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Industrial land discount in China: A public finance perspective

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Land in China zoned for residential use sells for roughly ten times more than land zoned for industrial use. This column asks why local governments do not sell more residential land and less industrial land until the marginal prices of the two equalise. Using comprehensive data on land sales from 2007 to 2019, the authors find the decision is determined by the different time profiles of revenues from industrial and residential land sales, local governments' financial constraints, and the extent of local governments' tax revenue sharing with other levels of government.

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China's land market has been a key driver of the country's extraordinary economic growth over the past 40 years. A body of recent research analyses the boom in residential real estate construction in China (Zhou et al. 2015) and whether there has been overbuilding of Chinese

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supply and rely heavily on land sales for fiscal revenue (Liu et al. 2014). Approximately one-third of local governments' incomes from 2010 to 2012 arose from land sale revenues.

In light of the importance of land sale revenues for local governments, a puzzling fact in the Chinese land market is that land zoned for residential use sells for prices roughly ten times higher than land zoned for industrial use. We refer to this price gap as the "industrial land discount." This fact begs the question of why local governments do not sell more residential land and less industrial land until the marginal prices of the two kinds of land equalise.

The popular explanation for the industrial land discount is the non-pecuniary benefit (e.g. economic growth and employment) of supplying industrial land (Liu and Xiong 2020). In our new work (He et al. 2022), we propose an alternative explanation for the industrial land discount, focusing on local public finance. We propose that local governments' choice between industrial and residential land sales reflects an intertemporal revenue trade-off. Residential land sales generate higher upfront revenue for local governments. However, except for the one-time taxes paid by home developers that sell houses built on residential land, residential land does not generate long-lasting future revenue flows. In contrast, industrial land sales generate substantially lower upfront revenues. However, industrial firms pay value-added taxes and income taxes annually in later years, so industrial land sales generate revenue in the future.

Are the distinct tax revenues between residential and industrial land sales large enough to make up for the difference in upfront sale revenues? To answer this question, we draw an analogy between local governments' land sale decisions and the classic theory of firm investment in corporate finance. The government's decision to sell a parcel of land zoned as industrial rather than residential can be thought of as an investment project. The upfront cost of the investment is the industrial discount, and the future cash flows of the investment are the future tax revenue differences generated by industrial land sales as compared to residential land sales. Given estimates of the industrial discount and the incremental tax revenues, we can define the government's internal rate of return (IRR) on industrial land sales as the rate at which the government would need to discount cash flows to make the present value of cash flows from taxes exactly equal to the upfront costs.

We then quantify these local government IRRs using comprehensive data on land sales in China from 2007 to 2019. We estimate industrial discounts by comparing the prices of residential land parcels to industrial land parcels with similar characteristics and vice versa. We estimate the incremental tax revenues generated by land sales using a differences-in-differences approach, comparing firms that purchased land to a set of control firms which did not. To address potential selection into which firms purchase land, we use control firms in the same industry and province and conduct propensity score matching based on previous sale growth and profit margin. To estimate the one-time taxes paid by home developers for each residential land transaction, we estimate the marginal increase of taxes for a one-RMB increase in home sales using public developers' data, multiplied by each city's floor ratio and the house prices one year after the residential land sales.

We find that from 2007 to 2010, the average industrial land discount is 1,000.6 RMB per square meter. Meanwhile, industrial land sales generate roughly 113.6 RMB per square meter in additional tax revenue in the first two years after the sale and roughly 214.2 RMB per square meter in later years, while residential land sales generate 1,215.5 RMB per square meter in the next year. This implies an IRR on industrial land sales of roughly 8.14%. The number is comparable to most estimates of local governments' costs of capital, which range from 3.5% to 7.5%. Our findings thus suggest that before 2010, revenue considerations alone can explain the large discount on industrial land relative to residential land. After 2010, the IRR decreased substantially from 6.84% in 2010 to 3.79% in 2019. Thus, industrial land sales appear to have gradually become a lower-return investment from the government perspective, from a purely pecuniary perspective. These patterns beget some follow-up questions: Do governments take into account these tax differences when making land allocation decisions? Moreover, what other considerations affect these decisions?

Land allocations in China are the outcome of a joint decision-making process between central and local governments, including quotas set by the Ministry of Housing and Urban-Rural Development; we discuss how this process is both top-down and bottom-up between different levels of government. To help understand the forces affecting land allocation decisions, we build a simple model of the optimisation problem facing a profit-maximising local government deciding between industrial and residential land sales. We incorporate two realistic forces within the Chinese land market. First, local governments may have market power within land markets, so their marginal revenues from land sales may differ from prices since their sales move overall prices. Second, local governments may not fully internalise the tax revenues from land sales because approximately 75% of industrial tax revenues accrue directly to the central government rather than local governments (Wu and Zhou 2015). We find that tax sharing can lead to an equilibrium IRR higher than the government discount rates, while market power tends to decrease the IRR.

An important implication of our findings is that local governments' allocation decisions in the land market may be interlinked with those governments' financial constraints and with the tax-sharing system between local and central governments. We show that these predictions hold empirically. Following a 2016 reform in the tax-sharing system between local and central governments, cities that experienced a larger increase in tax share subsequently experienced greater increases in industrial discounts, suggesting that they respond by changing the relative amounts of industrial and residential land sold. Shocks to local governments' bond yields are also associated with industrial discounts in the direction predicted by our model.

Together, our results provide new insights into the classic puzzle of relative prices in the Chinese land market. We find that industrial land sales, in fact, pay similar amounts, in present value terms, to residential land sales before 2010 when discounting tax revenues using local governments' cost of capital. However, industrial land sales have become a lower-return investment after 2010. Our findings imply a novel

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