Land-Use Regulation in India and China

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Introduction

While land-use regulation is widespread in the West, lower-income countries also provide many examples.

Building-height limits constitute a particularly graphic form of regulation, and their use in India and China is of particular interest.

India's height limits are famously draconian, being tighter than anywhere else in the world.

As elsewhere, the floor-area ratio (FAR) is regulated, equal to total floor area in a building divided by lot size.

Indian FAR's

Height Limits

City	*FAR limit*
Mumbai	1.33
Chennai	1.5
Paris	3
San Francisco	9
Chicago	12
New York	15
Tokyo	20
Singapore	25

Effects of regulation

FAR limits reduce the supply of housing, raising prices, and they create urban sprawl.

Welfare effect on consumers is a combination of higher prices and longer commutes.

For resident at city's edge, where prices are anchored to agricultural rent, loss is entirely from longer commute.

Estimating welfare loss

Can estimate gain from shorter commute due to higher FAR, as follows.

First step is regressing city land area on standard explanatory variables Z plus representative FAR, using cross-section data.

Regression is

$$CityArea_i = \alpha + \beta FAR_i + Z_i\theta + \epsilon_i$$

with $\beta < 0$ expected.

Brueckner and Sridhar (2012) carry out this exercise, using a sample of 101 Indian cities.

Magnitudes

Welfare Gain from Unit Increase in FAR

Area reduction in square km (20% $\times$ average area of 81.65)	16.33
Reduction in city's radius in km	0.54
Reduction in edge resident's annual commuting cost (0.54 $\times$ 969 Rs. per year per km)	523 Rs. (0.7% income)
Aggregate annual welfare gain (based on 750,000 households)	106.0 million Rs.

Motivation

It's argued that Indian urban planners have an aversion to high densities, but relaxing FARs would still entail extra infrastructure costs.

Nevertheless, chosen FARs are no doubt far too low.

Raises the following question: how to measure the stringency of land-use regulation, in this case FARs? How far below free-market values are they?

This exercise can be carried out using theory plus data from China (Brueckner, Fu, Gu and Zhang (2015).

Chinese context

Local governments in China acquire agricultural land and lease it to developers (a major revenue source).

Leases contain a host of development regulations, including a specified FAR value.

Data set, covering 20,000+ transactions in over 200 cities during 2002-2011 period, indicates price per square foot of land for the lease as well as FAR limit.

Key theoretical result

Theory shows that land value rises as FAR limit is raised, relaxing constraint on developer. Let

h^* = free market FAR (height)
$\overline{h}$ = regulated FAR.

When production function takes the common form h^β (= floor space per unit of land), can show that

The elasticity of land rent with respect to $\overline{h}$ is greater the smaller is $\overline{h}/h^*$,

or the more stringent is the regulation.

Results

So in log-log regression of land value r on FAR, ln(FAR) coefficient is a stringency measure.

Can assume common value for all cities or allow coefficient θ to be city specific:

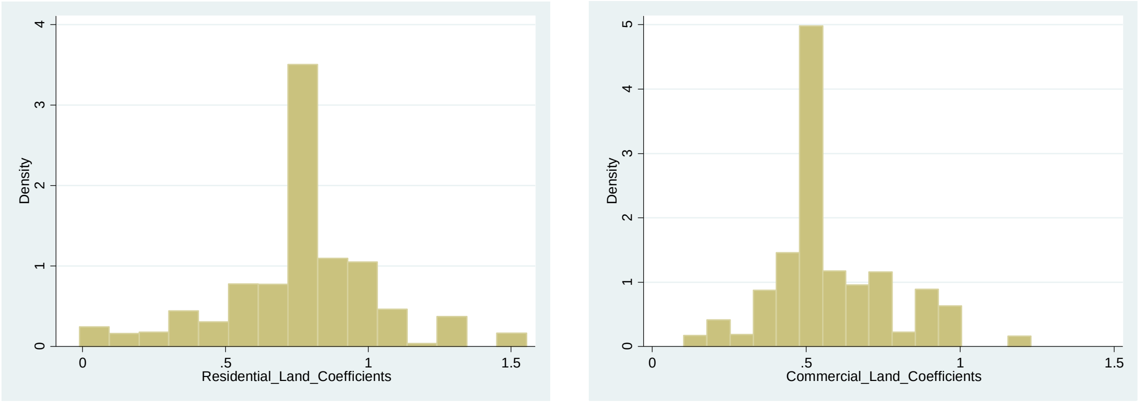
$$\ln r_{jcdt} = \alpha_{cdt} + \theta_c \ln FAR_{jcdt} + \epsilon_{jcdt} \tag{1}$$

where j = parcel, c = city, d = *district*, t = *year*.

Estimate of common θ is a highly significant 0.7466.

Average of city-specific $\widehat{\theta}$'s is 0.7481, with wide distribution.

Figure 2: Distributions of city-specific coefficients



(i) 73 city-specific coefficients for residential land, full sample

(ii) 62 city-specific coefficients for commercial land, full sample

Results

Among cities with smallest θ_c's, Qinhuangdao, Erdos, Yingkou (ghost cities), are well-known for a fast pace of construction.

Cities with largest coefficients are Nantong, Jiujiang, Kunming, Nanning and Yancheng.

Largest cities (Shanghai, Beijing, Tianjin, Chongquing, Guangzhou) have below-average coefficients and thus less-stringent FAR limits.

Endogeneity issue

How does local government choose *FAR* value?

Higher FAR means higher density and greater infrastructure costs, as well as higher r.

Government trades off gain and loss in setting FAR, making it endogenous.

Unobserved factors making r high will also make FAR high, leading to upward bias in θ estimate.

Matched-pair approach

Original regression had (crude) district fixed effects.

Matched-pair approach creates smaller clusters of sales on same street, where unobservables should be similar (usually 2 parcels).

Cuts estimated θ's roughly in half, with mean of city-specific $\widehat{\theta}$'s equal to 0.2876.

Assuming a value for β (0.75) then yields a implied value for $\overline{h}/h^*$.

Equals 0.64, so that building heights are 2/3 of free-market levels.

Single-city approach

Beijing has enough observations to allow single-city regression where FAR effect depends parcel characteristics:

$$\ln r_{it} = \alpha + \beta_t + \theta \ln FAR_{it} + \eta(x_{it} * \ln FAR_{it}) + Z_i\gamma + \epsilon_{it} \qquad (2)$$

Distance to Tiananmen square (historic center) plays the role of x.

Estimated η is negative and significant, showing higher FAR stringency near the square.

Further points

If similar Indian data were available, application of method would presumably show very large θ's.

Beauty of the available Chinese data is the profusion of vacant-land transactions with selling prices and regulatory information.

Chinese setting also has unique feature already noted: land-sale proceeds accrue as revenue to the same entity that imposes the land-use regulations.

Further points

Since infrastructure costs must be incurred with development, the government's goal is NOT to maximize sales revenue (which would be achieved by NOT regulating FAR).

Same point applies in India: free-market FARs would perhaps require unafforable investments in infrastructure.

Chinese FAR regulation means sprawl

FAR regulation in China means lower densities and thus urban sprawl.

Sprawl goes against on another Chinese goal: maintenance of food security via preservation of arable land.

Different assignment of fiscal responsibilities could lead to higher densities.

Conclusion

To our knowledge, only one other method exists for measuring the stringency of land-use regulations: the "regulatory tax" approach of Glaeser et al. (2005).

It measures gap between selling price per square foot of housing and construction cost, attributing the difference to regulations.

Like theirs, our method can be widely applied to gauge regulatory stringency, in both developed and developing countries.

Requirements are a continuous regulatory variable (like FAR) and data on transactions in vacant land.