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# Global Metropolitan Areas: The Natural Geographic Unit for Regional Economic Analysis

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# Global Metropolitan Areas: The Natural Geographic Unit for Regional Economic Analysis

BY STEVE COCHRANE, MEGAN MCGEE AND KARL ZANDI

**A**n understanding of subnational economies must begin with a definition of a functional economic region for which data can be collected and models of economic activity can be appropriately constructed. Metropolitan areas, as opposed to fixed administrative units, represent individual and unified pools of labor that form cohesive economic units. Because they are defined in economic terms, metropolitan areas are better suited than other sub-national geographic units for regional economic forecasting and global comparisons.

Metropolitan areas are the key geographic unit for regional economic analysis within nations and states. Economic activity concentrates in metropolitan areas through interactions among businesses, people and governments where investors may benefit from large labor markets, public infrastructure, and deep pools of consumers<sup>1</sup>. The proximity of such elements further creates productivity that leads to economic growth and ultimately drives the broader national and global economy. Indeed, firms benefit by locating in metro areas that maximize productivity growth and that are likely to contribute most to global economic growth<sup>2</sup>.

Moody's Analytics has developed a unique global system to define metropolitan areas for practical regional economic modeling, forecasting and analysis. This system creates, for the first time, a set of consistent metropolitan area definitions with global coverage for which time series economic data is available. Thus, Moody's Analytics accomplishes two objectives. First, it accommodates comparison across

space and time of similar functional economic units—metropolitan areas. Second, it creates a spatial definition of metropolitan areas that can be modeled.

## Defining Metropolitan Areas

A metropolitan area is defined as a core urbanized area and the adjacent areas tied together by strong economic connections. They form unified labor pools that are linked by infrastructure for daily commuting and form service regions for consumers and businesses. A metropolitan area typically spans a number of local government authorities.

The Organization for Economic Cooperation and Development (OECD) defines such an economic area as a geographical space within which a number of economic links are concentrated, most obviously labor markets but also networks of firms, important parts of supply chains, and relations between firms and local authorities<sup>3</sup>. Commuting is at the heart of a metropolitan region, as it brings together firms and workers through transport and telecommunications infrastructure<sup>4</sup>.

## The Natural Unit for Regional Economics

Regional economists have a wide spectrum of subnational functional economic regions to consider for analysis, such as states, counties and municipalities in the U.S. or NUTS 1,2, and 3 and LAU 1 and 2 in Europe. Although there are reasons to study subnational economics at each level of geography, metropolitan areas are the natural choice for modeling, forecasting and global comparisons for several reasons:

- » They represent complete labor markets, enabling equilibrium-based modeling.
- » Considering complete labor markets leads to more robust modeling and more accurate regional forecasting.
- » Their boundaries, defined in economic terms, mitigate the influence of local political boundaries on regional economic analysis.

Historically, Christaller and Lösch's development of Central Place Theory nearly a century ago first identified ways to create a hierarchical structure of functional economic units to identify the optimal location of industries<sup>5</sup>. These functional

1 See Emilia Istrate, Alan Berube, and Carey Anne Nadeau, Brookings Institution Metropolitan Policy Program: Global MetroMonitor 2011, Volatility, Growth and Recovery, 2012, p. 4.

2 McKinsey Global Institute: Urban World, Mapping the Economic Power of Cities, p. 1, March 2011.

3 OECD Territorial Reviews: Competitive Cities in the Global Economy, p. 31, ISBN 92-64-02708-4, 2006, p.31.

4 OECD (2006) p.33.

5 See W. Christaller (1933) Die zentralen orte in Süddeutschland. Translation: C.W. Baskin (1966) Central places in southern Germany. Prentice-Hall, Englewood Cliffs; A. Lösch (1941) Die raumliche ordnung der wirtschaft. Translation: W.H. Woglom and W.P. Solper (1954) The economics of location. Yale University, New Haven.

economic units were based on population centers with a fixed geographic shape and range to describe where goods were produced within the hierarchical system. Further, their definition depended upon input-output linkages between and among firms and households.

However, contemporary regional linkages are arguably more commonly established via commuting patterns rather than strictly by industry linkages, a trend that has been accelerated by improved transportation systems and rural-to-urban migration due to labor productivity growth<sup>6</sup>. Commuting patterns reflect a common labor pool for a region, as well as a common pool of consumers of goods and services. A geography based on fixed boundaries and input-output linkages does not capture these dynamics.

This combination of demographic trends and industrial structure within a metropolitan area defined by commuting patterns accommodates the estimation of an economic model that can simulate their interaction and growth. Within such a complete labor market, a model can be developed to endogenize employment, income and demographic trends in the context of local agglomeration economies within the area and trade patterns with external economies. These more robust models, in turn, facilitate more accurate forecasting of subnational economies.

Contemporary functional economic units—metropolitan areas—are defined in a bottom-up way based on population centers and commuting patterns and can change over time, staying current as commuting patterns change. In contrast, Christaller and Lösch's earlier fixed geographic definition of functional economic units reflected the traditional top-down identification of lower-order government units such as counties in North America or the various municipal entities across Europe that Eurostat identifies as NUTS 3 regions.

Furthermore, the geographic structure defined top-down by lower-order government units and political boundaries varies widely between countries, often making comparative

6 See Gordon F. Mulligan, Mark D. Partridge, and John I. Carruthers, (2012) Central place theory and its reemergence in regional science, *Annals of Regional Science*, 48: pp. 405-431.

economic statements difficult, if not impossible, to interpret. Analysis using metropolitan areas enables comparison of regional economies because their boundaries are constructed in economic terms rather than political terms. Thus the often-arbitrary influence of local administrative boundaries can be mitigated from regional economic analysis.

### The Need for a Practical Global System

Achieving the benefits of analysis of metropolitan areas relies on the capability to systematically define them and obtain sufficient time-series economic data. Indeed, they usually comprise a number of officially recognized units of local government such as counties, districts and cities. Thus, their construction may vary from country to country, their location and spatial boundaries will change over time as they grow, and hence their recognition as critical economic units can be questioned if not defined in a uniform way.

A practical system to specify global metropolitan area definitions for regional economic analysis must satisfy several criteria:

- » The defined metropolitan areas must be, or closely approximate, cohesive economic units representing complete labor markets.
- » Time series economic data for the areas constituting each metropolitan area must be available.
- » The system must be capable of being applied globally to countries for which sub-national economic data is available.
- » The system must be dynamic to accommodate changes in metropolitan boundaries and subnational geographic redefinitions.

We undertook the effort to develop a global metropolitan area definition system because no previous definitions met all necessary criteria. Efforts by the European Observation Network for Territorial Development and Cohesion, or ESPON<sup>7</sup>,

7 ESPON project 1.4.3 - Study on Urban Functions; Final Report. European Observation Network for Territorial Development and Cohesion (ESPON), March 2007. [http://www.espon.eu/export/sites/default/Documents/Projects/ESPON2006Projects/StudiesScientificSupportProjects/UrbanFunctions/fr-1.4.3\\_April2007-final.pdf](http://www.espon.eu/export/sites/default/Documents/Projects/ESPON2006Projects/StudiesScientificSupportProjects/UrbanFunctions/fr-1.4.3_April2007-final.pdf)

Eurostat's Urban Audit<sup>8</sup>, and the OECD<sup>9</sup> have resulted in partial definition sets that are instructive but lack full global coverage and do not guarantee that time-series data are available. ESPON and Urban Audit cover only metropolitan areas in Europe. Furthermore, data are not available for the Large Urban Zones (LUZ) defined by the Urban Audit on a regular basis. OECD does have a more global footprint, but only for the largest metropolitan areas, not covering many of the secondary cities that businesses and investors need to analyze and understand.

### Global Metropolitan Area Definition System

Moody's Analytics has developed a practical system to define metropolitan areas globally for regional economic analysis by aggregating subnational administrative units for which economic data exist (see Charts 1 and 2). These definitions specify that geographic areas contain, to the extent possible, all economic activity associated with each functional metropolitan area and no more. Constructed in this manner, these definitions guarantee data availability and mitigate biases that could be created by the peculiarities of a country's subnational administrative structure.

The process to specify the subnational areas constituting each global metropolitan area begins with a review of the geographic and administrative structure of each nation for which metropolitan areas are to be defined. Chart 3 illustrates the decision process by which Moody's Analytics constructs each metropolitan area based on this geographic structure.

If for a given country there exist national metropolitan definitions or a generally accepted definition from a private entity, Moody's Analytics uses those definitions. For example, the Moody's Analytics metropolitan areas system uses metropolitan statistical areas (MSA) provided by the Office of Management and Budget in the US and

8 Metropolitan Regions. Eurostat. [http://epp.eurostat.ec.europa.eu/portal/page/portal/region\\_cities/metropolitan\\_regions](http://epp.eurostat.ec.europa.eu/portal/page/portal/region_cities/metropolitan_regions)

9 OECD Territorial Reviews: Competitive Cities in the Global Economy. OECD Publishing, 01 Dec 2006.

Chart 1: Countries Aggregated into Metropolitan Areas

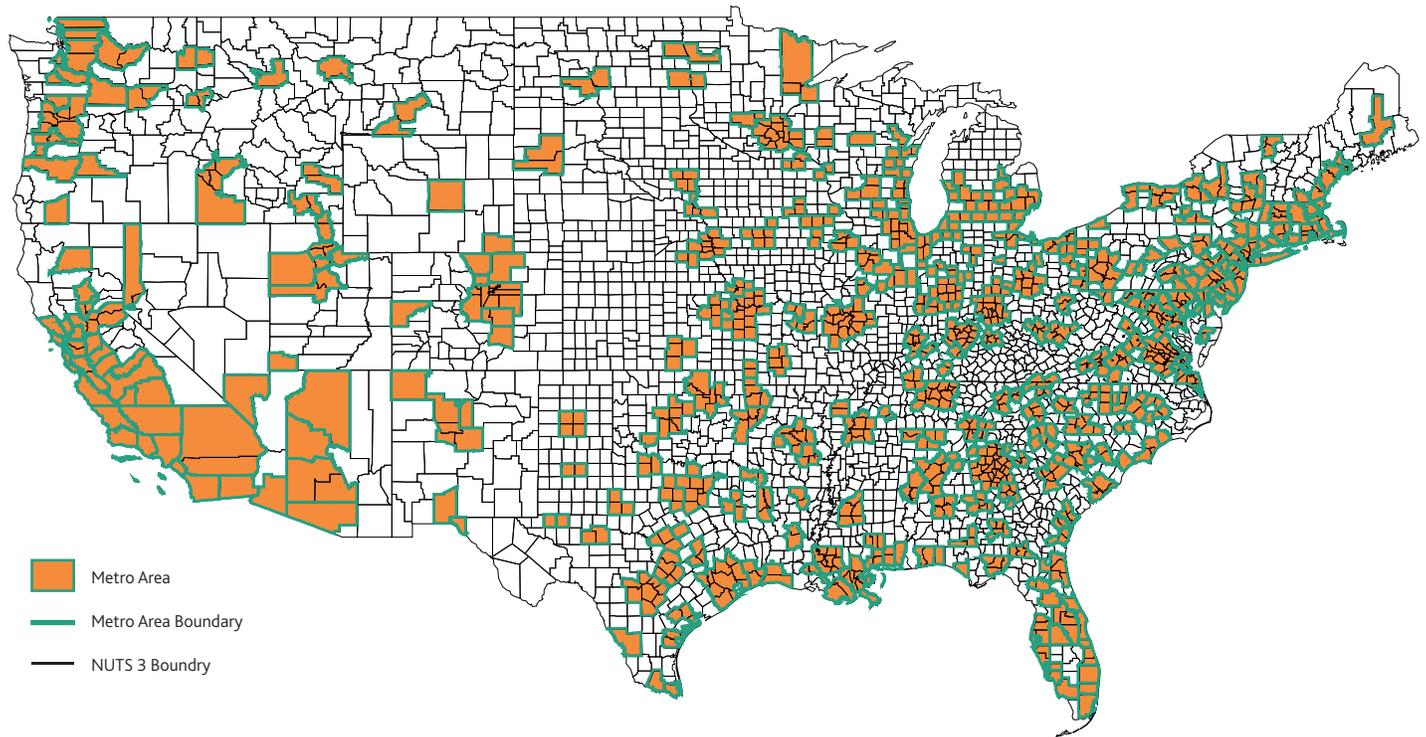
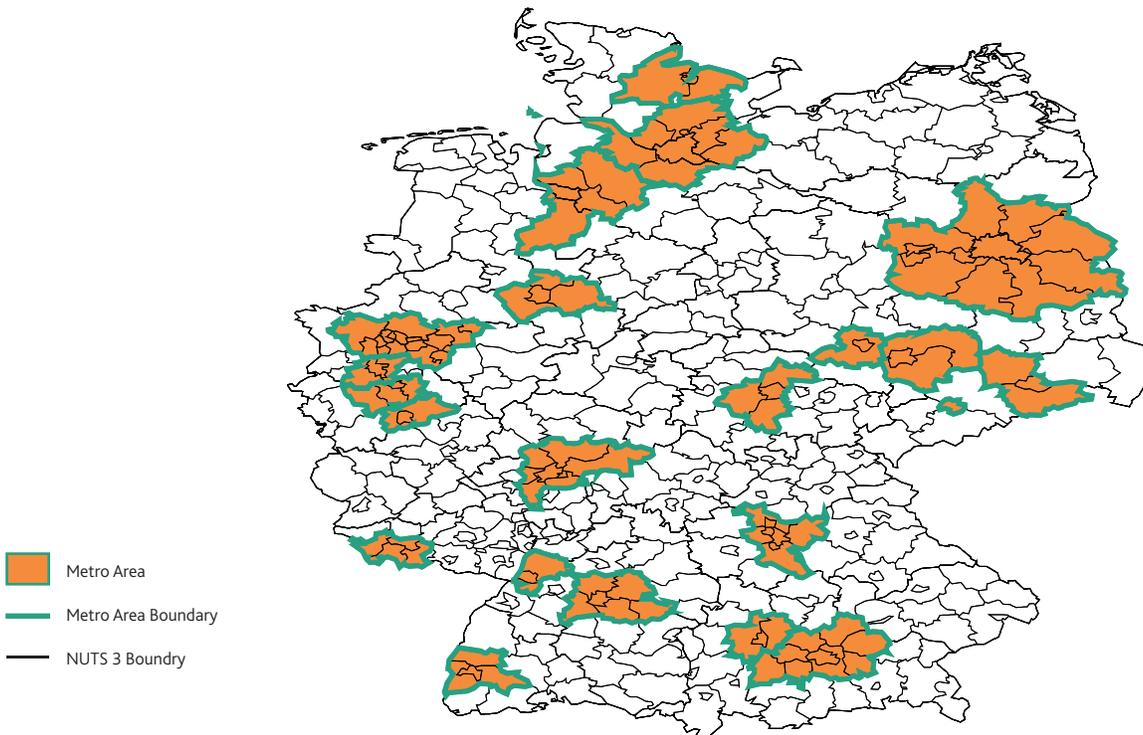
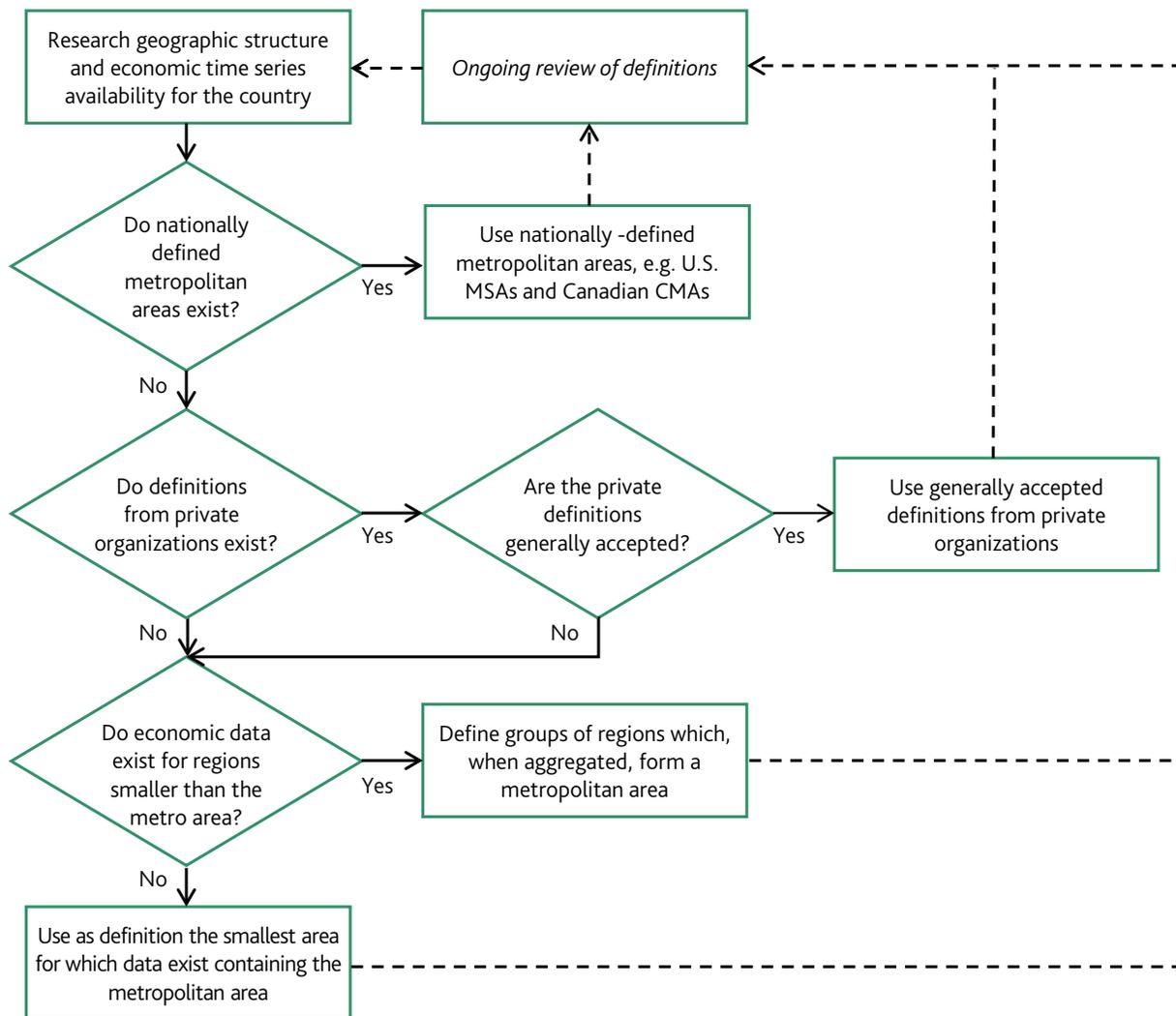


Chart 2: NUTS 3 Aggregated into Metropolitan Areas



**Chart 3: Decision Process to Define Global Metropolitan Areas**



census metropolitan areas (CMA) provided by Statistics Canada in Canada.

If no national or other generally accepted definition exists, Moody's Analytics will seek to identify geographic units one level smaller than the metropolitan area for which time-series economic data are available and whose aggregate forms a metropolitan area. The decision of which units to include in the aggregate is informed by study of population densities, commuting patterns and/or inferences drawn about commuting from household, and establishment employment surveys.

If time-series data are not available for units smaller than the metropolitan area, Moody's Analytics then seeks the smallest region containing the metropolitan area for which time-series data exist.

The final component of this system is ongoing review of global metropolitan area definitions to account for changes to the underlying geographic structure and boundaries of the administrative units that are used in the aggregation as well as changes in the size and shape of the metropolitan economy. Subnational administrative boundaries can and do change. By review-

ing definitions when subnational redefinitions occur and employing data estimation techniques this system ensures unbroken time-series availability over time, provided sources continue reporting data. Also, the ongoing review allows the Moody's Analytics definitions to grow or contract if a metropolitan economy's boundary shifts as commuting patterns change.

Therefore, through this system of construction and review, Moody's Analytics Global Metropolitan Areas meets the necessary criteria for a practical, global definition set for subnational economic analysis.

# About the Authors

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Steven G. Cochrane is managing director of Moody's Analytics. Steve oversees the U.S. regional forecasting service and directs the research and development activities of the research staff. He oversees the forecasts for all 50 states and developed the Global Cities service. He also edits the Regional Financial Review, the monthly publication that analyzes U.S. macro, regional, industry and international trends. An analyst with Moody's Analytics since 1993, Steve has been featured on Wall Street Radio, the PBS NewsHour, and CNBC. He earned a PhD in regional science at the University of Pennsylvania, a master's degree at the University of Colorado at Denver, and a bachelor's degree at the University of California at Davis.

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Megan McGee is assistant director of Data Services for Moody's Analytics. She is responsible for developing and maintaining the company's estimated data products, including global national and sub-national historical estimates and the U.S. detailed employment, output, and wages datasets. Megan holds a bachelor's degree from Pennsylvania State University.

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Moody's Analytics added Economy.com to its portfolio in 2005. Its economics and consumer credit analytics arm is based in West Chester PA, a suburb of Philadelphia, with offices in London and Sydney. More information is available at [www.economy.com](http://www.economy.com).

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