982 to 2010, the population increased from 11.72 million to 55.94 million; the GDP increased from CNY 11.63 billion to CNY 3738.8 billion; and the urbanization level increased from 16.26% to 82.72%. During 1980-2012, the secondary industries' share comprised around 45%-50% of

local GDP. The primary industries' share of the local GDP decreased from 25.8% in 1980 to 2.1% in 2012, while that of tertiary industries increased from 28.9% to 51.7%. This suggests that the manufacturing industry has made a major contribution to the local economy in the past 20 years and the tertiary industries have played an increasingly important role in regional development.

<Insert Table 1 here>

As a major manufacturing center of the world, some industries in the region are playing a leading role. For instance, some categories of the toy industry in the PRD have a share in excess of 60% in world production, with other leading products including footwear, lighting fixtures and furniture (HKTDC, 2014). The manufacturing sector accounts for nearly two-thirds of the total actualized foreign investment into the Delta, followed by the tertiary sector which accounted for 37% in the 1990s (Sit and Yang, 1997). Investment in the manufacturing sector has favored small and medium-sized urban places where a large amount of cheap village (collective) land is available. For example, the share of foreign investment is over 90 per cent in all the Jiangmen, Huizhou, Dongguan, Zhaoqing, Zhongshan and Qingyuan manufacturing sectors (ibid). Conversely, the non-manufacturing sectors in the provincial capital Guangzhou and the Shenzhen and Zhuhai SEZs accounted for nearly one-quarter of their respective total foreign investments, while they were less than 10% in small and medium urban places (Statistical Yearbook of Guangdong Province, 2015).

External forces, especially foreign investment inflows, are major driving forces of urbanization in the PRD (Sit and Yang, 1997). In 2012, the Delta's utilized Foreign Direct Investment (FDI) stood at USD 21.5 billion, 19% of the national total; and foreign enterprises, most of which are Hong Kong based firms, accounted for 60% of Guangdong's total exports (HKTDC, 2014). Shenzhen, Dongguan and Guangzhou, which are in a close proximity to Hong Kong, were the three cities in the PRD that attracted the most FDI (ibid). FDI into the Delta is mainly characterized by small and medium-scale, labor-intensive, processing-types of manufacturing and trade-creative investment - mainly from Hong Kong, Macao and Taiwan. For instance, the objective of most Hong Kong-based firms investing in the Delta is the maximization of short-term profits in low-level, labor-intensive, industrial processing by exploiting the local labor and land factors (Sit and Yang, 1997). The total assets of industrial enterprises in the PRD are about CNY 6066 billion (Guangdong Statistical Yearbook, 2013). The assets of industries with funds from Hong Kong, Macao, Taiwan and foreign sources make up a large percentage of the total assets (Figure 2), the former being CNY 15 573 billion and the latter CNY 15 475 billion. The FDI interacts with internal forces, such as economic restructuring, rural industrialization, and the emergence of an export-oriented economy (Sit and Yang, 1997). It has also generated massive population immigration and led to several social and environmental issues. The FDI inflow and the newly created export-orientated industrialization and urban growth in the Delta are now subject to the vicissitudes of the world market.

<Insert Figure 2 here>

Compared with that of Yangtze River Delta, for example, and the national average, the comprehensive land price index of the PRD has been influenced more by international economic changes (China Land Surveying and Planning Institute, 2011). For instance, the comprehensive land price index was 146 in 2007, dropping to 136 in 2008 with the occurrence of the global financial crisis. In general, industrial land prices dramatically increased during 2000-2011, although they remain much lower than residential and

commercial land prices (Figure 3). An increase in industrial land prices and fierce competition from neighboring countries in Southeast Asia, together with many other internal factors (e.g. increases in labor costs), have forced a large number of factories to move out or plan to leave the PRD. A survey by the Hong Kong Industrial enterprises showed that 37.3% of the population of about 80,000 Hong Kong enterprises was planning to move all or part of their production capacity out of the Delta (Zhang, 2008). Although some enterprises have moved out of the PRD, laborintensive industries have still made up a large percentage of industries in the region (Wang, 2016). Among the manufacturing industry, there are only a few highend enterprises while the major ity is made up by lowend and laborintensive enterprises. These lowend enterprises are called sanlaiyibu enterprises that process raw materials on clients' demands or samples, assemble parts of the clients, or engage in compensation trade. These industries largely rely on cheap land and labors and cause severe environment prob lems (Sang, 2012). How to upgrade the laborintensive industries is currently a key issue for the sustainable transformation of the PRD. Attention should therefore be paid to external forces (particularly increasing competition from neighboring countries) that lead to changes in industrial land prices in the PRD.

<Insert Figure 3 here>

Competition between the PRD and neighboring countries in Southeast Asia

Close neighbor Vietnam has continually learned from the China experience of reform and opening up (Callick, 2007). In order to attract FDI, many investment incentives have been offered. For instance, foreign invested enterprises enjoy a 4-year corporate income tax exemption and a 50 percent tax reduction for the next nine years. By absorbing foreign investment, Vietnam has constantly improved its industries' modernization and upgrading of the industrial structure (Freeman, 2002). Another neighbor, Malaysia, takes advantage of stable political situation & booming economics and relatively cheaper labor cost. Most important of all, it is located in the heart of Southeast Asia, with easier access into the ASEAN market, the new bridge to the Middle East and Australia. All of the above will help in improving the investment environment and strengthening investment incentives (Jomo, 2013). Since 2010, the Malaysia government initiated the Economic Transformation Programme (ETP) under the "New Economic Mode" plan. In this context, they have gradually developed a relatively booming economic prospect, healthy and stable financial system, and smaller inflationary pressure in comparing with other Southeast Asian countries such as Thailand, Indonesia and Vietnam. Altogether 4000 companies from more than 50 countries use Malaysia as an overseas industrial base (PKF Malaysia, 2013).

A third neighbor, Thailand, is known as one of the "Tiger Cub Economies", and has attracted a great deal of foreign investment since the 1980s (Leftwich, 2007). Thailand was among the top 8 priority destinations for foreign investment during 2014-2016 (UNCTAD, 2014). For several years, Thailand has followed Washington Consensus policies toward FDI in order to attract foreign investors (Azarhoushang et al., 2015). There are many tax incentives, such as exemption or reduction of import duties on machinery and a 50 percent reduction of corporate income tax (BOI, 2015). The FDI have been the main drivers of the rapid growth in manufacturing industries in Thailand. The percentage of FDI stock in the total GDP of Thailand increased from about 10 percent in 1995 to more than 50 percent in 2014 (UNCTAD, 2015). Labor-intensive industries such as metal products and machinery are the top sectors receiving FDI (BOI, 2015). Due to domestic political turmoil, the economy has slowed down in recent years (World Bank, 2013). However, it has a solid industrial foundation and its

development trend cannot be underestimated.

<Insert Table 2 here>

In sum, China is increasingly facing competition from its neighboring countries in Southeast Asia that have established preference policies to attract FDI and foreign enterprises (particularly labor-intensive industries). In addition to tax incentives, industrial land price is another important factor that influences the flow of FDI in the PRD and its neighboring countries. Table 2 shows the average price of industrial land in the PRD in comparison with these three Southeast Asian countries. As can be seen, the PRD prices are considerably higher than the others, with Thailand the next highest thanks to its overall sales of industrial land and ancillary services sales. Vietnam and Malaysia are ranked lower, at less than 33% of PRD. Therefore, an increase in industrial land prices largely reduces the competitiveness of the PRD in terms of attracting labor-intensive industries that rely heavily on cheap land. As indicated by Zhang (2008), for instance, a considerable number of shoe factories were shut down in the PRD and moved to Thailand, Vietnam, Malaysia and other Southeast Asian countries where cheaper land is available.此处增加若干文章 discussion 处的内容，关于一带一路。

The similarity between China and Thailand, however, extends beyond their industrial land prices. Both nations have been proudly independent over the years. Thailand, for example, unlike all of its surrounding neighbors - Myanmar, Cambodia, Malaysia, Vietnam and Singapore - has never been formally colonized by China or European powers (Feeny, 1979). There is also a substantial Chinese presence in Thailand, with the Thai Chinese, those of significant Chinese heritage, being 14% of the population (West, 2009), while Thais with partial Chinese ancestry comprise up to 40% of the population (Luangthomkun, 2007). Moreover, as with China, in latter half of the twentieth century, the political and business leaders of Thailand also changed the country's economic structure from an agriculture-based economy to an industrial-based economy (Srivardhana and Cater, 2006). This has similarly resulted in a greater emphasis on industrial production and continued growth in FDI especially by car and chemical companies (Temple, 2004). Crucially, however, the Thai culture throughout history has always had many points in common with that of the Southeastern Chinese (Srivardhana and Cater, 2006), which makes the adoption of the PRD and Thailand of particular significance in the game model to follow.

Modeling

Model building

Assume that total investment is fixed and investors have to choose funding between recipients country *A* and country *B* who are players in the model. Investment is measured by output and intensive use of industrial land. As shown in Table 3, the land price strategies adopted by the two countries determine their investment and land use.

<Insert Table 3 here>

In order to quantify the model, the following specific assumptions are made (Zheng et al., 2012):

1. Under the normal premium in both countries, intensive land-use and land-transfer fees

simply compensate for the cost of construction work needed.

2. Suppose an investment project can generate an annual production value of G and the production life of the project is n, so that the output value in the project cycle is nG. The scale of the investment project is assumed large enough for it to be broken down for investment in several countries.
3. Suppose the investment attractiveness of country A and country B is determined by the comprehensive investment environment that embraces land price. Country A, with a better investment environment, can attract a major share, m, of investment. Under certain conditions, the two countries come to a balanced position: A:mG; B:$(n-m)G$, $n/2 \leq m \leq n$.
4. If country A and country B both lower their land prices, this causes a total land loss of L, which includes the direct price loss and the social costs caused by the low price.
5. If one country attempts to lower its price to attract investment, then part of the investment will be transferred to this country. Investment transfer coefficient k is a multiplier of the original investment. Due to the expansion of investment in a country, the land loss will also expand accordingly. Suppose when the investment transfer coefficient is k, country A will generate land loss of mL/n and country B will generate land loss of $(n-m)L/n$.

At this point, k meets the following conditions: $k>1$; $n-km>0$; $n-kn+km>0$. According to the above assumptions and game theoretic considerations, the earned value of the two governments includes output value and loss of low price (consisting of the direct price loss and the social costs caused by the low price) as shown in Table 4.

<Insert Table 4 here>

Next, we introduce a land loss coefficient w, and assume total land loss $L = nwG$. Assume that the annual production value G is a basic unit, namely G=1. The two countries' win matrices are therefore

$$A = \begin{pmatrix} m & n-kn+km \\ km-mw & m-mw \end{pmatrix} \quad (1a) \qquad B = \begin{pmatrix} n-m & (n-m)(k-w) \\ n-km & (n-m)(1-w) \end{pmatrix} \quad (1b)$$

Cooperative game theory model

Nash (1951) proved there is at least one balanced pair in any two-person finite zero-sum game so that, at this point, neither side can benefit from any unilateral change in strategy. Clearly, country A and B's decisions interact in the above model, but at least there is a balanced game.

If (1a) satisfies the condition $\begin{cases} m \geq km - mw \\ n - kn + km \geq m - mw \end{cases}$, strategy $A1$ is better than strategy $A2$ and hence strategy $A2$ is redundant. At this point, $w \geq k-1$. When (1b) satisfies the condition $\begin{cases} n-m \geq (n-m)(k-w) \\ n-km \geq (n-m)(1-w) \end{cases}$, strategy $B1$ is better than strategy $B2$, then strategy $B2$ is redundant. At this point, $w \geq \frac{(k-1)m}{n-m}$. In conclusion, when $w \geq \frac{(k-1)m}{n-m}$, a low price strategy is

needless for country A and country B. Similarly, when $w \le \frac{m-n+kn-km}{m}$, both of the countries will adopt the low price strategy.

When $\frac{m-n+kn-km}{m} \le w \le \frac{(k-1)m}{n-m}$, a mixed strategy is needed. Suppose country A has probability x of adopting strategy $A1$, and probability of 1-x of adopting strategy $A2$ ($x \in [0,1]$). Similarly, assume country B has probability y of adopting strategy $B1$, and probability 1-y of adopting strategy $B2$ (y$\in$[0,1]). Country A and B's strategy probability matrix α, β is therefore

$$\alpha = [x \ 1\text{-}x] \quad (2a) \qquad \beta = [y \ 1\text{-}y] \quad (2b)$$

with expected values, E_A and E_B, respectively of

$$E_A = \alpha A \beta^T = \left[(2m-2km+kn-n)y + (k-1+w)m + n(1-k)\right]x + (km-m)y + m - mw \quad (3a)$$

$$E_B = \alpha B \beta^T = \left[(n+2mk-nk-2m)x + nw + m(1-w-k)\right]y + \left[(k-1)x + 1 - w\right](n-m) \quad (3b)$$

To maximize expected value, country A will use the mixed strategy listed below:

$$x = \begin{cases} 0 & \frac{(k-1+w)m+n(1-k)}{n-kn+2km-2m} < y \le 1 \\ \text{any number between 0-1} & y = \frac{(k-1+w)m+n(1-k)}{n-kn+2km-2m} \\ 1 & 0 \le y < \frac{(k-1+w)m+n(1-k)}{n-kn+2km-2m} \end{cases} \quad (4a)$$

Equation (4a) implies three cases as follows.

(1) When $\frac{(k-1+w)m+n(1-k)}{n-kn+2km-2m} < y \le 1$ $\left[(2m-2km+kn-n)y + (k-1+w)m + n(1-k)\right] < 0$

In this condition, only "x=0" can ensure the value is maximum. This means that to make as large a value as possible, country A will ignore the normal price strategy, so that the probability of country A adopting a normal price strategy is zero.

(2) When $0 \le y \le \frac{(k-1+w)+n(1-k)}{n-kn+2km-2m}$, $\left[(2m-2km+kn-n)y + (k-1+w)m + n(1-k)\right] > 0$

In this condition, only "x=1" can ensure the value of be the maximum. Country A will therefore use a normal price strategy, so that the probability of country A adopting a normal price strategy is unity.

(3) When $y = \frac{(k-1+w)m+n(1-k)}{n-kn+2km-2m}$, $\left[(2m-2km+kn-n)y + (k-1+w)m + n(1-k)\right] = 0$.

The value of x has no effect on E_A, so country A can take any probability of x.

For country B:

$$0 \qquad 0 \le x < \frac{nw+m(1-w-k)}{nk+2m-n-2mk}$$

$$y=\begin{cases}\text{any number between 0-1} & x=\dfrac{nw+m(1-w-k)}{nk+2m-n-2mk}\\ 1 & \dfrac{nw+m(1-w-k)}{nk+2m-n-2mk}<x\leqslant 1\end{cases} \quad (4b)$$

Combining (4a) and (4b), we can obtain Fig. 4, from which the balanced decision in the game can be found. The solid line and dotted line in Fig. 1 respectively represent the mixed strategies of country *A* and country *B*.

<Insert Fig 4 here>

In Fig. 4, there are three intersections: (1) when $w \geq \dfrac{(k-1m)}{n-m}$, the balanced game is ($A1$,$B1$); (2) when $w \leq \dfrac{m-n+kn=km}{m}$, the balanced game is ($A2$,$B2$); and (3) when $\dfrac{m-n+kn-km}{m} \leq w \leq \dfrac{(k-1m)}{n-m}$, the probability balanced game is

$$[(x,1-x),(y,1-y)]=\left[\left(\frac{nw+m(1-w-k)}{nk+2m-n-2mk},1-\frac{nw+m(1-w-k)}{nk+2m-n-2mk}\right),\left(\frac{(k-1+w)m+n(1-k)}{n-kn+2km-2m},1-\frac{(k-1+w)m+n(1-k)}{n-kn+2km-2m}\right)\right]$$

Results: the PRD and Thailand

The above analysis shows that when *n*, *m* and *k* are fixed, the value of *w* determines the policies to be adopted by the local government. In the case of the PRD and Thailand, for example, assume that there is industrial land of 1.5*Mu* (1*Mu*≈666.67m2) that can produce US$130475 /year. An investigation of the resource endowments of the two regions indicates that *n*=15, with the PRD occupying a major share of the investment, *m*=8. The coefficient of land price loss consists of direct price loss and the social costs caused by low prices. If the normal price of the land is CNY 600 000 for 1Mu then, according to the data in Table 2, the price is merely CNY 250 000 /Mu, so the direct price loss of the land will be CNY 525 000. If w_2 is ignored, then w_1 =52.5/15/85=0.041. At this point, provided the investment transfer coefficient *k*>1.035, in other words, as long as the unilateral low price strategy can increase investment by 3.5% or more,

$$w=0.041<\frac{(k-1)m}{n-m}$$

Similarly, for the PRD, the direct price loss of the land will be 105000 RMB. If w_2 is ignored, then w_1 =10.5/15/85=0.008. At this point, provided the investment transfer coefficient *k*>1.008, in other words, as long as the unilateral low price strategy can increase investment by 0.8% or more, *w*=0.008<*k*-1.

Considering both conditions, when *k*>1.035, both of the regions will follow a low price strategy. According to the results of the model, the balanced game is ($A2$,$B2$), which means

both regions adopt a low price strategy.

In the above case, if the governments of Thailand and the PRD do not consider w_2, when n=15, k>1.035, then the balanced game will be (A2,B2), and both regions should adopt a low price strategy. Therefore, only by considering enough social cost can the local governments change the situation. Let w_2=4 w_1, w_1 of the PRD =10.5/15/85=0.008, then w= w_1 + w_2 =5 w_1 =0.040. At this point, assuming k=1.04, means that a unilateral low price policy can increase investment by 4%, then $\frac{m-n+kn-km}{m} = 0.035 < w < \frac{(k-1)m}{n-m} = 0.044$, the two regions will adopt a mixed strategy. The PRD and Thailand will follow a normal price strategy both with the probability of 100%. This suggests that, when k is determined, increasing the social cost of the region holding the major investment can push the players into changing to a mixed strategy.

Discussion

Over the years, there has been an increased Government requirement for economic development in China and this has been achieved mainly by the industrialization of land. For instance, it is well known that during the 2000s when China entered into the WTO, the role of industrial land, as the local government's most important 'weapon', played an indispensable role in the country's urban sprawl from its position as the "World factory" and 'China Manufacturing'. 'China Manufacturing' is also well known for its dominant advantage of low added value, small profit margins and cheap labor force although this is now being greatly challenged by Southeast Asia countries such as Thailand. One outcome of this is international competition being exaggerated by low industrial land price strategies. Local governments at each level monopolize the supply of construction land use in China and are responsible for the achievement of this indicator of economic development and, with the pressure to develop the local economy, they are inclined to maintain low land prices in order to attract industrial enterprise investment such as FDI. In addition, as a unitary state, the higher levels of government in China still greatly control the political careers of local government officials and place considerable political pressure on them through a strict evaluation system of their political achievements centering on economic development. This creates fierce competition between local governmental officials in pursuit of increased promotion opportunities and together has greatly reduced the price of industrial land in China.

Even though China's economic development has currently entered a transitional period and the central government emphasizes the concept of the "new normal", local governments still face daunting tasks on economic development. For example, in the report of 18th Communist Party Congress, President Jintao Hu proposed that China would achieve the goals of building a comprehensive well-off society by 2020 and doubling the 2010 gross domestic product (GDP) and per capital income of urban and rural residents. To achieve this, a 6.5% rate of economic growth needs to be maintained over the 2016 to 2020 period.

A current prevailing phenomenon is therefore the sharp contrast between the soaring residential land price and low industrial land price in China, with urban residents being usually crowded into 'birdcage' style apartments while industrial products are manufactured in garden-type-modernized plant. The price of land in Southeast Asian countries is also significantly lower than in the Pearl River Delta (PRD) region due to the low land price policy measures introduced by the Southeast Asian governments. To remedy the situation, one of the

best options for local governments is to optimally adjust the proportions of industrial land and residential land. Land is one of the world's natural resources and its optimal utilization should therefore follow Hoteling's rule, by which 'the net value of resources' price must remain unchanged across different time spans or, alternatively, 'the increase in price of natural resources should be equal to market profits' (Hotelling, 1990). Therefore, when the market fails, land use resource efficiency should be guaranteed with the assistance of state intervention. However, with the increase in cost of human resources, industrial competitiveness has further declined in China, which has created further pressure on supply mode adjustment of land use by local government.

Additionally, state intervention in land use resources is characterized by central government monopoly in China, which has resulted in exaggerated land use conflicts and the irrational expropriation, allocation, abuse and overuse of farmland without any fallow rotation. The Chinese 'race to competition' model can perhaps attract FDI opportunities and make China become the world's low and medium-end manufacturing center in the short term, with low land use efficiency and high energy and material consumption. However, this is at the expense of the high social cost of lower industrial land prices, a cheaper labor force and high environmental cost and inevitably creates a series of economic, social and environmental problems that may eventually deter investors. Moreover, the dual track land property rights and land supply system implemented by local government have also led to irregular market behavior and market alienation.

How, then, can this be avoided and reasonable international planning and governance guidance be provided to achieve international "win-win" development in the future? Two obvious possibilities are immediately apparent, which are to include the social costs involved in the industrial land pricing strategy; and to develop an international cooperation strategy:

Include social costs in the industrial land pricing strategy
In order to curb the negative effects of the low price strategy, it is necessary for governments to evaluate and consider all the consequential social costs caused by combining industrial transfer and upgrading. It is suggested that the central government monitor land prices directly and levy heavy fines on local governments that introduce low value-added, energy intensive or polluting industries. At this time, w is increased, so if $w = w1 + w2 \geq (k-1)m/(n-m)$, then the balanced game is (A1,B1) according to Fig.1 and both sides should choose a normal price policy. The implementation of normal pricing improves the threshold of the PRD's industry and drives out enterprises with low land use capability and weak competitiveness. This will facilitate the process of selecting the superior, and eliminating the inferior, strategy and promote the competitiveness of the PRD region.

International strategy: paradigm shift from 'competition' towards 'coopetition'
'Coopetition' has been denoted by strategic management scholars as a synthesis between the competitive and cooperative paradigm (Brandenburger and Nalebuff, 1996; Bengtsson and Kock, 2000; Gnyawali et al., 2008). Based on the core idea of the dynamic interplay between cooperation and competition, coopetition is considered a unique strategy that capitalizes on the benefits of collaboration and competition among firms (Chen, 2008; Gnyawali and Madhavan, 2001; Gnyawali and Park, 2011). This core idea could also be reflected at the national level that is driven by the mindset shift from being competitive towards coopetitive. The establishment of the European Union makes the specialization of production a great success. "*One example is Airbus, which makes parts of planes and assembles them in France, Germany, Spain, and the United Kingdom as well as in other countries. Huge sections of*

aircraft are loaded onto ships and planes, as places specialize in making different parts and producing them in scale. Countries in a region that was divided not so long ago now trade with former enemies to become an ever-more- integrated European Union (Quote from the World Development Report, 2009)". This has demonstrated a great reference for international coopetition strategy/policy design between China PRD and Southeast Asian regions (e.g., Thailand). In this context, governments from the Asian countries need to think about providing competitive specialized supply chain products rather than providing low land price strategies that may ultimately lead to vicious competition.

As can be seen, the Chinese economy is undergoing a phase of multi-contradiction. For example, economic development involves not only the adjustment of economic structure and transformation of the mode economic of development, but also maintaining stable economic growth, promoting employment and advancing industrial development. Additionally, it needs to both further promote the development of the real estate industry with a rapid process of urbanization and effectively control the risks associated with local land finance and the real estate market. Meanwhile, it also needs to expand domestic demand, while continuing to promote a Chinese export-oriented economy and attract FDI over a longer period. To resolve these contradictions effectively from a strategic perspective involves 1) increasing FDI and addressing the increasingly serious problem of excessive production capacity; and 2) further promoting development of the industrial chain and improving the industry structure and technological ability as a 'world factory".

Of relevance in this is the United States' Marshall Plan, implemented through the Foreign Assistance Act issued by the government in 1948 to cope with the excessive production capacity spurred in World War II and used to aid other countries. As a result, the United States saw an increase in FDI, with an estimated surge from 183 million dollars in 1946 to 786 million dollars, as statistical data has shown (Wood, 1986); representing a more a fourfold increase on FDI. This largely helped maintain a sustained boom of the post-war economy through the export of production capacity in the United States. In September and October 2013, the Chinese president Jinping Xi proposed the joint projects of the "Silk Road Economic Belt" and the "South Pacific in the 21st Century Maritime Silk Road" during his visits to the countries of Central and Southeast Asia. These two joint projects – together called "the Belt and Road" - are defined as the *China-based Marshall Plan* (Ferdinand, 2016) and will provide a better platform for achieving a win-win cooperation of economic development between China and Southeast Asia.

Developing countries around the Southeast Belt and Road have experienced slower economic growth in recent years. The construction of urban infrastructure in these countries has significantly lagged behind. Taking railway construction as an example, the ratio between the total railway mileage and national territory area is less than 1% in the majority of countries. In contrast, China has had salutary experiences in the field of infrastructure construction, the industries involved having been in a state of excessive production capacity. The production capacity of five of the largest of these industries - steel, cement, electrolytic aluminum, glass and shipping - has been below 80% (State Council, 2013). The consumption of excessive production capacity can curtail and reduce production in the domestic market, while also solving the problem by promoting investment in infrastructure construction overseas. Meanwhile, China has been facing an urgent demand for food, oil, gas and mineral resources due to its huge industrial system. It can facilitate complementarities with economic development in Southeast Asian countries and further achieve the win-win cooperation of economic development between China and Southeast Asia.

As is observed in previous findings, a 'win-win' result may occur when the governments involved use a "mixed industrial land price strategy". In doing this, two important conditional policy/rules/ laws are needed. First, the institutional constraints for both 'parties' need to be clearly stated to enable multigovernment participation in the industrial land price decision-making process. If one of the local governments decides to withdraw, the 'win-win' cooperative relationship will end accordingly. Secondly, the governments enter into a national level contract to create a shared Development Prioritized Zoning Planning Guideline. Guideline should provide legal power to protect regular development and cooperation initiatives occurring between the governments concerned. Given the opportunity for the diversified use of land resources, this may offer increased benefits in addition to relieving some of the current intense competition between the PRD region and Southeast Asia countries such as Thailand. For example, a rational land rent system between the PRD and Thailand could be established to avoid overly intense competition, improve industrial land use efficiency and hence correcting the existing land use imbalance hindering agricultural, ecological and construction land.

Conclusions

China's unprecedented economic growth over the last two decades is largely attributed to its increase in industrialization. A large part of this has been due to both domestic and foreign investment because of tax breaks, low-level premiums, preferential policies and start-up funds provided by local governments. This has resulted in fierce competition for investors between cities and regions, with local governments selling large amounts of cheap land for industrial development – causing severe problems in the form of a major imbalance between industrial land and other land, such as farmland for food production, an increasing amount of unused or waste land as well as adverse consequences to the market and management of industrial land. Simply raising prices is difficult due to international competition having a significant impact on the price of industrial land in China, with current threats to China's FDI being mainly Southeast Asian countries, especially Vietnam, Thailand and Malaysia, which have a great potential for attracting international investment. This paper addresses these issues for the first time by an equilibrium noncooperative game theoretic approach in modelling land price formation in the PRD region, where the process of urbanization and industrialization has been considerably influenced by foreign capital and currently faces fierce competition from proximate Southeast Asian countries. This is the paper's innovative contribution to the methodological challenges involved in this topic.

In applying the method to the important situation of China's Pearl River Delta, market failure is identified as the cause of the currently optimal 'stuck' low-pricing strategies of industrial land in China, where it benefits no one individual government seller to increase prices, and that some form of government intervention is needed. A potential solution for this situation is proposed for the central government to monitor land prices directly and levy heavy fines on local governments that introduce low value-added, energy intensive or polluting industries. The result of this is to change low pricing into a sub-optimal strategy and make the 'normal price' now optimal. This has the potential effect of raising the threshold of the PRD's industry, driving out enterprises with low land use capability and weak competitiveness and simultaneously promoting the competitiveness of the PRD region. An alternative, cooperative, solution is for the various competing governments involved to obtain a win-win situation by an agreed "mixed industrial" land price strategy through a formal partnership arrangement.

An increase of land price and market competition from Southeast Asian countries and other countries in the global South suggests that areas such the PRD are gradually losing their competitiveness to attract labor-intensive industries that heavily rely on cheap land. China in general is facing competition from global cities, not only Southeast Asian countries. A cooperative strategy between China and Thailand to increase/reduce land prices, therefore, may not be helpful. What can be done is to upgrade its industry, improve its investment environment and capture new opportunities (e.g. technological development) for new development, which is reflected by China's "One Belt, one Road" strategy. This will provide a better platform for achieving a winwin cooperation of economic development between China and Southeast Asia.. This is also an opportunity to gradually transform low-end industries into high-end industries. On the one hand, new policies can be established to support the upgrading of traditional manufacturing industries, such as household electronics, textiles and garments, food and beverages, and construction materials, so that they can compete with global brands (Asia Business Council, 2011).

On the other hand, integrated planning strategies should be made to promote the sustainable development of the region. These strategies can focus on improving the polluted environment, enhancing place quality and attracting more high-end industries, such as high-tech companies, green industries and innovative sectors. However, it is highly recommended that national/regional competition should be shifted towards 'coopetition'. For example, China PRD could initiate and establish a regional collaboration union with Southeast Asian regions. In this way, each of them can reframe and redesign the production positioning within their industrial park. A complementary effect rather than a 'substitution effect' could be cultivated to help each side (PRD and Southeast Asian regions) to play their key role as their own competitive advantages. Given this consideration, it is therefore advised to issue relevant incentive policy strategies at the above-mentioned regions to first set up strategic cooperative industry alliance and then encourage each side to promote different industry development foci not only upon the traditional industry but also high-tech industries. In this way, the 'coopetition' strategy could therefore be implemented and complemented in different regions.

Finally, worthy of mention is that, as is the case with game theoretic modelling in general, the main limitations are in the model's assumptions. In this case, the most significant of these are that the intensive land-use and land-transfer fees just compensate the cost of construction work needed under the normal premium; the scale of the investment project being large enough to be broken down for investment in several countries; and that countries lowering their land prices causes a total land loss which includes the direct price loss and the social costs caused by the low price. Of course, strict rationality is also assumed, as is the accuracy of measuring the variables involved, such as social costs. Future empirical research will investigate the sensitivity of these issues and the opportunity costs involved.

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References

Asia Business Council. 2011. Economic transformation of the Greater Pearl River Delta: Moving the value chain.

Azarhoushang, B., Masoumy, P. and Wu, J. P. 2015. FDI effects on industrial value-added: Evidence from Chinese and Thai government policies.

BOI. 2015. Foreign Direct Investment: Annually Statistics. http://www.boi.go.th/index.php?page=statistics_foreign_direct_investment

Bengtsson, M., Kock, S., 2000. "Coopetition" in business networks—to cooperate and compete simultaneously. Industrial Marketing Management 29 (5), 411-426.

Borel, E., Ville, J. 1938. Applications de la théorie des probabilités aux Jeux de Hasard. Gauthier-Vilars.

Brandenburger, A.M., Nalebuff, B.J., 1996. Co-opetition. Doubleday, New York.

Brueckner, J. K., & von Rabenau, B. (1981). Dynamics of land-use for a closed city. Regional Science and Urban Economics, 11(1), 1-17.

Callick, R, 2007. The China model: How long can economic freedom and political repression coexist? The American. November-December.

Cao, L., Qiu, D., Liu, L., 2005. Economic evaluation of industrial park land use. Journal of Southwest China Normal University (Natural Science Edition), 30 (1): 180-218.

Capozza, D.R., Helsley, R.W. 1989. The fundamentals of land prices and urban growth. Journal of Urban Economics, 26(3), 195-306.

Cartier, C. (2001). 'Zone Fever', the Arable Land Debate, and Real Estate Speculation: China's evolving land use regime and its geographical contradictions. Journal of Contemporary China, 10(28), 445-469.

Chen, M.J., 2008. Reconceptualizing the competition-cooperation relation- ship: a transparadox perspective. Journal of Management Inquiry 17 (4), 288–305.

Chen, H. P., Wu, Q. 2010. A review of researches on market-oriented allocation of industrial

China Land Surveying and Planning Institute. 2011. China land price index report 2011.

Choy, L. H., Lai, Y., Lok, W. 2013. Economic performance of industrial development on collective land in the urbanization process in China: Empirical evidence from Shenzhen. Habitat International, 40, 184-193.

Ding, C. 2003. Land policy reform in China: assessment and prospects. Land Use Policy 20(2),109-20.

Feeny, D. 1979. Competing hypotheses of underdevelopment: a Thai case study. The Journal of Economic History, 39(1), 113-127.

Freeman, N.J. 2002, September. Foreign direct investment in Vietnam: an overview. In United Kingdom Department for International Development workshop on globalization and poverty in Vietnam, Hanoi, 23-24 Sept.

Gnyawali, D.R., Madhavan, R., 2001. Cooperative networks and competitive dynam- ics: a structural embeddedness perspective. Academy of Management Review 26 (3), 431–445.

Gnyawali D.R., and Park B.J. (2011). "Coopetition between giants: collaboration with competitors for technological innovation", Research Policy, 40, 650-663

Goldberg, M. A., Chinloy, P. 1984. Urban land economics. New York: Wiley.

Guangzhou Statistical Bureau (2013). Guangdong Statistical Yearbook 2013. China Statistics Press.

HKTDC (2014) PRD economic profile. http://china-trade-research.hktdc.com/business-news/article/Fast-Facts/PRD-Economic-Profile/ff/en/1/1X000000/1X06BW84.htm
Hong, Y.M. 2007 Serious problems exist in the extensive utilization of industrial land in urban areas. Beijing Observation 9, 14 (in Chinese).
Hotelling, H. (1990). Stability in competition (pp. 50-63). Springer New York.
Ji-Wei, C.H.E.N. 2010. Tentative suggestion on developing countermeasure of intensive use of industry land in Shanghai. Shanghai Geology, 3, 009.
Jia, H.J., Huang X.J., Yu S.T., Wang G.H., Zheng Z.Q. 2010. Status of intensive use of industrial land in China and the countermeasures for improving it. China Land Science 24.9, 52-6 (in Chinese).
Jomo, K.S. (Ed.). 2013. Industrializing Malaysia: policy, performance, prospects. Routledge.
Krugman, P. R. 1991. Geography and trade. MIT press.
Lai, Y. N., Peng, Y., Li, B. and Lin, Y. L. 2014. Industrial land development in urban villages in China: a property rights perspective. Habitat International, 41, 185-194.
Leftwich, A. 2007. States of development: on the primacy of politics in development. Cambridge: Polity Press.
Li, J.J. 2005b. Analysis on distortion of local governments' economic behaviors in economic transition of China. China Industrial Economy, 1, 39-46.
Li, Y. 2005a. Institutional analysis of land use policies in China under the transition economy: with reference to rural to urban land conversion in Guangzhou. PhD thesis, Department of Building and Real Estate, The Hong Kong Polytechnic University.
Lin, G. C. S.. 2001. Metropolitan development in a transitional socialist economy: spatial restructuring in the Pearl River Delta, China. Urban Studies, 38(3), 383-406.
Lin, R.M., Liu, X.M. 2008. Mathematical and empirical research on industrial land in China. Journal of Finance and Economics, 7, 004.
Lind, R. C. 1973. Spatial equilibrium, the theory of rents, and the measurement of benefits from public programs. The Quarterly Journal of Economics, 87(2), 188-207.
Ling, G. 2006. Discussion on the way of the industrial land price reform in the new land manipulation background. Journal of Anhui Agricultural Sciences, 34(23), 6312.
Management of Land and Resources 04
Liu, T., Liang, L.T. 2006. Land for industrial use should be sold in a regular way-an enlightenment from sales of profit-oriented land. Scientific and Technological Management of Land and Resources, 3, 013.
Liu, W.D.Z. 2008. (College of Southeast Land Management, Zhejiang University, Hangzhou310029, China); Study on the rational determination of the standard of industrial land prices. Journal of Zhejiang University (Humanities and Social Sciences) 04
Luangthomkun, T. 2007. The Position of Non-Thai Languages in Thailand. Language, Nation and Development in Southeast Asia (ISEAS Publishing): 191.
Luo, Y.H. Lin, J. 2003. Excessive competition of investment for land in Suzhou, Kunshan Development Zone. Reform, 6,101-106.
McMillan, M. 1974. Open space preservation in developing areas: an alternative policy. Land Economics, 50(4), 410-418.
Myerson, R.B. 1991. Game theory: analysis of conflict, Harvard University Press.
Nash, J. 1951. Non-cooperative games. The Annals of Mathematics, 54(2), 286-295. Ohlin, B. 1935. Interregional and international trade.
PKF Malaysia 2009. Doing business in Malaysia.
Peng Yi. 2004 Industrial parks should pay close attention to the interests of land-lost farmers in China. China Science and Technology Forum, 20 (3): 43-4.
http://www.claytonmckervey.com/attach/doing-business-in-malaysia.pdf

Qin, X.L., Zhang, B., Huang, X.J., Pu, L.J. 2005. The formation mechanism and game analysis of industrial land price in Yangtze River Delta. China Land Science, 19(3), 44-48.
Sigman, H. 2009. Environmental liability and redevelopment of old industrial land (No. w15017). National Bureau of Economic Research.
Sit, V. F. S., Yang, C. 1997. Foreign-investment-induced Exo-urbanisation in the Pearl River Delta, China. Urban Studies, 34(4), 647-677.
Smith, S.M. 2013. Trust, repeated interactions, and user group disturbances in common property irrigation. http://extranet.isnie.org/uploads/isnie2013/smith1.pdf
Southey, C. 1974 Spatial rents, spatial competition, and efficiency. Canadian Journal of Economics 7(2): 260-272 .
Southgate, D.D., Runge, C.F. 1990. The institutional origins of deforestation in Latin America (No. 5). St. Paul, Minnesota, USA: Department of Agricultural and Applied Economics, University of Minnesota.
Srivardhana, T., Cater, J. J. (2006). Thailand: Southeast Asian tiger or historical underachiever. Journal of International Business Research, 5(2), 107.
Sunzi, Giles, L. 1910. Sun-Tzu on the Art of War. Wiretap.
Temple, P. 2004 (December, 18). Tigers stalked by the dragon: South-East Asian economics. The Financial Times, pp. 26.
UNCTAD. 2014. World Investment Report 2014. http://unctad.org/en/PublicationsLibrary/wir2014_overview_en.pdf
UNCTAD. 2015. Country Fact Sheets 2015: Thailand. http://unctad.org/sections/dite_dir/docs/wir2015/wir15_fs_th_en.pdf
Von Neumann, J., Morgenstern, O. 1944. Theory of games and economic behavior, Princeton University Press.
Wang, J. T., Cao, Q. F., Tian, S. Y. 2012. Industrial agglomeration, government intervention and industrial land prices: an empirical study on 35 cities in China. China Land, 9, 001.
Wang, H., Huang, Z. 2004. Public interest, the scope of land requisition and fair compensation. China Economic Quarterly Economics 4 (1): 249-262.
Weber, A. 1929. Alfred Weber's theory of the location of industries. The University of Chicago Press.
Wengert, N., Graham, T. 1977. Transferable development rights and land use control. Property Rights in Transition, 29(5), 227.
West, B.A. 2009. Encyclopedia of the Peoples of Asia and Oceania, Facts on File, p. 794, ISBN 1438119135
Wong, S.W., Tang B.S. 2005. Challenges to the sustainability of development zones: a case study of Guangzhou Development District, China. Cities 22(4), 303-16.
World Bank. 2013. World Bank East Asia and Pacific Economic Update 2011: Navigating turbulence, sustaining growth. World Bank Publications.
Wu, Y., Zhang, X., Skitmore, M., Song, Y., Hui, E. 2014. Industrial land price and its impact on urban growth: A Chinese case study. Land Use Policy 36, 199-209.
Wu, Y.Z. 2005. Low land price of industrial land be harmful [n]. China Land and Resources News, 2005-01-18 (5).
Wu, Y.Z. 2007. On regional equilibrium of industrial land price and management strategy based on game theory. Journal of Zhejiang University (Humanities and Social Sciences), 37(4), 124-133.
Xian, G., Wen, D. 2008. Center for Transnational Corporations of Nankai University; Foreign Openness, Dynamic Externalities and Regional Industrial Growth
Xiao-jun, D.O.N.G. 2004. A study of the dynamic equilibrium of industrial land. Scientific and Technological Management of Land and Resources, 1, 13-16.

Xiong, L,, Brown, L. 2000. Shanghai's industrial land use efficiency and layout [j]. IEEE Transactions on Town Planning 2 (2): 22-29.
Yang, D.L. Beyond Beijing: Liberalization and the Regions in China (London and New York: Routledge, 1997) , p. 57.
Zhang, C. Q. 2008. “Labour Contract Law” has triggered a domino effect: “The World’s Factory” has faced a painful transformation that factories have moved out the Pearl River Delta. Southern Metropolis Daily, AA16, 22 January 2008.
Zheng BB, Wu YZ, and Zhang XL,(2012) On the External Driving Force of Industrial land Prices in the Pearl River Delta: A Game Model Analysis,Proceedings of the 17th International Symposium on Advancement of Construction Management and Real Estate, Springer-Verlag Berlin Heidelberg, 281-289
Zhu, J. ‘Changing land policy and its impact on local growth: the experience of the Shenzhen special economic zone, China, in the 1980s’, Urban Studies 31(10), (1994), pp. 1611–1623.
Zhu, J. 2000. The impact of industrial land use policy on industrial change. Land Use Policy, 17(1), 21-28.

Table 1
PRD composition of GDP

	1980	2008	2012
Primary industries (%)	25.8	2.4	2.1
Secondary industries (%)	45.3	49.9	46.2
Tertiary industries (%)	28.9	47.7	51.7

Source: Guangzhou Statistical Bureau (2013)

Table 2

Comparison of 2011 industrial land price comparison in the PRD and three neighboring countries[1]

Country (region)	PRD	Vietnam	Thailand	Malaysia
Land price (RMB/m^2)	795	260	380	135

[1]Note：data for the PRD is obtained through from China Urban Land Price Monitoring http://www.landvalue.com.cn/, data for the Southeast Asian countries is obtained through http://www. vnone.vn/Industry/,http://www.ieat.go.th/ieat/map/info/status_cn.html, http://202.190.126.187/cn/

Table 3

Policy game of land price between the two countries

Country B's policies Country A's policies	B1(normal price)	B2(low price)
A1(normal price)	Both intensive land use No effects on investment	A: Intensive land use with a decrease in investment B: Extensive land use with an increase in investment
A2(low price)	A:Extensive land use with an increase in investment B: Intensive land use with a decrease in investment	Both extensive land use No effects on investment

Table 4

Policy game of land price between the two countries (indicated by parameter)

Country B's policies Country A's policies	B1(normal price)	B2(low price)
A1(normal price)	mG, (n-m)G	(n-kn+km)G, k(n-m)G-(n-m)L/n
A2(low price)	kmG-m L/n, (n-km)G	mG-mL/n,(n-m)G-(n-m)L/n

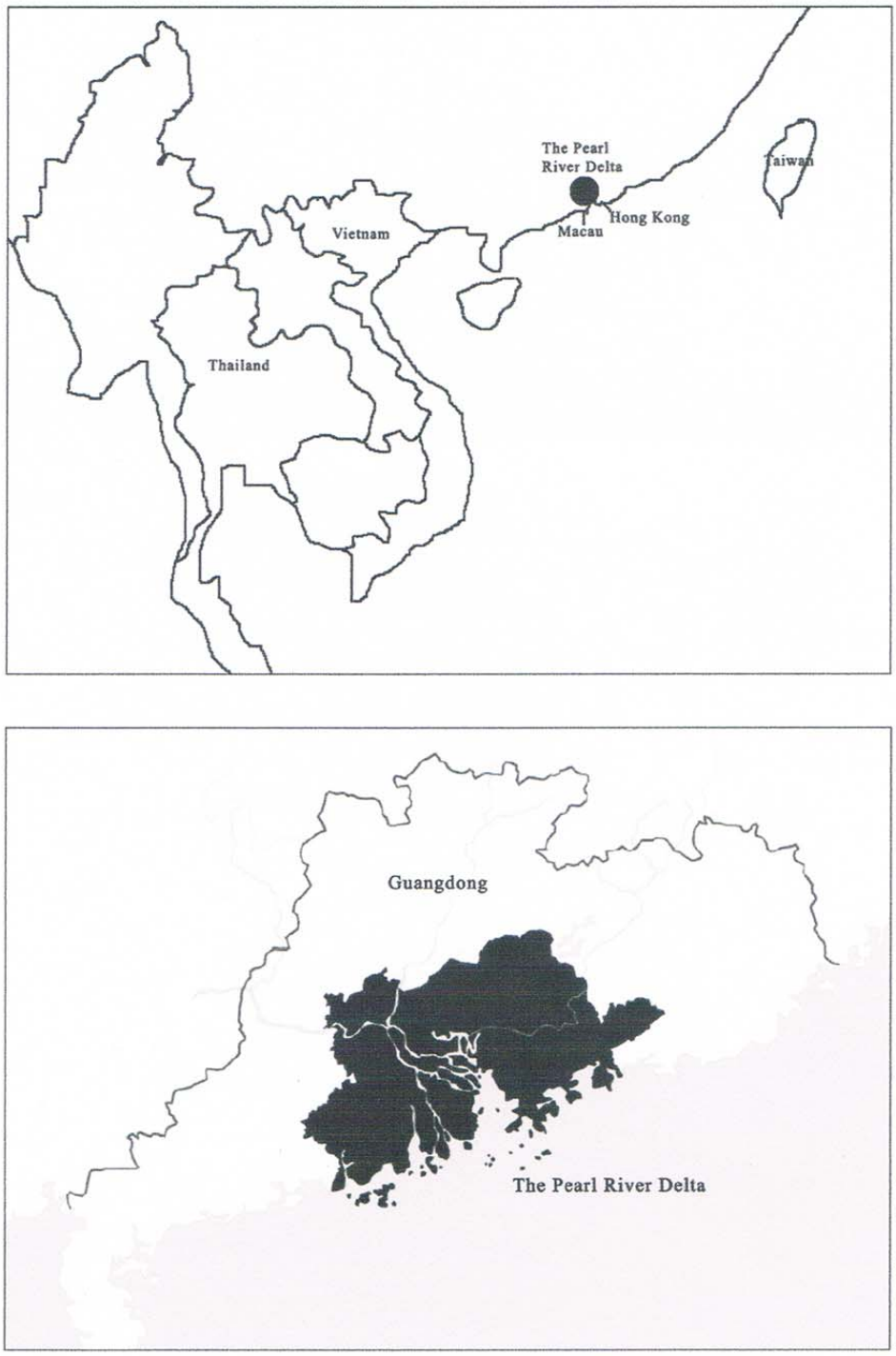

Fig. 1. The Pearl River Delta (source: authors' drawing)

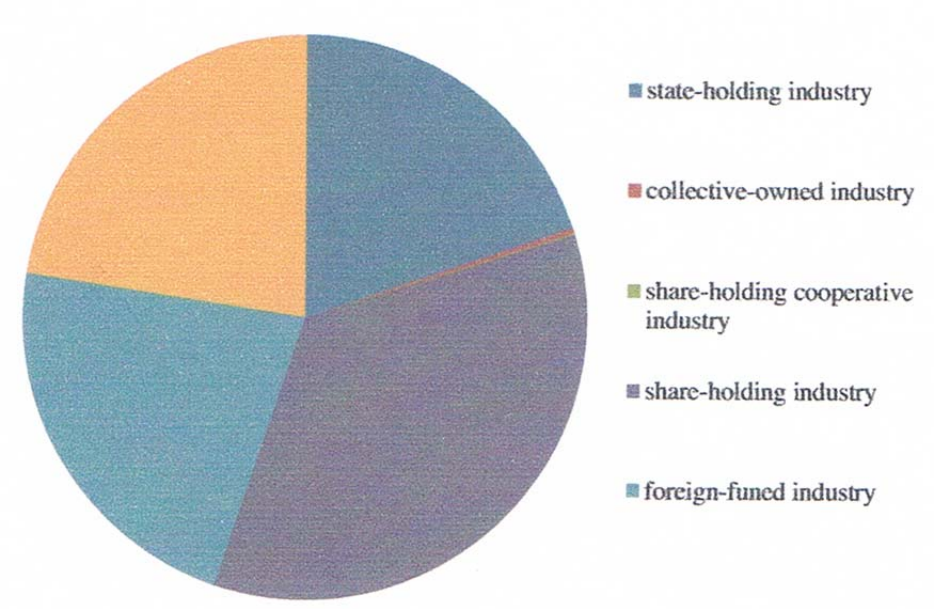

Fig. 2. Assets of industrial enterprises in the PRD

Source: Guangzhou Statistical Bureau (2013)

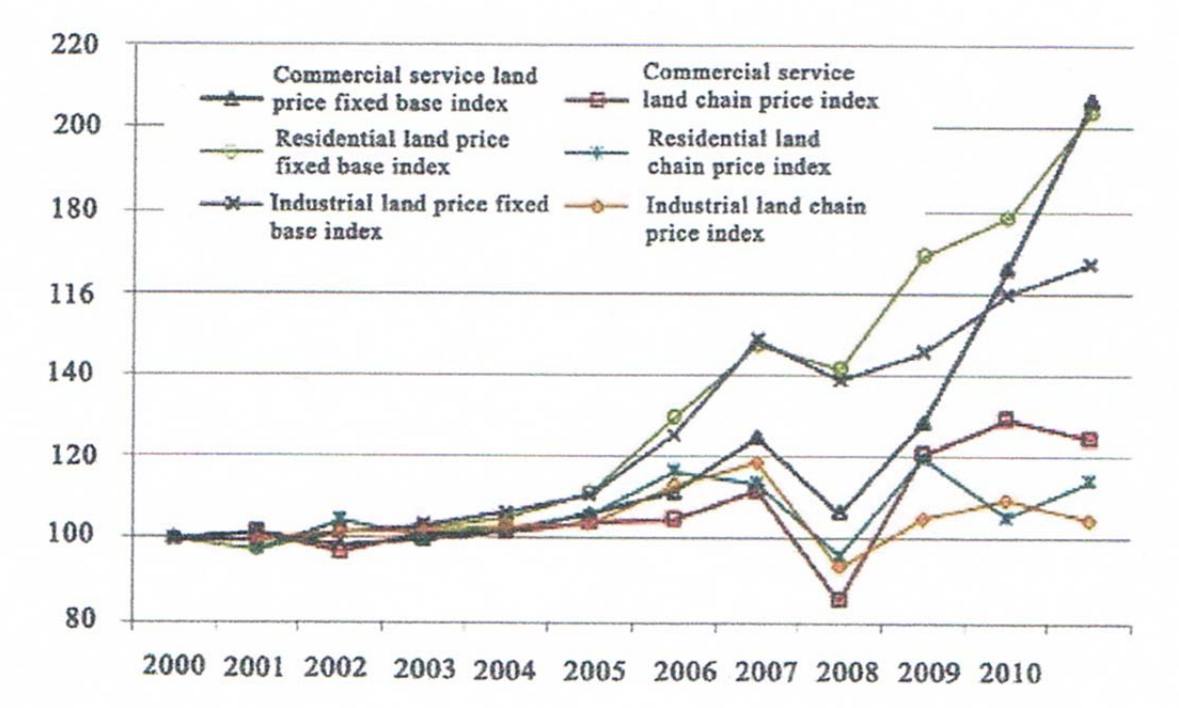

Fig. 3. The dynamics of land prices in the PRD during 2001-2011

Source: China Land Surveying and Planning Institute (2011)

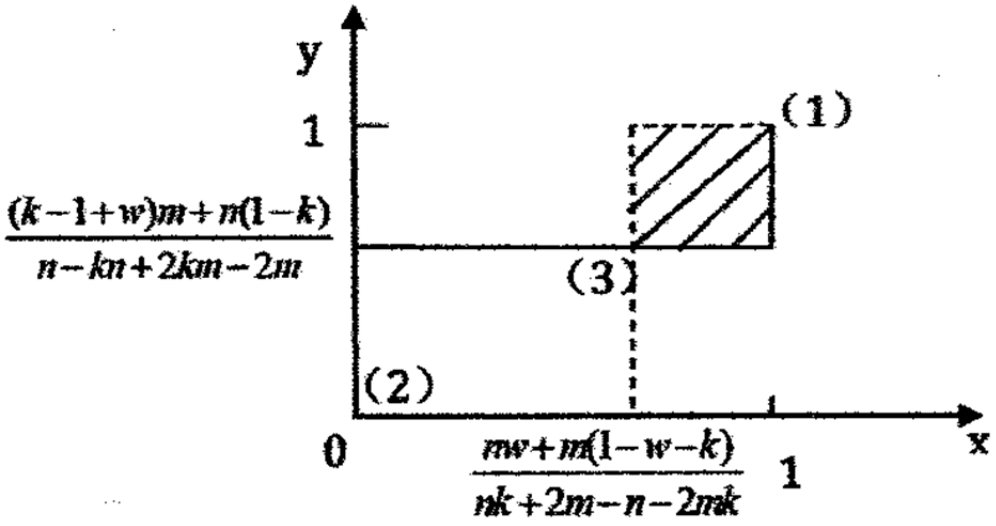

Fig. 4. Country A and Country B's price strategy game balance