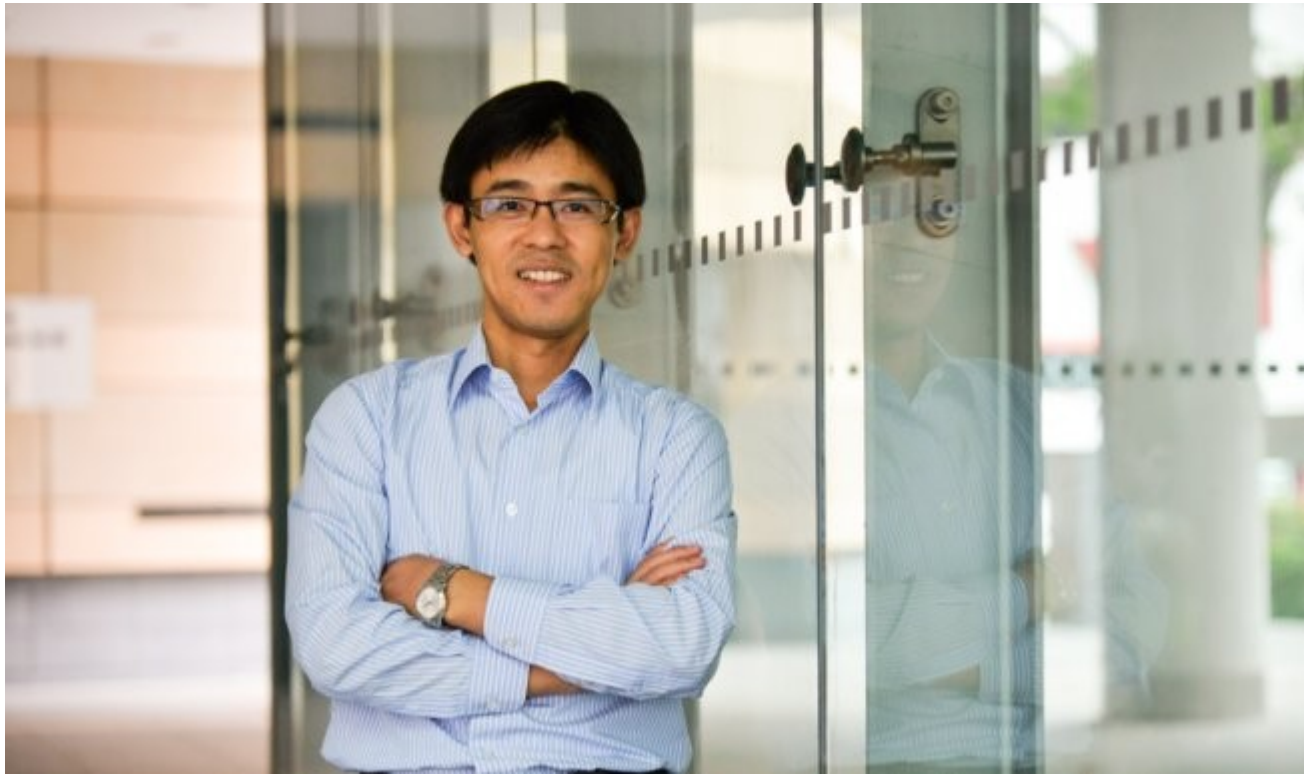


Letting Cities Develop Naturally

SMU Assistant Professor Hsu Wen-Tai uses mathematical models to study urban landscapes and what makes big and small cities different.



AsianScientist (Feb. 26, 2015) - By Sim Shuzhen - A look at the world map tells us that countries and cities vary greatly in size, and that there are many more small cities than there are big ones. Interestingly, such uneven distribution of city sizes can be quite accurately described by a mathematical relationship known as the power law. For example, the population of the largest city in a country is approximately twice the size of the second largest city and thrice the size of the third largest one.

Social scientists have struggled for a long time to find a reasonable explanation for such a regular pattern. Some popular theories are based on the idea that cities grow at random rates. In other words, large cities will only develop when a sequence of conducive events occurs over the course of history. However, given that the probability of this happening is small, big cities are comparatively rare.

The problem with these random growth models is that spatial relationships among cities typically have no effect on city size distribution. This notion is questionable not only because cities exist in geographical space, but also because growing evidence suggests that geography does affect economies – for example, inter-regional and international distance can affect trade between cities and countries.

A modern update to a classic theory

Assistant Professor Hsu Wen-Tai of the Singapore Management University (SMU) School of Economics has a deep interest in how spatial relations affect the economic landscape. His recent work has provided an updated explanation of the power law to acknowledge the importance of geographical relationships among cities.

Professor Hsu's model is based on central place theory, an idea which was proposed decades ago to explain the size and distribution of human settlements, but which has seldom been formalised.

The key idea behind the theory is that goods and services provided by cities vary in economies of scale. Goods and services that cater to large numbers of people (such as stock exchanges, concert halls and stadiums) are only found in a few places, while those that cater to smaller markets (such as petrol stations, convenience stores and post offices) are more widely available.

As large cities provide a much wider range of goods and services, smaller cities are usually located in the market areas of large cities so that they can tap on the supply of goods which they lack. According to central place theory, these factors drive the differential development of large and small cities.

"The two papers that I have written lay a modern microeconomic foundation for central place theory to explain the different locational patterns of different sized cities and how these patterns are intertwined in a hierarchical way. The underlying economics is a combination of competition among firms and the pivotal difference between industries in terms of the scale of the markets that they serve. The hierarchy of cities so formed is called a central place hierarchy," he notes.

In addition to formalising the central place theory, Professor Hsu's main contribution is the finding that the power law can emerge from a central place hierarchy under quite modest conditions.

Letting the markets take their course

Professor Hsu's research sports a key theme: the unevenness of the urban landscape is actually a natural phenomenon driven by the economy. Pushing back against these natural agglomeration forces—as can happen when governments implement unnecessary development initiatives in smaller cities, for example—may prove counter-productive.

"Although there are numerous externalities involved in the formation and development of cities, it appears that optimal city development happens when markets are allowed to take their course. There are many examples of failed public investments in poor regions because decision makers ignored the fact that markets tend to cluster in areas where goods and services are already present," he explains.

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“You wouldn't want every region in a country to have a science park because multiple centres will crowd out each other's market. In the end, only one centre will succeed or none at all. Yet, irrational policies like this occur because of political pressure from poor regions, especially when such regions become pivotal areas during elections.”

Translating a love for maps into a career

When asked what would be the next major research focus in spatial economics, Professor Hsu notes that China and India, with their rapidly changing human and economic landscapes, will be the most exciting regions in which to study spatial economics. Although the United States and Europe underwent similar urbanisation in the past, the disciplines of urban and regional economics have only just matured to a level whereby these changes can be studied rigorously. The other powerful enabler is modern computing capacity.

For Professor Hsu, part of the appeal of economics lies in the field's ability to explain human behaviour from the perspective of incentives and market interactions.

“Both urban and regional economics, as well as international trade, are fields that are relatively applied, meaning that it has a lot to do with real life. Imagine how beneficial it would be if we can find a compelling theory that allows people to comprehend what is going on in the real world,” he says.

However, the motivation behind his interest in spatial economics goes deeper than that.

“When I was a kid, I used to stare at maps, scrutinising the details and imagining what went on in real life behind those maps. I like to observe how people live their lives in different ways, in different geographical areas,” he shares.

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