BRIGHT SPOTS OF THE GLOBAL ECONOMY: Improving our night-time illumination data will shine new light on economic activity

A new database of night-time light intensity from space created by Melanie Krause and Richard Bluhm – to be presented at the annual congress of the European Economic Association in Geneva in August 2016 – will help to create better measurements of economic activity in cities and regions that official statistics don't record.

Survey-based measurements of GDP often fail to reflect regional differences in countries, for example not distinguishing between economic activity in urban and rural locations. Measurements of light emitted by cities, recorded by satellites, have helped economists since 2012. But all very bright areas saturate the sensors, and so tend to underestimate economic activity in places like New York or Lagos.

These researchers are using external data to improve data quality, and are creating a corrected panel data set of night-time light for the entire world, covering the period from 1992 to 2013. They say: ‘We intend to make this new data available to researchers and practitioners. This way, night-time lights can be used as a proxy for local economic activity both in developing and developed economies, rural and urban regions.’

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How is economic activity distributed within a country? Which regions are bustling centres of activity, which areas are lagging behind and how large is the rural-urban divide? The lack of data on local economic activity makes these questions hard to answer. In developing countries, where even GDP data on the national level is often inaccurate, high quality local data is particularly hard to come by.

Thankfully, the intensity of night-time lights has recently emerged as a very good indicator of local economic activity. Hence, observing a particular place from out of space during the evening can literally shed light on growth, inequality and development at the local level. There is one big problem with these data, however: the satellites fail fully to capture very bright lights and therefore underestimate the economic importance of cities.

These researchers apply a correction procedure that infers these top lights from other occasionally observed data. With the raw data, they find that in 2013, global spatial inequality in lights is considerably lower than estimates of global income inequality (the Gini coefficient is 0.44).

After their top lights correction, inequality in lights increases by more than ten percentage points to 0.56, reaching levels that are roughly comparable to income inequality in, for example, Latin America. The large difference in these two estimates underlines the importance of big cities as centres of global economic output.

How do lights capture output and consumption? Virtually all man-made economic activity emits lights, ranging from factory lighting over lit public infrastructure to residential homes. Weather satellites capture light emissions around 8pm to 10pm local time at every corner of the earth. The data are freely available as a yearly panel for 1992 to 2013 at a high resolution of around 1 square kilometre.
In recent years the economic research literature has discovered their potential, for example Henderson et al (2012), who use these data to study the growth performance of nations in their seminal publication in the American Economic Review.

The use of the lights data has, however, been constrained by measurement problems, particularly in the developed world, which tends to be highly urbanised and very bright. A major problem is that the satellite data are top-coded because the sensors saturate at high levels of brightness. In other words, they cannot distinguish the city centre of Geneva from that of New York City. The maximum observable brightness is already reached by a mid-sized city.

The new analysis shows that the lights of megacities such as New York, Tokyo and Seoul (but also Lagos and Jakarta) should be more than 10 times as bright as recorded in the data. Obviously, failing to capture the true brightness of big cities distorts estimates of regional inequalities and underestimates urban-rural differences.

The correction of the top-coding problem in the new study relies on methods from the top income literature. There too, top earners are usually not observed in surveys but have to be recovered from auxiliary data such as tax returns.

The researchers extend this approach into the spatial literature and then reconstruct the lights of big cities of the world. As highlighted above, the corrections make a large difference: global inequality rises and the local light-output relationship becomes considerably stronger.

The researchers are now working on a top-coding corrected panel data set of night-time lights for the entire world covering the period from 1992 to 2013 and intend to make this new data available to researchers and practitioners. This way, night-time lights can be used as a proxy for local economic activity both in developing and developed economies, rural and urban regions – and a whole host of important questions may be answered with greater confidence.

ENDS

‘Top-Lights – Bright Spots and their Contribution to Economic Development’
Presented by Melanie Krause (University of Hamburg), joint work with Richard Bluhm (University of Hannover)
EEA Presentation in ‘Growth and Development I’, Monday 22 August, 13:45-15:20

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