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**Science of cities**

One has always been in favour of good qualitative research as it captures the depth of social realities better. However, quantitative research if done well could also be very useful in bringing to the fore the broad patterns.

Geoffrey West’s 2017 book ‘Scale’ is a path-breaking publication that has used big data to reveal the larger trends in the biological and sociological world. Today, in this article, we are going to focus on the chapters of the above-mentioned book that explore the science of cities.

The bottom-line of the write-up is that the science of cities is not linear. This is music to the ears of social scientists as we often start critiquing phenomena that are described as linear to us and point out that the social world is much more complex. However, the book states the infrastructure and energy sources of the cities are sublinear (0.85 whose value is less than 1) and positive and negative social aspects of living in the cities such as patents, innovation, crime and disease is superlinear (1.15 whose value is more than 1).

The book states that cities are “scaled” versions of each other. In other words, all cities all over the world share certain characteristics and they are common to all of them. Though one must point out that the science of cities described in the book is more relevant to the developed world.

The book explains that cities facilitate human interaction and this leads to what is described in the literature elsewhere as conglomeration effect. So, people living in the cities are going to be 15 percent more productive and earn higher wages than those not living in big cities. Similarly, crime and disease are also going to be 15 percent higher for those living in big cities.

In developing countries like Pakistan, cities like Islamabad are much safer than rural areas and also experience less disease. So, the science of cities discussed in the big may be more relevant for the developed world’s big cities. Yet, it describes interesting insights and is worth reading.

That the science of cities is not linear means that when the population of a city doubles, it does not mean that it needs twice as much infrastructure and energy sources, though intuitively one would like to think that way. With each doubling of the city, only 0.85 additional infrastructure and energy sources are needed and not twice as much as linearity would stipulate. In other words, there is ‘value-added’ as the scale of cities increases and it is called ‘increasing returns to scale’.

Take the example of petrol stations as part of the transport infrastructure. Big cities need less petrol stations on a per capita basis because every petrol station in a big city serves more people and sells more fuel per petrol station than it would in a small city. Thus, there is a “systematic economy of scale”. The same is true for other infrastructure and energy sources such as roads, transport networks, water and power supply consumed in the big cities. The same “mathematical scaling law” is applicable with an additional 0.85 resources in all big cities all over. Each doubling of population only needs 85 percent more infrastructure and not 100 percent more.

This scaling law of the science of cities has important environmental consequences. While intuitively we think big cities are a source of more pollution and it is true in a certain sense, this work on cities states that the bigger the city, the greener it is for the world as it needs relatively less infrastructure sources and has less carbon footprint on a per capita basis.

Cities are much more than infrastructure. Cities are about people, about social networks and facilitate ideas and productivity through human interaction. The author states that cities “emerge from the underlying dynamics and organization of how people interact with one another through social networks. To repeat: cities are an emergent self-organizing phenomenon that has resulted from the interaction and communication between human beings exchanging energy, resources, and information”. Similarly, following the same scaling laws, those living in the big cities are going to have 15 percent higher wages and patents.

Cities benefit from “high social connectivity” between its inhabitants and it leads to them solving problems in diverse ways. It leads to “positive feedback loops” and multiplies innovation and productivity. These laws of scaling are applicable beyond the divisions of history, geography, and culture. Cities integrate “physical infrastructural networks” with the “social networks” dynamics. In other words, the infrastructural sublinear scaling (0.85) complements the social super-linear scaling (1.15).

This work on cities also puts into question the notion of open-ended growth that has propelled urbanization with the “discoveries of iron, steam, coal, computation, and most recently, digital information technology”. There is a need to think of the long-term sustainability of such open-ended growth of cities. Though cities have less carbon footprint on a per capita basis than non-cities, there is still a need to analyse the consequences of continuous cycles of innovation and productivity.

The science of cities presented in the book sounds convincing for the developed world, though one need not buy it whole-heartedly. There is a need for more research on it in the context of developing countries where there is peripheral capitalism and cities dynamics may be different.

Developing countries have informal economies and urbanization research states that it needs to be analyzed in terms of the inroads it made in areas that are not yet formally considered urban. All social science research has broader patterns. This book needs to be commended for bringing some of those trends in the limelight.

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