



Rural to urban land conversion in China – How large is the over-conversion and what are its welfare implications?

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ABSTRACT

The current system of converting farmland to urban land use in China can be characterized as a hybrid system that combines government controls with market-based transfers. In this paper we argue that this hybrid governance structure causes an over-conversion of farmland from the rural to the urban sector, as compared to a competitive market situation, and a welfare reallocation that discriminates against farmland owners. We develop a partial equilibrium model that can be used to examine the impact of the current hybrid governance structure on the over-conversion of farmland and to analyze the welfare changes for different groups of actors and the resulting net social welfare loss. Using a dataset with detailed information on farmland acquisitions and urban land transactions in Yingtan City in Jiangxi Province, we illustrate how this framework can be applied. Our results indicate an over-conversion of 33.5% of the total converted farmland in this city between 1999 and 2003. The welfare of farmland owners affected by the conversion decreased by 1.38 billion RMB, while the net social welfare loss equaled more than 270 million RMB during the same period. The local government obtained 380 million RMB of revenues by re-selling farmland as urban land through competitive conveyance mechanisms between 2002 and 2005, while the manufacturing sector gained an estimated 280 million RMB from buying land use rights at relatively low prices. We conclude that the current policy of increasing urban land conveyance through competitive mechanisms does not address two major underlying causes of over-conversion, and that protection of farmland would be better served by replacing the current hybrid rural to urban land market structure by a competitive land market.

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1. Introduction

The conversion of farmland from agricultural use into nonagricultural use in China has attracted growing attention of policy makers as well as researchers. It is seen as a major driving force behind the rapid decline in farmland area in recent decades, and raises concern about China's ability to maintain national food security (e.g. Chen, 2011; Tan, Li, Xie, & Lu, 2005). The forced nature of rural land acquisitions and the relatively low compensations paid to farmers are considered to be a major source of social tension and injustice (Ding, 2007). The acquisition of cheap rural land by local officials and subsequent leasing to industrial enterprises and the real estate and commercial sector under widely divergent conditions is believed to be at the root of China's current over-capacity in the industrial sector and bubbles emerging in the real estate sector (Cao, Feng, & Tao, 2008).

Adjustments in the governance structure of land transfers may play an important role in reducing the waste of resources involved in the conversion of farmland into nonagricultural land. Preferably, this governance structure should not only take into account the

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requirements of urbanization and industrialization, but the constraints posed by China's food self-sufficiency policy and the consequences for China's rural–urban income gap as well.

The Chinese government is recently undergoing a transition in the system of governing farmland conversion that has resulted in a hybrid governance structure which combines governmental controls with market-based transfers. The government controls the supply of farmland that is converted into urban land, while a market system for urban land use rights has gradually been set up in many cities, even though these urban markets are still facing some inherent weaknesses (Cao et al., 2008; Ding & Lichtenberg, 2011; Lin & Ho, 2005).

Available studies of the impact of the current governance system, such as Ding (2007), Cao et al. (2008) and Ding and Lichtenberg (2011), compare available piecemeal information on rural–urban land conversion with land conversion quota set by the central government and information on illegal land transactions and land left idle after conversion to show that a large amount of over-conversion is taking place. Anecdotal evidence on compensation payments to farmers and the price of land leased out by local governments in the urban land markets is used in these studies to show that compensation payments received by farmers are set too low. Ding and Lichtenberg (2011) derive a similar conclusion from an econometric model of urban GDP growth. Based on this evidence, Ding (2007) argues that farmers should be paid market values that reflect supply as well as (urban) demand for their land, while Cao et al. (2008) argue that rural land acquisition needs to be marketized so that disposed farmers can negotiate directly with urban land users about the terms of compensation. A similar plea for allowing village collectives to lease land to urban users in competitive markets is made by Lichtenberg and Ding (2008).

To our knowledge, no study has examined until now to what extent the conversion of farmland to urban land exceeds the amount that would prevail in a competitive market, nor the impact of the current hybrid market system on the net social welfare loss and the distribution of welfare between farmers, urban land users and the government. The current study tries to fill this gap. Using a partial equilibrium framework, we examine the impact of the current hybrid governance structure on the over-conversion of farmland as compared to a competitive land market situation and analyze the welfare changes for different groups of actors and the resulting net social welfare loss. Using a dataset with detailed information on farmland acquisitions and urban land transactions in Yingtan City in Jiangxi Province, we illustrate how this framework can be applied in empirical research to provide empirical estimates of the degree of over-conversion and its social welfare implications.

The paper is organized as follows. Section 2 provides an overview of the current hybrid governance structure of farmland conversion in China, including land ownership and property rights and institutions involved in different stages of farmland conversion. Section 3 presents a partial equilibrium analysis of the impact of the hybrid governance structure on the over-conversion of farmland and on social welfare. In Section 4, we illustrate for the case of Yingtan City in Jiangxi Province how this approach can be applied in empirical research for estimating the extent of farmland over-conversion and the welfare implications for farmland owners, different groups of urban land users and the government. Conclusions follow in the last section.

2. Farmland conversion in China

2.1. Land ownership and land use rights

Before China started its market-oriented reforms at the end of the 1970s, land was allocated through a central-planning mechanism and was available free of charge for all economic sectors. The increasing number of foreign investors and the gradual dismantling of state-owned companies increased the awareness of the Chinese government that land allocation among sectors and users without clear property rights is not suitable for a market-oriented economy. The ownership of land is stipulated in China's Constitution, i.e. urban land belongs to the entire population, while rural land belongs to the collective organizations of farmers or to the village committees. The Constitution, however, does not distinguish between the different elements of ownership (e.g. Furubotn & Richter, 2005), i.e. the right to use the land (user right), the right to appropriate the returns from the land (income right), the right to change the form and substance of the land (alteration right), the right to exclude others (exclusion right), and the right of transfer to others through markets or to their heirs (transfer rights).

In practice, the State Council (central government) represents the owner of urban land, i.e. the State Council possesses the full bundle of rights. The collective organizations of farmers hold the full bundle of rural land ownership rights, except the right to sell the land, if the land is used for agricultural production. Non-agricultural construction is prohibited on agricultural land. Land acquisition, in which land ownership is transferred from the collective organizations to the state, is therefore obligatory before any construction can take place (Ding, 2007).

In order to adapt to the gradual establishment of urban land markets, China's Constitution Revision of 1988 makes a distinction between so-called land use rights (LUR) and land ownership. LUR are allocated or conveyed to rural and urban land users, and form the legal base for the operation of land markets and for farmland conversion.

Rural households obtain LUR for farmland from the village through the so-called Household Responsibility System (HRS) (Tan, Heerink, & Qu, 2006). Until recently, LUR had a limited duration and farmers had to pay a mandatory quota of grain, or other specified commodities, and agricultural tax in return for the LUR (Brandt, Huang, Guo, & Rozelle, 2002). But nowadays these rights are obtained costless and without time constraints.¹

¹ The HRS contract period equals 30 years. The new Property Law passed in 2007 and implemented on 1 October 2007, however, states that the HRS contract can continue according to relevant laws and regulations when it has expired.

LUR in rural China consist of user rights and income rights distinguished in the literature. Rural households possess only partial alteration rights, because the land can only be used for agricultural production. Exclusion rights are very limited, because farmers cannot refuse the reallocation of farmland by the village committee or the acquisition of farmland by the government. Until recently, rural households did not possess formal transfer rights, even though growing off-farm employment opportunities made farmland renting increasingly popular. Farmland transfer rights have been legalized during the Third Plenary Session of the Seventeenth Central Committee of the Chinese Communist Party in October, 2008.

In urban China, the bulk of the land is under the control of local officials who act as representatives of the state under the supervision of higher level officials (Ding & Lichtenberg, 2011). Private sector enterprises can lease LUR with a duration of 40 years for commercial uses, 50 years for industrial uses, and 70 years for residential uses. Normally LUR can be acquired by paying an up-front conveyance fee to the local government. Foreign companies, however, can pay an annual rent during the lease period.² Urban LUR in China consist of user rights, income rights, alteration rights, exclusion rights as well as transfer rights. Most of these rights, however, have their limitations. User rights are limited to a certain period, as specified above. Alteration rights are constrained because the land use has to be consistent with urban planning. Exclusion rights are restricted because the government may announce a requisition for public interests. In such cases, however, urban land users will be fully compensated according to the market value of the land. Transfer (selling as well as leasing) rights are almost complete. The only provision is that the transfer of urban land should be in accordance with the original land conveyance contracts.

2.2. Hierarchical land use quota system

During the twenty years since the revision of the constitution, a hybrid system has been formed which combines hierarchical control on the conversion of farmland into urban land with an immature land market system to allocate converted land among different urban land users (Cao et al., 2008; Tan & Beckmann, 2010). As specified in the Land Administration Law (People's Congress of China, 1998), a quota system is used to control land use and the conversion of farmland into urban land. The land use quota system includes three main quotas, which are stipulated in the land use plans at each administrative level³:

- 1) a quota for the maximum amount of construction land permitted within the planning period,
- 2) a quota for the minimum amount of farmland to be maintained within the planning period, and
- 3) an annual quota for the maximum amount of newly added construction land that is converted from farmland within the planning period.

Each quota is allocated by an upper-level authority to the level immediately below it, and is distributed by that authority to its sub-levels. The third quota authorizes each upper-level government body to decide annually the quota of farmland conversion for urban development and for rural infrastructure construction according to the local economic and social situation, national industrial policies, and other information.

2.3. Land market structure

Four different types of markets can be distinguished in China's current land market structure. They are shown schematically in Fig. 1.

The farmland rental market is the market where farmers rent, sublease or exchange land inside their own village. Because the use of farmland is restricted to use for agricultural production and because farmers cannot resist governmental acquisition of the land, the farmland rental market has no direct relation with farmland conversion for urban development.

The farmland acquisition market is the market where the sole demander, the government, acquires farmland and changes the ownership from the village collective to the state. It is the only legal way to supply new converted land for urban construction.⁴ The owners (individual farmers who lost their land and the village committees in question) will receive compensation.⁵ The compensation is "negotiated" between the local, i.e. municipal or township level, government and the leader of the village committee and, in some cases, a farmers' delegation. The compensation includes three parts, according to the Land Administration Law: a compensation for the lost farmland, a fund for the resettlement of lost-land farmers, and a compensation for lost crops (Ding, 2003). The total compensation should not exceed 30 times the average annual output value during the last 3 years.

The Land Administration Law does not specify detailed compensation guidelines. Local governments therefore have much freedom in setting the compensation standards. Because the local government has a monopoly position in land acquisition and because land leasing is an important source of revenues for local governments, the compensation paid for the farmland is much lower than the price received when it is sold in the urban land market through competitive conveyance (Ding, 2007; Ding & Lichtenberg, 2011; Lichtenberg

² Likewise, LUR that are re-conveyed for profit-making use and were originally allocated administratively, but where the current land use does not match the land use planning, can be acquired by paying an annual rent.

³ The Chinese government consists of the following five levels: central (State Council), provincial (province, autonomous region, municipality governed directly by the State Council), municipal (municipality, autonomous canton, autonomous alliance), prefecture (prefecture, district), and township (town).

⁴ There are, however, some cases in which farmland is converted to urban construction land without government acquisition (Lin & Ho, 2005). This is illegal, and the number of cases is comparatively small (Qu et al., 2004). Because this type of illegal conversion does not seriously influence total conversion, it is neglected in the following analysis.

⁵ In some places, the compensation is distributed among all the farmers in the village, while the farmers who lost their land receive another piece of land through the reallocation of farmland within the village.

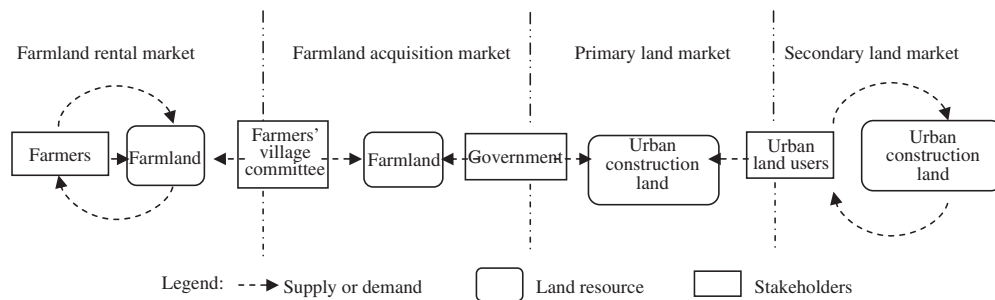


Fig. 1. China's current land market structure.

& Ding, 2009). The local government determines the amount and the location of the farmland it wants to acquire. Although there is the quota restriction from higher level governments, the local government has a certain discretionary, practical right on deciding the actual acquisition amount, because the quota only sets an upper-limit and does not specify location and time sequencing. Moreover, there is also much illegal land acquisition that exceeds the assigned quota (Cao et al., 2008; Ding & Lichtenberg, 2011). In some areas, the local governments' 'land-hunger' behavior has resulted in much converted farmland remaining unused after the conversion because of the relatively low demand from urban investors (Qu, Feng, & Zhu, 2004).

The third market is the urban primary land market where the government allocates or conveys the LUR of newly converted farmland to different urban land users at prices that differ between different types of land users. Urban land users include profit-making private businesses as well as non-profit organizations, such as governmental units, and other public units, such as public schools and hospitals. The conveyance or allocation approaches for each type of land use are shown in Table 1. They are presented in order of increasing average land price.

Administrative allocation of urban land (*huabo*) means that the government allocates LUR to certain land users with no time limit and free of charge. Negotiation (*xieyi*), tender (*zhaobiao*), auction (*paimai*) and listing (*guapai*) are market-oriented patterns of conveyance, which are employed by the governments to improve land allocation efficiency (MLR, 2006a, 2006b).

Conveyance through negotiation means that the land administration bureau, as the representative of the government, negotiates with certain urban land demanders on the conveyance fee and conveys the LUR for a specified contract period. In order to attract investors, local governments often use negotiation to offer so-called reasonable prices, which are generally much lower than the market price (Cao et al., 2008).

Conveyance through tender implies that the land administration bureau organizes a public tender or invites certain persons, groups or organizations to participate in the tender procedure. The land user will be selected on the basis of the tender result. Not only the offered price plays a role, but sometimes also the reputation of the land developer and the degree to which the intended land use is preferred by the government (Cao et al., 2008).

In the auction approach, the land administration bureau organizes a public auction during a certain period. Land will be conveyed to the land user who offers the highest price.

The listing approach is a variation of the auction approach. The land administration bureau announces that a piece of urban land is on sale; everyone who wants to buy it can offer a new and higher price within the listing period, which normally lasts 20–30 days. The last person calling out a bid will obtain the land use rights. The listing system is more flexible than an auction because the time period in which the land users have to make a decision is longer than an auction.

Table 1

Conveyance approaches and land uses in the urban primary land market.

Conveyance types	Land uses
Administrative allocation	Governmental units; military use; urban infrastructure and public interest use; state-supported infrastructure of energy, transportation, and irrigation systems; other land uses for which land can be obtained through administrative allocation as stipulated by law and administration rules
Negotiation	Non-profit-making land uses with no competitor who wants to purchase the same land use right; administratively allocated land users who convey the land use right in the secondary market; users of land conveyed through negotiation who apply to renew the contract; other land uses for which land can be obtained through negotiation as stipulated by law and administration rules
Tender, auction, listing	Profit-making land uses, such as trade business, tourism, entertainment, and profitable residence construction; cases where two or more persons or groups want to purchase the land use right; land re-conveyance for profit-making use if the land was originally allocated administratively; changes in land use after the land has been conveyed; other land uses for which land can be obtained through tender, auction, and listing as stipulated by law and administration rules

Source: People's Congress of China (1998); Ministry of Land and Resources of China (2006a, 2006b).

The urban secondary land market is the market in which urban land users sell, rent or mortgage their urban LUR, but have to comply with relevant laws and the original land conveyance contract in the primary land market. The existence of a secondary land market gives urban land users more options to obtain LUR. When it is not possible to obtain a piece of land in the urban primary land market, it may still be possible to buy a 'second-hand' LUR in the urban secondary land market. Most cities have established mature secondary land markets that offer such opportunities. Urban land obtained through administrative allocation, however, cannot go directly into the secondary market. To avoid windfall gains, the users of land obtained through administrative allocation need to go through the same conveyance procedures and pay the same conveyance fees as in competitive conveyance patterns (tender, auction, and listing) in the urban primary land market.

2.4. Main features of the hybrid governance structure

One of the distinct features of China's land market structure is the hierarchical control on the supply of newly converted land for urban development. The government controls farmland conversion, which results in two special markets. In the farmland acquisition market, the government is the sole farmland demander and has a monopsony power in determining the amount of farmland it acquires and in setting prices (i.e. the compensation paid to farmers). In the urban primary land market, the government is the sole supplier of the converted farmland. But whether or not it acts as a profit-maximizing monopolist depends to a large extent on the purpose for which the land is used (see also Cao et al., 2008). Land used for residential purposes and other businesses falling into the tertiary sector, such as shops, banks, and hotels, are increasingly sold through competitive patterns. When, however, the land is used for businesses falling into the secondary sector, it is generally leased out through negotiation at a much lower price than the monopoly price or even the competitive market price (See also Tan, Beckmann, Van den Berg, & Qu, 2009).

The reason for these differences in conveyance patterns and prices received is that local officials are dealing with two different types of investors. Enterprises belonging to the secondary sector are generally location non-specific, because most manufacturing factories are not mainly producing for local customers but sell their products to other regions or to the international market. Location non-specificity also means that they can move to other areas and set up production facilities with relative ease, which greatly empowers these footloose investments vis-à-vis local governments. In response to this mobility and the fierce competition for manufacturing investment between regions, local officials have to offer attractive packages, including tax breaks for the first few years and low- or zero-priced land leases (usually through one-on-one, behind closed doors style negotiations). The loss of revenues that results from offering cheap land to manufacturing industries may (at least partly) be offset by the gain in value-added tax revenues from such industries. Local governments receive 25% of the value-added tax, the central government 75%. More important for local officials is, however, the contribution to local GDP and employment growth of manufacturing enterprises. GDP growth rates and local employment growth play a major role in the evaluation of local leaders by higher level governments and the promotion opportunities of local leaders.

Profit-making businesses in the tertiary sector, on the other hand, provide location specific services to residents in a particular region. They cannot serve their customers without physically being there. Thus a revenue maximizing government may take advantage of its monopolistic position and tighten local land supply to service-oriented businesses in an effort to obtain as much (extra-budgetary) revenues as possible.

This situation, in which the secondary sector obtains urban land through negotiations and the tertiary sector through tenders, auctions, or listings, lasted until September 2006. Since then, all industrial LUR should also be conveyed through competitive mechanisms, i.e. tenders, auctions, and listings. However, this should merely be seen as a signal that the central government of China wants to increase the competition in the urban primary land market. In practice it will take a considerable time before the effect of the policy change can be noticed. And due to the intense regional competition for location non-specific investments, industrial LUR are probably still leased out through negotiation for low prices although formally the procedure resembles a market-oriented one (Cao et al., 2008: 27).

3. Theoretical framework

We use Fig. 2 to analyze the impact of the current hybrid governance structure on the amount of over-conversion of farmland and the size and distribution of the social welfare loss as compared to a competitive land market. D and S represent the demand and supply curves of farmland in a competitive market. Although aggregate supply of land is often observed to be price inelastic due to spatial immobility, government interventions, and rules and customs (Slangen, Loucks, & Slangen, 2008), supply of land in a competitive market is expected to depend on the price of land, land productivity, off-farm income opportunities, and other factors that may differ between farm households. Hence, the supply curve in Fig. 2 is assumed to be price-elastic. The demand curve D represents the demand for land by urban land users.

The market equilibrium is at E, with Q^* and P^* showing the amount of farmland that will be converted and the price per unit of farmland, respectively. In practice, however, the Chinese government intervenes in the conversion of farmland between farmland owners and urban land users. In Fig. 2, the local government acquires a quantity Q^S of farmland at a price P^A , showing the land-hunger of local governments. Q^S may even exceed the farmland conversion quota assigned by the higher level government.

The following inferences with respect to the farmland acquisition market can be drawn from the figure. Firstly, the size of over-conversion of farmland, as compared to a competitive market situation, equals $Q^S - Q^*$. Secondly, the welfare change of farmland owners as compared to a competitive market situation equals $(P^{AKO} - KFHP) - P^{*EO} = -P^{*EFHP}$. And thirdly, the welfare gain of

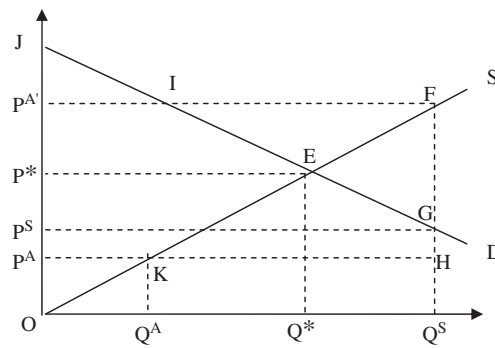


Fig. 2. Welfare effects of hybrid land market structure.

urban land users (represented on the market by the local government) is equal to $JGHP^A - JEP^* = P^*EGHP^A$. Hence the net change in social welfare equals $P^*EGHP^A - P^*EFHP^A = -EFG$.

The local government has three main options for conveying the LUR of Q^S to land users in the urban primary land market. For analytical purposes, we will assume that all the land is conveyed to just one type of urban land user, so that the welfare implications of the three options can be compared with each other.⁶

Governmental units and other units in the public sector can obtain the LUR free of charge through administrative allocation (*huabo*). We assume that the demand for land of these public units is price responsive, in case they would have to pay for it, and can be represented by curve D in Fig. 2. The welfare gain of the public units⁷ equals $JGQ^SO - JEP^* = P^*EGQ^SO$, while the cost for obtaining the land by the local government equals P^AHQ^SO . Hence, the total welfare change for the public sector equals P^*EGHP^A . In other words, government acquisition of farmland that is being transferred to the public sector causes a welfare gain of public sector enterprises and organizations at the expense of the welfare of farmland owners, government revenues, and net social welfare.

Land users falling into the secondary sector can obtain the land use rights through negotiation at price P^S , which is assumed to be higher than P^A and lower than P^* in Fig. 2. Compared to the competitive market case (equilibrium at E), the welfare change of manufacturing enterprises equals the trapezium P^*EGP^S , while the change in government revenues is equal to P^SGHP^A . Hence, in this case welfare of farmland owners is transferred to the manufacturing sector and the government (and a net social welfare loss).

Urban land users belonging to the tertiary sector increasingly obtain their LUR through competitive conveyance mechanisms. Assuming that local governments act as competitive suppliers,⁸ these enterprises will pay P^* for their LUR. The result is that part of the converted land ($Q^S - Q^*$) remains unused. The welfare gain for the tertiary sector in this situation is equal to the welfare gain under a competitive market, while the welfare change of farmland owners (as compared to a free market situation) remains $-P^*EFHP^A$. The local government, however, obtains an amount of revenues that equals $P^*EQ^*O - P^AHQ^SO$. Hence the net change in social welfare in this situation equals $P^*EQ^*O - P^AHQ^SO - P^*EFHP^A = -EFQ^SQ^*$. In other words, the over-conversion of farmland increases the net social welfare loss in this situation with an amount equal to the trapezium EGQ^SQ^* in Fig. 2.

The foregoing analysis distinguishes three extreme cases in which all the land is conveyed to just one type of urban land user. In practice, urban land is conveyed in the primary urban land market to a combination of these three user groups. The chosen combination of user groups (and corresponding conveyance methods) will depend to a large extent on the weights that local government officials attach to different policy objectives. Land conveyed to manufacturing industries is expected to contribute in particular to local GDP and employment growth, while land leased out for urban residential construction and other tertiary sector activities generates substantial additional (extra-budgetary) revenues for the local government. Land allocated to the public sector, on the other hand, enhances the provision of public services but may have a detrimental effect on government revenues. The importance attached to local GDP and employment growth in the evaluation of local leaders by higher level governments and the much greater welfare gains of the secondary sector as compared to the tertiary sector under the current hybrid governance land market governance structure explain why a relatively large share of land in the primary urban market is conveyed to the manufacturing sector. It also helps to account for the excessive investment in the manufacturing sector and the over-capacity in industrial production in recent years as well as the current bubbles in the real estate sector (Cao et al., 2008).

The partial equilibrium framework that we presented in this section may be used in empirical research to derive empirical estimates of the degree of over-conversion of farmland to urban land and to examine the social welfare implications of rural to

⁶ For reasons of simplicity, government investments in land improvement, such as roads, street lights, and sewage systems, and transaction costs are not included in our analysis of the urban primary market.

⁷ We treat public sector organizations and enterprises in the same way as private enterprises in our welfare analysis, and neglect the contribution of their activities to public welfare.

⁸ If local governments take advantage of their monopolistic positions to maximize their revenues from land conversion, a higher price would be the result. In such cases, the tertiary sector will experience a welfare loss (as compared to a competitive market), and more converted land would remain idle.

Table 2

Mean values of major variables and transactions by sub-market.

	Farmland acquisition	Primary urban market				Secondary urban market
		Allocation	Negotiation	Auction	Listing	
Land size (m ²)	22,663	8739	18,004	13,252	38,374	35,733
Price (RMB per m ²)	23	0	71	204	337	296
Grade ¹	4.61	3.53	3.50	3.50	3.70	3.22
Distance to:						
Bus station (km)	2.27	2.03	1.38	1.61	1.86	2.05
Commercial center (km)	2.67	2.49	1.37	1.51	2.10	1.98
Green area (km)	0.24	2.44	0.40	0.51	0.29	0.39
Main road (km)	0.37	0.13	0.19	0.04	0.24	0.12
Railroad (km)	1.42	0.49	0.44	0.37	0.47	0.65
Train station (km)	2.19	0.68	1.40	1.64	1.84	2.06
Number of transactions	240	15	78	8	30	127
To urban sector:						
Public sector		15				
Secondary sector			78			
Tertiary sector				8	30	

¹ Grade refers to the grade assigned to the land as a part of the benchmark price system. The benchmark price system has been established since the late-1980s in most of Chinese cities to provide guidelines for the price of tender, auction, listing, and re-conveyances in the urban land market in order to overcome the lack of market data and experiences with land transactions (Ding, 2001). Normally the actual price of the LUR on a plot is higher than its benchmark price. The grades assigned to the land range from 1 (highest quality) to 5 (lowest quality).

urban land conversion. In the next section we will illustrate how this can be done, using a data set with detailed information on farmland acquisitions and urban land transactions in Yingtan City, Jiangxi Province.

4. Application of the framework

4.1. Data collection

Yingtan is a prefecture-level city in Northeast Jiangxi province, located along the railroad and highway connecting Nanchang, the province's capital, with Hangzhou, the capital of coastal Zhejiang province. It has 1.1 million inhabitants and per capita income was equal to 18,744 RMB in 2007, i.e. 36% higher than the average income of urban households in China in that year (NBS, 2008). Its urbanization process is not as fast as in many coastal areas in China, but faster than in many cities in western China.

The collected information refers to 240 farmland acquisition cases from 1999 to 2003 (all the acquisition cases during the period), 131 urban primary land market trade cases from 2002 to 2005 (more than 90% of the cases during the period) and 127 urban secondary land market trade cases from 2001 to 2005 (more than 90% of the cases during the period). For each case, detailed information is available on land size, price, land use, land quality and other relevant factors. A digital map of the city was also obtained, on which all the observed cases have been labeled.⁹ The map allows the measurement of all the spatial information, such as the distance to the nearest commercial center, railway station, bus station, green area, and so on.

Table 2 presents the mean values of the most important variables that we use in our analysis, sub-divided by (sub-)market, and the number of transactions that took place in each (sub-)market. The total size of the farmland that was converted in the period 1999–2003 was 543.9 ha, while the land conveyed in the primary urban market in the period 2002–2005 equaled 279.3 ha and the land traded in the secondary market during the period 2001–2005 amounted to 453.8 ha. The average price for which the city government acquired the farmland (23 RMB per m²) was much lower than the average prices it received in the different primary urban sub-markets. The highest price was obtained through listings and, to a lesser extent, auctions. The average price received on the primary urban market during the period 2002–2005 equaled 153 RMB per m², i.e. 6.67 times the average price paid for land acquisitions during the period 1999–2003.

4.2. Method

In terms of Fig. 2, the dataset contains information on Q^S (converted farmland quantity), P^A (price of converted farmland), and P^S (price of land conveyed through negotiation at primary urban market). Hence, what is still needed are estimates of the supply function S , demand function D and the equilibrium price (P^*) and quantity (Q^*) at the competitive market. As explained in Section 2, prices obtained through negotiation will often be affected by non-market factors. The prices that result from auctions

⁹ The cases were labeled by one staff member from the land management bureau of Yingtan city with ten years of working experience on land information registration, and two staff members from a local influential land valuation company who were involved in most of the cases' valuation procedures.

and listings, however, are usually considered as competitive prices. We therefore estimate the supply and demand functions at the competitive market from the data on primary urban land that was transferred through auctions and listings. Identification of the supply and demand curves is ensured by using the farmland acquisition price as an independent variable in the supply equation and including the secondary urban market price as an explanatory variable in the demand equation.

One complication in our analysis is that it is not clear from our dataset what the price of a piece of land traded through auctions and listings at the primary urban market will be when it would be traded at the secondary urban land market. Nor does the dataset contain information on the prices paid during farmland acquisition for the land traded on the urban primary market. For each market, we therefore run regressions of land prices on plot characteristics. Available information on plot characteristics is then used to estimate the 'counterpart prices' of a plot in other markets. For example, we use the data for the farmland acquisitions to estimate the impact of different plot characteristics (quality, location) on the prices received by farmland users. The estimated equation is then combined with information about characteristics (quality, location) of plots traded in the primary urban market to estimate the prices that were paid for these plots during farmland acquisition.

For each farmland acquisition case, we use the estimated supply and demand functions to estimate the equilibrium quantity and price at a competitive market, given the properties of the acquired plot. Aggregating these equilibrium quantities over all acquired plots gives Q^* , while P^* is obtained as the average of all equilibrium prices. Comparing Q^S with Q^* gives us an estimate of the size of farmland over-conversion during the period 1999–2003. The welfare loss of farmers during that period can be derived from the estimated demand and supply functions, the estimates of Q^* and P^* , and the average price paid by the government for acquired land, P^A (see Fig. 2).

Using the data on land transactions in the primary urban land market, a similar approach is applied for estimating the welfare changes of different groups of urban land users between 2002 and 2005. For each land allocation and negotiation case, the equilibrium quantities and prices are obtained from the estimated supply and demand curves on the competitive market and the values of the explanatory variables for that case. The value of P^A is obtained for each case through the same method as is used for estimating P^A for the listing and auction cases. For the allocation cases, P^S also needs to be estimated (see Fig. 2). This is done by running a regression for negotiated prices, and substituting the characteristics of an allocated land plot into the estimated equation. Finally, the welfare changes of the public sector and the secondary sector, as compared to a competitive land market, and the changes in government revenues involved in the different primary urban sub-markets are obtained by applying the framework of Fig. 2 to these outcomes.

4.3. Empirical results

4.3.1. Price equations

As explained in the previous section, we cannot use 'counterpart prices' at the farmland acquisition and secondary markets for the estimation of the demand and supply functions at the competitive primary urban land market. Instead, we use estimates of these counterpart prices based on quality and location characteristics of the plots in question. Likewise, for the estimation of welfare changes resulting from land allocation in the primary urban land market, we need estimates of the negotiated price (P^S) for the plots that are allocated to public sector units.

Table 3 presents the results of regressing farmland acquisition prices, negotiated primary urban land prices and secondary urban land market prices, respectively, on land grade and location characteristics of the plots in question. Because lower prices are usually paid for larger land plots, the size of the traded plot is also included as an explanatory variable. To reduce the potential impact of outliers, a double-logarithmic specification is used in all the price regressions. All explanatory variables are expected to have a negative impact on land price and are tested one-sided, except distance to the nearest railway line (which may also have a positive impact due to the noise generated by trains passing by).

Table 3
Estimation results of the three land price equations.

Explanatory variables	Farmland acquisition	Negotiated urban land	Secondary urban land
	Coefficient (t-statistic)	Coefficient (t-statistic)	Coefficient (t-statistic)
Constant term	4.04*** (11.4)	8.61*** (15.61)	6.95*** (21.93)
Acreage (m ²)	−0.06*** (−3.01)	−0.28*** (−3.89)	−0.04* (−1.43)
Land grade	−0.29* (−1.38)	−1.00** (−2.25)	−1.13*** (−7.19)
Distance to the bus station (km)	–	−0.57** (−1.82)	−0.25*** (−2.65)
Distance to the commercial center (km)	–	–	–
Distance to the nearest green area (km)	–	–	–
Distance to the nearest main road (km)	−0.11*** (−3.28)	–	−0.19*** (−3.40)
Distance to the nearest railway line (km)	–	0.32*** (2.75)	–
Distance to the train station (km)	−0.26*** (−3.07)	–	–
R ²	0.21	0.60	0.65
F	12.4	26.8	56.9

Source: Calculated by the authors.

* Represents 10% significance.

** Represents 5% significance.

*** Represents 1% significance.

Table 4

Estimation results for urban primary land market (auction and listing).

Demand	Coefficients (<i>t</i> -test)	Supply	Coefficients (<i>t</i> -test)
Constant	14.93*** (11.31)	Constant	13.59*** (9.72)
Price	−0.34*** (−3.18)	Price	0.60** (2.10)
Secondary market price (estimated)	−0.61*** (−3.03)	Farmland acquisition price (estimated)	−2.27*** (−4.01)
J-statistic	0.38		

Source: Calculated by the authors.

** Represents 5% significance.

*** Represents 1% significance.

Table 5

Farmland over-conversion and welfare changes in Yingtan City, 1999–2003.

Actual conversion (ha)	Competitive market conversion (ha)	Over conversion (ha)	Over conversion ratio	Farmland owner welfare loss (million RMB)	Social welfare net loss (million RMB)
543.9	361.9	182.0	33.5%	1384.3	270.5

Source: Calculated by the authors.

The estimation results show that the size and the grade of the traded land both are significantly related to the price at all three markets. Location variables have an impact as well, but which location factors play a role differs between the three markets.

4.3.2. Supply and demand curves

Estimation results for the supply and demand curves of primary urban land market traded through auctions and listings in Yingtan city between 2002 and 2005 are shown in Table 4. Estimated counterpart prices on the secondary urban market and the farmland acquisition market are used to identify the demand and supply curves, respectively. In order to correct for simultaneity bias that may be caused by omitted relevant explanatory variables, the GMM method is used for estimating this set of equations.^{10,11}

All the estimated coefficients are significant at the 5% testing level. The estimated price elasticities have the expected signs in both the demand and the supply equation, with supply being more responsive to price changes than demand. The farmland acquisition price has a significant negative impact on supply. This finding is consistent with *a priori* expectations that supply of land by the local government through competitive conveyance mechanisms will be less when the revenues it obtains by doing so are lower. The impact of the secondary market price on the demand for land at the competitive primary urban land market is also found to be negative. This is a puzzling result, because a higher secondary market price allows buyers to make bigger profits when they resell the land bought in the primary market on the secondary market. More research is needed on the interaction between these two markets to explain this finding.

4.3.3. Calculation of farmland over-conversion and welfare change

Using the estimation results presented above and the method described in Section 4.2, we can now estimate the amount of farmland over-conversion and the welfare change for farmland owners and the social net loss for the 240 farmland acquisition cases between 1999 and 2003. The results are shown in Table 5.

Our estimates indicate that the actual farmland conversion during this period was 182.0 ha, or 33.5%, higher than the amount that would have been converted in a competitive market situation. As a result of the over-conversion and the low compensation paid by the government, the welfare change of farmland owners was 1384.3 million RMB lower than would have been the case if the land would have been sold through a competitive market. The estimated net social welfare loss from farmland conversion amounts 270.5 million RMB.

We have no information in our dataset about the way in which the farmland plots that were acquired between 1999 and 2003 were traded in the primary urban market and the amount of acquired farmland that remains unused. Hence, we cannot examine the welfare redistribution over different actors in the primary urban market of the 543.9 ha farmland that was converted to urban land between 1999 and 2003. We can, however, use the collected information on the primary urban land market between 2002 and 2005 to analyze the welfare changes caused by different conveyance mechanisms during that period in order to obtain more insights into how the welfare loss experienced by farmland owners is distributed over different groups of primary urban land market participants. Social welfare losses caused by leaving acquired land unused cannot be taken into account in such an analysis.

¹⁰ The GMM estimator selects parameter estimates so that the correlations between the instruments and disturbances are as close to zero as possible, as defined by a criterion function. GMM is a robust estimator in that it does not require information on the exact distribution of the disturbances. Many standard simultaneous equations estimators can be considered as special cases of GMM (Pindyck & Rubinfeld, 1998).

¹¹ The instrumental variables in the demand equation include price, secondary market price, and the location variables. In the supply equation, grade, distance to the center, the farmland acquisition price, a dummy variable indicating land use for commercial purposes, and a dummy variable for land conveyance through listings are used as instrumental variables.

Table 6

Welfare changes caused by primary urban market transactions in Yingtan City, 2002–2005 (unit: million RMB).

	Allocation cases	Negotiation cases	Competitive cases	Total
Government revenues	– 3.8	70.7	380.0	446.9
Public sector	41.3			41.3
Secondary sector		279.6		279.6
Tertiary sector			0	0

Source: Calculated by the authors.

Table 6 shows our estimates of welfare changes caused by each of the three conveyance mechanisms, taking auction and listing together as one competitive mechanism. The results indicate that the local government was the actor that gained most from selling land through the primary urban market. It not only obtained 380 million RMB of revenues by selling farmland – that it acquired at relatively low prices – through competitive conveyance mechanisms to the tertiary sector, but it also gained around 71 million RMB of revenues from selling land through negotiation to the manufacturing sector at slightly higher prices than it paid for acquiring the land. Only 5% of the land transferred through the primary urban market was allocated for free to public enterprises. As a result, the loss in government revenues from allocating land to the public sector was only around 4 million RMB.

The secondary sector is the other actor that benefited most from the hybrid structure of the land market. Our estimates indicate that manufacturing companies gained around 280 million RMB from the fact that they can obtain land at much lower prices than they would have to pay at a competitive market.

The results shown in Table 6 clearly demonstrate that welfare changes of different groups of actors in the primary urban land market depend on the share of land conveyed through different conveyance mechanisms. The higher the proportion of the competitive conveyance mechanisms (auction or listing), the larger the increase of government revenues and the smaller the gains of the secondary (and public) sector. When manufacturing companies can only obtain land through competitive mechanisms, and therefore need to pay much higher prices, they will probably be less eager to buy newly converted land and are expected to use the land more efficiently. This is the main reason why the central government stipulated in September 2006 that the conveyance pattern of tender, auction or listing should be employed when local governments convey land use rights to companies in the secondary sector. But even when this regulation would be implemented effectively throughout the country, it does not reduce the revenue gains from farmland conversion for local governments and therefore may not reduce the problem of farmland over-conversion.

5. Conclusion

Several studies have argued in recent years that the current system of rural to urban land conversion leads to considerable over-conversion of land and that compensation payments received by farmers are set too low. Systematic analyses of the extent to which land conversion exceeds the amount that would prevail in a competitive market, and the impact of the current system on the welfare changes of different groups of actors and on net social welfare loss is lacking so far. In this study, we describe the current hybrid governance structure of rural to urban land conversion in China, and present a partial equilibrium framework that can be used to analyze the impact of this governance structure on the amount of over-conversion of farmland and the welfare implications of rural–urban land conversion. Using a dataset with detailed information on farmland acquisitions and urban land transactions in Yingtan City in Jiangxi Province, we illustrate how this framework can be applied in empirical research.

The estimates obtained through this methodology indicate that the degree of farmland over-conversion, as compared to a competitive market situation, was around 33.5% of the total converted farmland between 1999 and 2003 in Yingtan City. Due to this over-conversion of land and the low compensation paid by the government, the welfare loss of farmland owners was around 1.38 billion RMB, while the net social welfare loss resulting from the over-conversion was around 271 million RMB. Data on urban land transactions through different conveyance mechanisms in Yingtan City during the period 2002–2005 are used to estimate which groups gain most from the over-conversion of land and the underpayment of farmland owners. We find that the local government obtained 380 million RMB of revenues by selling land through competitive conveyance mechanisms to the tertiary sector, while it also gained around 71 million RMB of revenues from selling land through negotiation to the manufacturing sector at slightly higher prices than it paid for acquiring the land. The estimated welfare gain for the manufacturing sector from obtaining land at relatively low prices during the same period amounted to 280 million RMB, while the free allocation of land to public enterprises resulted in an estimated welfare gain of 41 million RMB for that sector.

Our results indicate that rural to urban land conversion in Yingtan City faces major shortcomings. The current hybrid governance structure, in which government-determined farmland conversion quota are combined with market-based transfers of urban land, fails to reach its major objective i.e. prevention of over-conversion of farmland. This may either be due to the quota itself not being adequately calculated by higher level governments, or to the hierarchical structure failing to neutralize incentives from the current system of evaluating local officials that stimulate them to convert more farmland. Ironically, our results indicate that, if the government of Yingtan City would not have intervened in the farmland conversion market, then farmland acquisition during the period 1999–2003 would have been 33.5% lower, and 182 ha of urban land would have remained farmland.

The results of our analysis for Yingtan City confirm evidence of farmland over-conversion presented in earlier studies for other parts of China (Cao et al., 2008; Ding, 2007; Ding & Lichtenberg, 2011). There are in principle two options for the government to solve this problem of over-conversion. One is to maintain the current structure while increasing the proportion of competitive conveyance in the primary urban market. The other is to change the structure of the current land market by eliminating government interventions.¹² A major difference between these two options is the resulting welfare redistribution. Maintaining the current structure while increasing the proportion of the competitive conveyance will imply that welfare of farmland owners is transferred to the government instead of manufacturing enterprises. Establishing a competitive market between farmland owners and urban land users, on the other hand, will greatly increase the welfare of farmland owners. The first option will be difficult to implement in practice, because intense regional competition and non-specificity of investments by manufacturing enterprises stimulate local governments to convey land to such enterprises through informal negotiations while formally using competitive mechanisms. Moreover, the revenue gains for local governments from land conversion through competitive patterns appear to be another major cause of farmland over-conversion. Protection of farmland and achieving food self-sufficiency for the whole nation may therefore be better served by replacing the current hybrid rural to urban land market structure by a competitive land market.

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¹² The second option is essentially similar to the option suggested by Slangen et al. (2008: 359–365), i.e., giving farmers strong property rights over their land with full compensation for takings of their land by the government, provided farmers can choose whether or not to sell their land at the offered (full) compensation. The amount of converted farmland and the change in farmers’ welfare will be the same as in a competitive land market, but the welfare change of other actors will depend on the conveyance types used in the primary urban land market.