



To build above the limit? Implementation of land use regulations in urban China



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ABSTRACT

This paper studies the implementation of land use regulations in urban China. In particular, we investigate land developers' compliance with floor-to-area ratio (FAR) regulations using a unique set of residential land parcel data from 30 major Chinese cities matched with the corresponding residential development projects built on those parcels. In our sample, in more than 20% of the cases, developers built above the regulatory FAR limits in the ex post land development, and the total floor area built in those cases increased 21.5% over the regulatory limit. Our analysis finds that attractive land location attributes tend to induce developers to pursue upward adjustments of FAR. Moreover, developers who are more likely to have special relationships with government officials tend to make larger upward adjustments. Our estimates suggest that there exists a significant gap between the privately optimal FAR that maximizes land value and the regulatory FAR. This gap is only modestly reduced by corrupt ties with government officials, implying that FAR regulations have imposed a highly restrictive constraint on China's urban land development even given imperfect compliance.

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1. Introduction

A considerable body of literature studies the effect of land use regulations on housing supply in various countries (e.g., Cheshire and Sheppard, 2002, 2005; Glaeser and Gyourko, 2003; Quigley and Raphael, 2005; Glaeser et al., 2005a, 2005b; Cheshire, 2006; Saiz, 2010; Turner et al., 2014). However, the existing literature is generally silent about the actual enforcement of land use regulations, thus leaving unanswered questions about the nature and magnitude of the effects of such regulations. This issue is especially relevant in developing countries like China where compliance with regulations should not be taken for granted and corruption in real estate development is widespread (Cai et al., 2013; Fang et al., 2014). A better understanding of this issue may also shed light on the gap between government land use regulations and private optimal decisions. Understanding this gap has important policy implications for developing economies as inefficient land use may severely curb the process of urbanization and distort the urban landscape for decades to come (Glaeser, 2011).

In this paper, we study the implementation of land use regulations in urban China by focusing on the floor-to-area ratio (FAR) regulation. FAR is a density regulation for land development, serving as an upper limit on the ratio of the total floor area to the lot size of the land to be developed. FAR regulations are common in many countries and are considered one of the most important land use regulations (e.g., Bertaud and Brueckner, 2005; Gao et al., 2006; Gomez-Ibanez and Ruiz Nunez, 2009; Bertaud, 2011; Brueckner and Sridhar, 2012; Brueckner et al., 2015).

Objective data on compliance are notoriously hard to obtain. However, we are able to measure compliance with FAR regulations by comparing the regulatory FAR of a land parcel when it is sold with the actual FAR of the residential development project on the land after its development. Both are required by law to be revealed publicly. Specifically, we identify 854 exactly matched pairs of land parcels and their corresponding residential development projects in 30 major Chinese cities. In 181 of these 854 cases, the land developers built above the regulatory upper limits that were set when the land parcels were acquired. The developers adjusted the FAR upward in 21.2% of all the cases, covering approximately 25.2% of the total land area developed. In terms of magnitude, the average upward adjustment over the regulatory FAR limit is 39.9%. For those cases in which upward adjustments occurred, the floor area built increased 21.5% over the regulatory limit, which added a total

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housing market value of 88.5 billion in 2012 RMB yuan.¹ Including all 854 cases, the total floor area was increased by 4.3% beyond the total regulatory limit due to upward adjustments of FAR. The increased housing supply created by these upward adjustments is much greater in several coastal cities where land is more valuable. For example, the total floor area increased 28.9% in Shenzhen, 6.9% in Shanghai, 6.2% in Nanjing, Dalian and Jinan, and 5.7% in Qingdao.²

To understand the phenomenon of “building above the limit,” we create a simple model of how private land developers determine their desired FARs in the presence of a regulatory upper limit by extending the framework of DiPasquale and Wheaton (1996). A developer is free to build up to the regulatory upper limit. However, if the developer wants to build above the limit, he is required to pay an adjustment cost. Informed by our interviews with government officials and land developers, we suppose that the adjustment cost is increasing in location attractiveness and decreasing in special ties between the developer and government officials. Our model predicts that the developer tends to build further above the limit if the land parcel is more attractive and if he has a corrupt deal with government officials.

In our empirical analysis, we first construct two variables that are essential to the developer’s FAR decision: a continuous variable that measures the location attractiveness for each land parcel and a dummy variable that indicates whether the land sale is likely to involve a corrupt deal between the developer and government officials. We construct the variable of location attractiveness as an index of the collective value of all relevant location attributes, e.g., distance to the city center, school quality, and access to public services such as subways, parks, hospitals, etc. We consider a land sale likely to be corrupt if the land was located in an attractive location but sold noncompetitively at auction.

We then estimate a structural MLE model based on our theory. Our estimation yields three key findings. First, attractive location attributes induce pursuit of upward FAR adjustments. Second, if a land parcel is more likely sold through a corrupt deal, then ex post, its developer tends to build more floor area above the regulatory limit. Finally, based on our estimates, there exists a significant gap between the FAR that maximizes the market land value and the regulatory FAR. Corruption may facilitate an upward adjustment and reduce the gap, but only modestly. This suggests that FAR regulations have imposed a highly restrictive constraint on China’s urban land development even in the absence of strict compliance.

This paper contributes to the literature on land use regulations. (For a review, see Gyourko and Molloy, 2015.) We show that private developers’ compliance is not a negligible factor when evaluating the effects of land use regulations. In this sense, our study echoes the literature that studies the endogenous implementation of environmental regulations by polluting firms (Holland and Moore, 2008; Sigman and Chang, 2011; Cai et al., 2016). Our paper is also related to the literature on corruption, in particular, the corruption in China’s real estate sector. The heavily regulated real estate industry and the bureaucratic system in China offer a unique setting for studying corruption (Svensson, 2005). Two recent papers have investigated corruption linked to real estate development in Chinese cities. Cai et al. (2013) analyze a large dataset of land sale transactions in China and present evidence of corruption in the urban land auctions held by China’s city governments. Using a matched dataset of land sales and ex post developments, our paper complements theirs by showing that corruption may facilitate

upward adjustments of FAR in ex post land development. Using a dataset on housing mortgage loans from a leading commercial bank in China, Fang et al. (2014) find that bureaucrats from government agencies critical to real estate development enjoy larger price discounts on their house purchases than regular homebuyers.

The rest of the paper is structured as follows. Section 2 discusses the institutional background of the urban land markets and FAR regulations in China. Section 3 models the FAR decision of a profit-maximizing developer in the presence of a regulatory upper limit and specifies the estimation equations accordingly. We introduce the data for empirical analysis in Section 4, and present the estimation results in Section 5. Section 6 discusses the implications of our empirical findings. Section 7 concludes.

2. Background

In China, all urban land is owned by the state. Since 1988, the use rights of vacant urban land have been allocated through leaseholds by each city’s land bureau. In the 1990s, most use rights allocations were done by “negotiation” between developers and government officials. To control widespread corruption in such negotiated land deals, in 2002 the Ministry of National Land and Resources banned negotiated sales after August 31, 2004. Since then, all urban leasehold sales for private development have been conducted through public auctions. In each city, land auctions are held by the local land bureau, with details of all transactions posted to the public on the Internet. Although public auction is generally viewed as a way to prevent corruption in land allocations, there is still wiggle room. Two-stage auctions (called *guapai* in Chinese) and English auctions (called *paimai* in Chinese) are the two main auction types used by land bureaus. As Cai et al. (2013) show, a corrupt land bureau official tends to select the format of the two-stage auction in order to help her partner developer win the land he is interested in. Specifically, the developer can signal that this land parcel is already taken by bidding at the reserve price at the beginning of the first stage of the auction and hence significantly deter the entry of other competitors into the auction.

The city’s land reserve and allocation committee conducts land use planning and sets the general guidelines for regulations on land use with the aims of promoting “rational” land use, guarding “public interests,” and protecting historic heritage and natural resources. This committee consists of the city’s political leaders and key figures from relevant local government agencies, such as the land bureau and the urban planning bureau. Following those guidelines and other relevant laws and provisions, the city’s urban planning bureau then independently determines use type and detailed development restrictions (e.g., regulatory FAR limit, building height, green area rate, etc.) before each land parcel is released to the land bureau for auction.

The FAR regulation is one of the most important land use regulations in urban China. By law, any land parcel to be auctioned off must have a designated regulatory FAR level. Also, after the land is developed, the city’s planning bureau must complete an official inspection of the residential project before it is put up for sale, in order to ensure compliance with the FAR regulation. In most cases, the FAR regulation takes the form of an upper bound constraint on the ratio of a building’s total floor area to the lot size on which the building is to be constructed. Lower bound constraint cases are very rare and almost always not binding in our exactly matched sample, so we focus on the upper bound constraint in this paper.

FAR is not equivalent to building height. A developer can achieve a higher FAR by reducing open space and building more densely on a given land parcel without increasing building height. A developer can freely choose the FAR level for a project as long as it is not higher than the regulatory upper limit. However, if a

¹ The fact that FAR was adjusted upwards by 39.9% and the floor area built increased 21.5% among the cases of upward adjustment indicates that smaller land parcels underwent greater adjustments than larger land parcels.

² Appendix A reports the upward adjustment statistics and the resulting increase in total floor area by city.

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