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Analyzing
Urban Systems

In brief

- Around 5 billion people will be living in urban areas by 2025. We cannot view such cities in isolation. Each city is part of their country's overall urban structure, thus, policymakers are interested in learning how reducing spatial differences in productivity or amenities would effect how well off people are.

- There is a need for a quantitative model of a system of cities that can account for the interaction between different cities and be simple enough for policy analysis.

- The authors propose a framework to analyze urban system whereby cities differ in three basic characteristics: efficiency, amenities, and the quality of governance. The authors present a simple way of identifying these characteristics in the data, and then quantify the model and run counterfactual experiments to answer key policy questions.

- Key policy implications:
    - Reducing spatial differences in productivity and amenities makes people better off.
    - In some countries, the effect of spatial smoothing is much larger than in others.
    - Spatial productivity differences matter.
    - Restrictions to population mobility are costly.
    - Smooting out spatial differences does not necessarily imply that mega-cities will disappear.
    - Analyzing a city in isolation may be misleading
    - Cities are multi-dimension

- To implement this framework, the only data needed are population, income, consumption and hours worked at the level of a country's metropolitan areas. A simple step-by-step implementation guide is provided in Desmet and Rossi-Hansberg (2012b)

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Policy Motivation

"The Nigerian city of Lagos, for example, is expected to increase its population by 50% to nearly 16 million in the next decade and a half"

The trend towards ever greater urbanization is continuing unabatedly across the globe. According to the UN, by 2025 close to 5 billion people will be living in urbanized areas. Many cities, especially in the developing world, are set to explode in size. The Nigerian city of Lagos, for example, is expected to increase its population by 50% to nearly 16 million in the next decade and a half (UN-Habitat 2010). Some people believe that mega-cities are creating mega-problems, raising the question of whether we should restrict the growth of the world's largest cities.

When analyzing whether mega-cities have become too large, policy makers often focus on the fate of a particular city, such as Cairo, Shanghai or Mexico City. However, cities cannot be viewed in isolation; each city is part of their country's overall urban structure. Improving local infrastructure in one city may attract immigration from other cities, and policies that make intermediate-sized cities more attractive affect both smaller and larger cities. Motivated by a desire to make growth spatially more balanced, policy makers are interested in understanding how much better off people would be if policies were implemented that reduce spatial differences in productivity or amenities. But unfortunately, analytical tools to quantify the effects of such policies on a country's hierarchy of cities is often lacking.

There is thus a need for a quantitative model of a system of cities that is at the same time complex enough to account for the interaction between different cities but simple enough in terms of its structure and data requirements to be usable for policy analysis. Our project proposes such a simple theoretical framework and addresses a number of relevant policy questions by applying it to the urban systems of the United States, China and Mexico.

A Framework to Analyze Urban Systems

"People flock to cities in search of higher paying jobs and better amenities"

People flock to cities in search of higher paying jobs and better amenities. Many of the world's large metropolises, such as Los Angeles and Mumbai, are highly productive and are located next to large bodies of water. As cities grow in size, however, they start suffering from increased congestion, higher crime rates, and air pollution. How fast the benefits of efficiency and amenities erode with population size because of increasing congestion costs depends on the quality of governance, responsible for the provision of road infrastructure, sewage systems, clean water, and security. Motivated by this, in our framework cities differ in three basic characteristics: efficiency, amenities, and the quality of governance. These differences determine the overall city-size distribution. We present a simple way of identifying these city characteristics in the data. We then quantify the model and run counterfactual experiments that allow us to answer some of the relevant policy questions mentioned above (Desmet and Rossi-Hansberg, 2012a).

Policy Implications

Reducing spatial differences in productivity and amenities makes people better off

Because of congestion, being large is costly. If all cities had a productivity level equal to the country's average, population would generally tend to be more equally distributed across space, overall congestion would decrease, and people would become better off.

In some countries the effect of spatial smoothing is much larger than in others

In the U.S. and Mexico reducing spatial differences in productivity or amenities has modest effects on people's well being, whereas in China the potential effects of such policies are huge.

Spatial productivity differences matter

In the U.S. and Mexico productivity differences across space are substantially smaller than in China. This explains why the positive effect of smoothing spatial differences is so much greater in China.

Restrictions to population mobility are costly

We find evidence consistent with restrictions to the inflow of population in China's most efficient cities. The welfare effects of lifting such restrictions are potentially enormous. As in Au and Henderson (2006), China's largest cities are too small.

Smoothing out spatial differences does not necessarily imply that mega-cities will disappear

If all U.S. cities had the same productivity, the overall city-size distribution would hardly change, although some of the current mega-cities would decline and new mega-cities would pop up. In China the effect is even more extreme: new mega-cities would emerge that are substantially larger than Beijing and Shanghai. Only in Mexico do we see a significant reduction in the population of its mega-city, without a new mega-city taking its place.

Analyzing a city in isolation may be misleading

Cities do not exist in isolation; analyzing urban policies requires taking into account the interactions between cities.

Cities are multi-dimensional

One would expect that reducing differences in productivity across cities would make cities more equal in size. The finding that this does not always happen has to with differences in the other dimensions of cities --- amenities and governance

Implementation

The examples of the U.S., China and Mexico illustrate that implementing this framework to do relevant policy analysis is straightforward. The only data needed are population, income, consumption and hours worked at the level of a country's

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metropolitan areas. To facilitate the implementation of this framework, in Desmet and Rossi-Hansberg (2012b) we provide a simple step-by-step guide that can be used to replicate and extend our policy analysis for other countries.

Further Readings

Au, C.-C. and Henderson, J.V., 2006. "Are Chinese Cities Too Small?," *Review of Economic Studies*, 73, 549-576.

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About the authors

Klaus Desmet is a Professor at the Universidad Carlos III de Madrid.

Esteban Rossi-Hansberg is a Professor of Economics in the Economics Department and Woodrow Wilson School at Princeton University. He performs research in macroeconomics, international trade, and urban economics. His research focuses on the internal structure of cities, the distribution of economic activity in space, economic growth and the size distribution of cities, the effect of offshoring on wage inequality, the role on information technology on wages and organization, and firm dynamics and the size distribution of firms. Rossi-Hansberg was a faculty member in the Economics Department at Stanford University. He is a faculty associate of the National Bureau of Economic Research (NBER) and his research receives support from the National Science Foundation. He received his Ph.D. from the University of Chicago.

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