



Inefficient Cities

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Introduction and Overview

Cities exist to take advantage of agglomeration economies, or the benefits that firms obtain by being close to one another. These agglomeration economies can occur within a given industry, as when firms in the same industry concentrate in a metropolitan area to facilitate access to specialized suppliers or expertise that could not be supported with fewer firms. They can also occur across industries through the diversity of skills and experiences that encourages innovation when different industries locate close together.

But with the generation of these advantages of agglomeration economies, cities also create important agglomeration diseconomies. The high concentration of jobs and residents increases congestion, pollution and the competition for centrally located sites. Thus, urban economists view the size of a city as a tradeoff between agglomeration benefits and costs, as illustrated in the classic diagram developed by William Alonso (1971) and reproduced in Figure 1 below. As city size increases, the incremental benefits of further agglomeration are assumed to decline and the incremental costs rise. The optimal city size is where the two curves intersect and the incremental

advantages of further agglomeration are just offset by the incremental costs.

Market forces alone will not ensure that city size is optimal, as many agglomeration benefits and costs are not fully captured by private real estate and infrastructure entrepreneurs. Therefore, municipal governments play a key role in managing the economies and diseconomies of agglomeration, which in turn determines how productive and efficient their cities are. The land use and infrastructure policies chosen by governments are crucial to the economic health of cities, and we believe that these policies are an important subject for empirical economic analysis. Unfortunately, there is a lack of consistent data on both infrastructure and land use policies. Thus, we propose that rents charged for centrally located workplaces provide a sign of how poorly or how well cities are managing their urban economies. Rents that are either very high or very low, relative to those in otherwise comparable cities, suggest poorly designed land use policies, inadequate provision of infrastructure or a combination of the two factors.

We analyze the relationship between 2005 office rents from a set of international cities and a variety of factors that determine the supply

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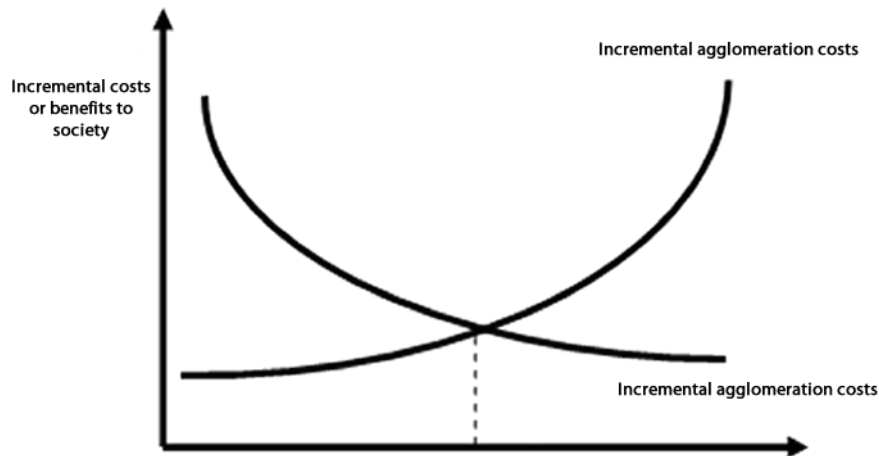
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Figure 1: Incremental Costs and Benefits of Agglomeration



and demand for central office space, such as construction costs, geographic constraints, metropolitan area populations and incomes. We then assume that any unexplained residuals are caused by the city's land use and infrastructure policies. Through our analysis, we seek to identify the cities where rents seem elevated or depressed by poor land use or infrastructure policies, and thus identifying efficient and inefficient cities.

We find substantial variations in office rents that appear to be due to land and infrastructure policies. Though our results are not crystal clear, they seem very reasonable in that many of the cities with unusually high rents, such as Mumbai, also have reputations for excessively stringent controls on land development. Likewise, when cities such as Manila have low rents, it implies that too much development has been allowed, particularly relative to the infrastructure available to support it. Moreover, the differences in rents are substantial, suggesting that the burden of poor land use and infrastructure policies on the metropolitan economy can be quite high, and that cities with unusually high or low rents would greatly benefit from investigating the causes.

Variation in Office Rents Around the World

This research was motivated by the wide variation in property values and rents among cities in both developing and developed countries. Consider the example of the city of

Mumbai (formerly known as Bombay). Using nominal exchange rates, the average annual rent in 2005 for modern and high quality offices located in the main business districts of Mumbai was roughly half of the price of comparable offices in Tokyo and London, the two most expensive cities in the world that year. But when using Purchasing Power Parity (PPP) exchange rates, which take into account the relative costs of untraded inputs that are important in office construction, such as labor and land, Mumbai is more than twice as expensive as Tokyo and London, four times the cost of New York and six times the cost of Jakarta.

Many observers believe that Mumbai's high rents are largely due to its land and infrastructure policies, which severely limit building density and fail to provide adequate transportation infrastructure.

Mumbai's high rents can not be blamed on its large size: its metropolitan population is comparable to that of the other four cities and its office stock is roughly one-tenth that of London, New York and Tokyo and similar to that of Jakarta. Although Mumbai's central business district is on a peninsula surrounded on three sides by water, which makes access and expansion more difficult,

Mumbai’s rents cannot be explained entirely by these geographic constraints. Manhattan is essentially on a peninsula as well, and New York has managed to overcome this disadvantage by building bridges and tunnels and by allowing taller buildings.

Many observers believe that Mumbai’s high rents are largely due to its land and infrastructure policies, which severely limit building density and fail to provide adequate transportation infrastructure. The net effect is

to severely constrain the supply of office space and housing, driving up rents and threatening Mumbai’s role as the premiere financial center of South Asia.

Mumbai is arguably the most extreme case of high office rents in the world, but there are many cities with surprisingly high or low rents. By way of example, Figure 2 shows some simple plots of office rents against metropolitan population for 29 large Asian cities. When rents are calculated using nominal exchange

Figure 2a: Class A Office Rents at Nominal Exchange Rates and Metropolitan Population in 29 Asian Cities

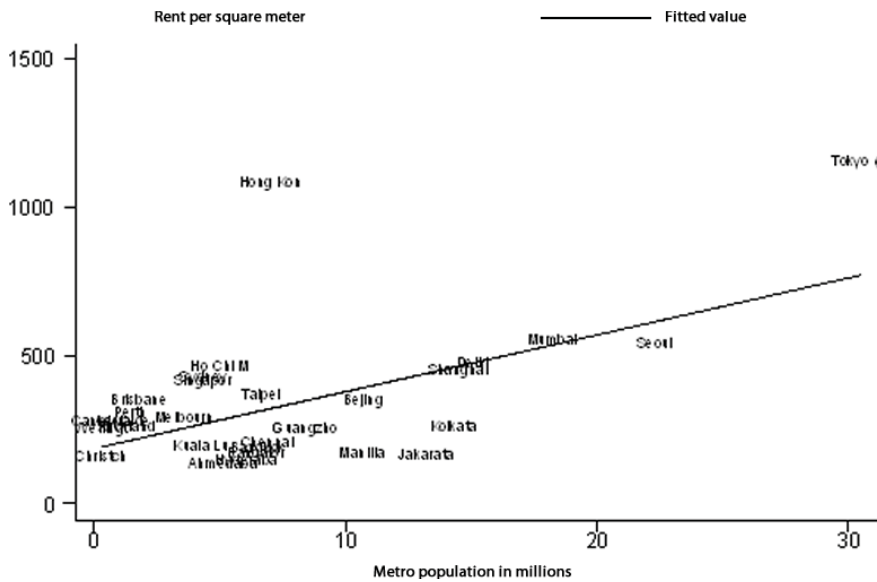
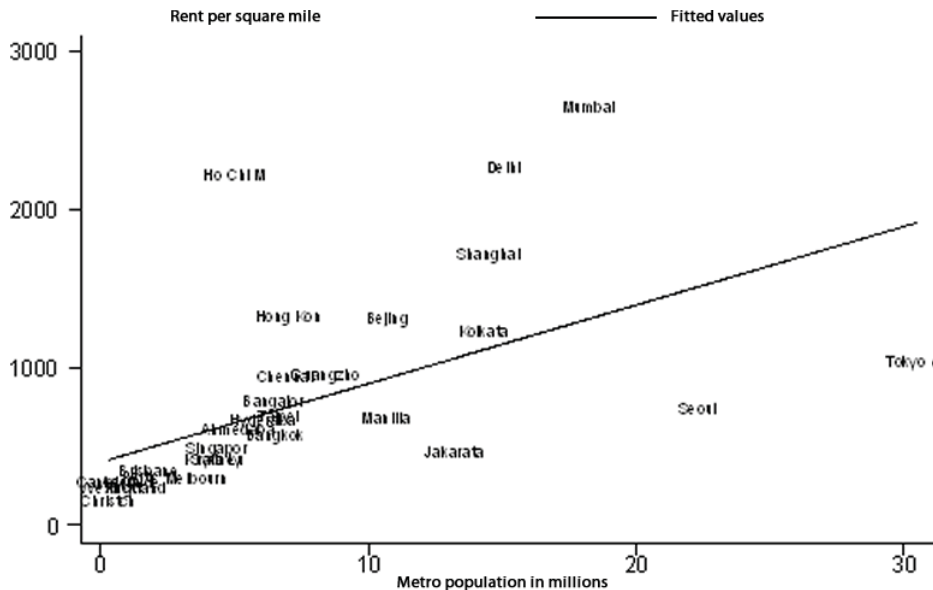


Figure 2b: Class A Office Rents at PPP Exchange Rates and Metropolitan Population in 29 Asian Cities



rates, Tokyo and Hong Kong look unusually expensive for their size while Ho Chi Minh City, Singapore and a cluster of New Zealand and Australian cities with populations of around 1 million or less also appear more expensive than the average. The situation changes dramatically when the Asian rents are calculated using PPP exchange rates. Now Ho Chi Minh City, Mumbai and Delhi appear extremely expensive with Hong Kong, Shanghai and Beijing not too far behind.

Among the large European metropolitan areas, London and Paris appear expensive using nominal exchange rates but reasonable using PPP exchange rates. Moscow and St. Petersburg show the opposite pattern: reasonable using nominal exchange rates but very expensive with PPP rates. Istanbul appears a bargain no matter which exchange rate is used. It is difficult to generalize about the two groups. Most Western European countries have cities in both groups, although Switzerland, the United Kingdom and Germany tend to have more high cost cities while France, Spain and the Netherlands have more low cost cities.

The range of office rents in Latin America and North American cities is comparatively narrow and less affected by the choice of exchange rates. A large number of cities with populations of 1 to 6 million have rents in the range of \$200 to \$250 per square meter and only New York has rents in excess of \$500 per square meter.

In sum, the inexpensive cities include a mixture from both industrialized and developing countries. The results change radically using PPP exchange rates in that more large cities in developing countries now appear to be relatively expensive, especially compared to the relatively low cost cities of North America. The list of cities with unusually high rents includes plenty of developing and transition cities.

Two Tools for Managing Agglomerations

Land Use Controls: Municipal governments have two primary tools to bring the costs and

benefits of agglomeration into balance: land use controls and infrastructure policies. The rationale for government involvement in both land and infrastructure is that the actions of real estate developers, their tenants and the tenants' employees generate externalities or spillovers on other parties. Some of these externalities are positive, such as the increased productivity that other firms enjoy when a new firm moves to the primary business district and increases the size of the agglomeration economies there. Others are negative, particularly the congestion and pollution that additional office workers commuting to the central area impose on other commuters and city residents.

In theory, the government might correct these externalities by awarding subsidies and imposing charges. For example, firms contemplating relocation to the center might be offered subsidies reflecting the positive productivity externalities their move would generate for other firms and commuters might be charged tolls or fees to cover the congestion and pollution they impose on others. In practice, however, few governments are willing to tackle the political and practical problems of administering such complex subsidy and charge schemes, and instead rely on land use controls to help deal with the externalities associated with development. Land use controls limit allowable densities or uses, the implicit assumption being that, at the margin, the negative congestion and pollution externalities outweigh the positive agglomeration externalities so that, absent government intervention, the private calculus of developer supply and tenant demand will lead to too much development in the center.

Building rents in the center of the city should reflect how well the government regulates land use. Overly strict land use controls should increase central area rents both by restricting the supply of space available and by raising average agglomeration benefits and reducing average agglomeration costs. Conversely, overly lenient controls should reduce central rents both by expanding supply and by reducing

average agglomeration benefits and increasing agglomeration costs.

Infrastructure Provision: The stringency of land use controls should be related to the level of infrastructure provided since transportation, drainage, sewerage and other infrastructure are designed to reduce the congestion and pollution caused by concentrated activity. The government typically provides basic infrastructure facilities, financing them from some combination of fees and taxes charged to tenants, their employees, developers and the general public. But to take advantage of the government infrastructure the tenants, employees and developers must make complementary expenditures in their own facilities or time, above and beyond the user fees they are charged. The lower the quality of the government-provided facilities, the higher the expenditures required of the other parties. If the government-provided water or electricity systems are unreliable, for example, the developers or their tenants may have to install water storage tanks or standby generators in their buildings. Similarly, the lower the quality of the roads and public transport services that the government provides, the more time the tenants' employees must spend in commuting. Ideally, the government would expand its infrastructure facilities to the point where the marginal cost to private parties to cope with the congestion and pollution caused by an additional unit of central activity is just equal to the marginal cost to the government of expanding its facilities so that the additional activity could be accommodated without increasing congestion or pollution.

Building rents in the center should reflect the level of infrastructure provided, although exactly how depends in part on the way infrastructure is financed. In the case of transportation, which is often the most important form of infrastructure, a shortfall in provision is likely to reduce rents while an excess in provision may increase rents. The private costs of insufficient transportation infrastructure are likely to be borne almost

entirely by the tenants' employees in the form of increased commuting time, thus causing a leftward shift in the tenants' demand curve for downtown buildings and a reduction in downtown rents. However, the savings in public finance from insufficient infrastructure are likely to be diffused across a wider base, since public infrastructure is typically financed by taxes and fees paid by general taxpayers and by developers and tenants across the metropolitan area rather than just in the center. Thus the leftward shift in the tenants' demand for central building space is unlikely to be offset by rightward shift in the developers' supply for central space. Excess infrastructure would have the opposite effect: shifting tenants demand curve to the right and driving rents higher without any offsetting shift in the supply curve. In short, unusually low rents may be a sign of excessively lenient land use controls and/or a shortage of transportation infrastructure, while unusually high rents may be a sign of overly stringent land use controls and/or a surplus of transportation infrastructure.

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Empirical Strategy

Why Look at Downtown Office Rents? Our data on rents for Class A (high quality and modern or recently updated) offices and on vacancies and stocks for Class A and Class B offices were gathered from both published reports and unpublished data provided by five international real estate firms. We focus on offices in the central business district, which we define as the district having the highest

density of employment and a very large, if not the largest, concentration of offices. Offices in the center provide an interesting focus for two reasons. First, the central district is the single best place to measure of the skill with which local governments manage their agglomeration because it is the site where the tradeoff between the costs and benefits of agglomeration is most acute. The center has the highest concentration of economic activity in the metropolitan area, which presumably makes it one of the most difficult sites to serve with adequate transportation and other infrastructure. And the fact that the central district usually enjoys the highest rents is a sign that the incremental benefits of agglomeration are also greatest there. Moreover, the performance of the central business district will reflect the performance of the secondary business districts, at least to the extent that the locations are substitutes for one another. If the secondary business districts are well managed so that their rents are more affordable, it will drive down rents in the central district as well.

Second, offices are a very important and common building type, even though they account for perhaps only 5 to 10 percent of the floor area in buildings in most metropolitan areas. Every major metropolitan area has a central business district with offices, even if it specializes in manufacturing or other less office-extensive industries. Moreover, since the service sector's share of the economy increases as incomes grow, the need for offices is likely to be increasing in most metropolitan areas, even those whose population may be stagnating. In addition, the economic activities and industries that use offices extensively seem to be among those most subject to agglomeration economies. Finally, offices provide a useful focus because data on office rents for many cities and countries are available in published and unpublished reports from five international real estate brokers and investment advisors.

Key Assumptions: The strategy of this study is dictated by the difficulties of devising direct

measures of whether governments are pursuing efficient infrastructure and land use policies. Our approach of inferring the efficiency of land and infrastructure policy from prices makes two important and problematic assumptions. The first is that we can control for all of the other factors besides land use and infrastructure

The cities with the large positive residuals fit, by and large, the hypothesis that high rents can be a sign of very restrictive land use policies.

policy that influence office rents. If so, we can interpret the difference between expected and actual rents as the effects of policy. The second assumption is that the average city is doing a good job of managing land use and infrastructure and thus can be used as a benchmark for efficient policy. If the average city is only mediocre, however, and there is a significant group of cities that are doing much better than average, then interpreting the differences between predicted and actual rents becomes more problematic. Without this assumption, therefore, unusually high or low rents alone are not enough evidence to be certain that a city's land use and infrastructure policies are poor.

Model: We regress nominal rents on a large number of variables thought to influence supply and demand, such as occupancy rates, metropolitan populations, utility costs, quality of government institutions, construction costs, real interest rates, expected gains from real appreciation, geographic constraints, Gross Domestic Product (GDP) per capita and climate. By controlling for these variables thought to influence supply and demand, we are then able to look at the residuals for each city to estimate the effect of a city's land use controls and infrastructure policies, as described above. Our results are in Table 1.

Table 1: Regressions

(1A) baseline regression using nominal exchange rates			(1B) Baseline regression using PPP exchange rates			
Observations	125			125		
Countries	39			39		
R squared	0.5809			0.7630		
	Coefficient	T-stastic		Coefficient	T-stastic	
Occupancy	3.217	***5.30		2.872	***4.93	
Population	0.271	***5.01		0.275	***4.93	
Const. wage	-0.192	-1.59		-0.198	*-1.91	
Cement price	-0.320	-0.89		0.155	0.81	
Interest rate	-0.101	-0.84		-0.138	-1.26	
GDP/cap grpwth	-0.027	-0.33		0.067	0.75	
Geography	0.052	0.41		0.076	0.61	
GDP/capita (natl.)	0.355	**2.66		-0.113	-0.60	
Pollution	-0.102	-0.98		-0.081	-0.84	
High temp.	-0.594	**2.15		-0.430	*-1.70	
Capital	-0.015	-0.16		-0.165	-0.18	
Constant	-6.877	***-2.88		-3.159	-0.95	
Largest positive residual			Residual			Residual
	India	Mumbai	+0.92***	India	Mumbai	+0.85***
	India	Dehli	+0.62**	India	Dehli	+0.54**
	Germany	Frankfurt	+0.59**	Germany	Frankfurt	+0.54**
	UK	Edinburgh	+0.58**	UK	Edinburgh	+0.53*
	UK	Birmingham	+0.57*	Switzerland	Zurich	+0.50*
	UK	Bristol	+0.56*	UK	Bristol	+0.47*
	UK	London	+0.52*	Brazil	Sao Paulo	+0.47*
	UK	Manchester	+0.51*	UK	Birmingham	+0.46
	Switzerland	Zurich	+0.50*	US	Charleston	+0.45
	Brazil	Sao Paulo	+0.46*	UK	London	+0.43
	Greece	Athens	+0.46*	Greece	Athens	+0.42
	US	Charleston	+0.43	UK	Manchester	+0.42
	Switzerland	Geneva	+0.41	US	Reno	+0.42
	Brazil	Rio	+0.40	Brazil	Rio	+0.42
	US	Reno	+0.40	Switzerland	Geneva	+0.41
	Netherlands	The Haque	-0.29	US	Houston	-0.29
	US	Nashville	-0.31	Canada	Montrael	-0.29
	Austria	Vienna	-0.31	Canada	Kitchener	-0.32
	India	Bangalore	-0.32	France	Lyon	-0.32
	US	Minneapolis	-0.33	Canada	Winnipeg	-0.33
	US	Milwaukee	-0.33	Chile	Santiago	-0.33
	Canada	Winnipeg	-0.34	Mexico	Mexico City	-0.33
	Chile	Santiago	-0.37	Philippines	Manila	-0.34
	US	Los Angeles	-0.45	India	Bangalore	-0.37
	India	Hyderabad	-0.45*	New Zealand	Auckland	-0.43
	Indonesia	jakarta	-0.46*	US	Los Angeles	-0.44
	Columbia	Bogota	-0.49*	Australia	Melbourne	-0.47*
Largest negative residual	Australia	Melbourne	-0.53**	India	Hyderabad	-0.51*
	Philippines	Manila	-0.55**	Canada	Edmonton	-0.54*
	Canada	Edmonton	-0.55**	Indonesia	Jakarta	-0.70***

***Significant at 1 percent

** Significant at 5 percent

* Significant at 10 percent

The cities with the large positive residuals fit, by and large, the hypothesis that high rents can be a sign of very restrictive land use policies. Eight of the cities with large positive residuals are in developed countries—the United Kingdom, Germany, Switzerland—that have reputations for fairly strong local planning controls. Within those countries, there are cities, like London, with unusually high rents for their size and income levels. Two more cities are in India: Mumbai, as expected, and Delhi, which also has a reputation for stringent development controls. The remaining five cities—Athens, Sao Paulo and Rio de Janeiro in Brazil and Charleston, North Carolina and Reno, Nevada in the United States—fit the hypothesis less obviously. Athens and Charleston presumably constrain development somewhat to preserve their historic character. Sao Paulo and Rio de Janeiro’s large residuals appear to be an artifact of our use of data on real interest rates from International Monetary Fund (IMF), since the IMF estimates of interest rates for Brazil are unusually high.

Also as expected, the cities with large negative residuals seem to fall into two groups, with some overlap. Many of the cities have reputations for being much more encouraging of development than their peers, often with little regard for the infrastructure that might be needed. Two cities—Jakarta and Manila—are notorious for high levels of traffic congestion that is usually blamed on development outstripping infrastructure. (Bangkok has a similar reputation, but its rents are only 16 percent lower than expected, perhaps because it opened a system of elevated toll expressways and two mass transit lines in the last 15 years.) Similarly, the two Indian cities on the list—Bangalore and Hyderabad—have been more enthusiastic about development than either Mumbai or Delhi, although they do not have reputations for congestion as severe as Jakarta and Manila. Los Angeles also complains often about congestion, which may have helped depress rents there. But many cities on the list also have reputations for innovative and high quality government,

such as Bogotá, Melbourne and Minneapolis and Milwaukee in Minnesota. Thus it is hard to know whether these cities have large negative residuals because they have allowed too much development and provided too little transportation infrastructure or because they are better at managing development and infrastructure than their peers. Presumably both types are represented.

Our regression results do not change greatly when PPP exchange rates are used instead of nominal exchange rates. They are also quite similar when we use a variety of robustness checks such as different construction price values and population measures, limiting the sample to larger and wealthier cities, and using city GDP instead of national GDP.

Conclusion

Though using rents as a benchmark for policy is complicated in practice, the empirical analysis of rents presented here is encouraging. The same cities keep on appearing in the lists of outliers, even using different specifications and samples, and our results align well with the reputations that certain cities have for their land control policies or quality of infrastructure. Our estimates suggest that the burden of poor land use and infrastructure policy can be very large, and thus imply a need for the cities to constantly reassess the policies they put into place.

RELATED PUBLICATIONS

Alonso, William (1971). “The Economics of Urban Size.” *Papers of the Regional Science Association* 26: 71-83.

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