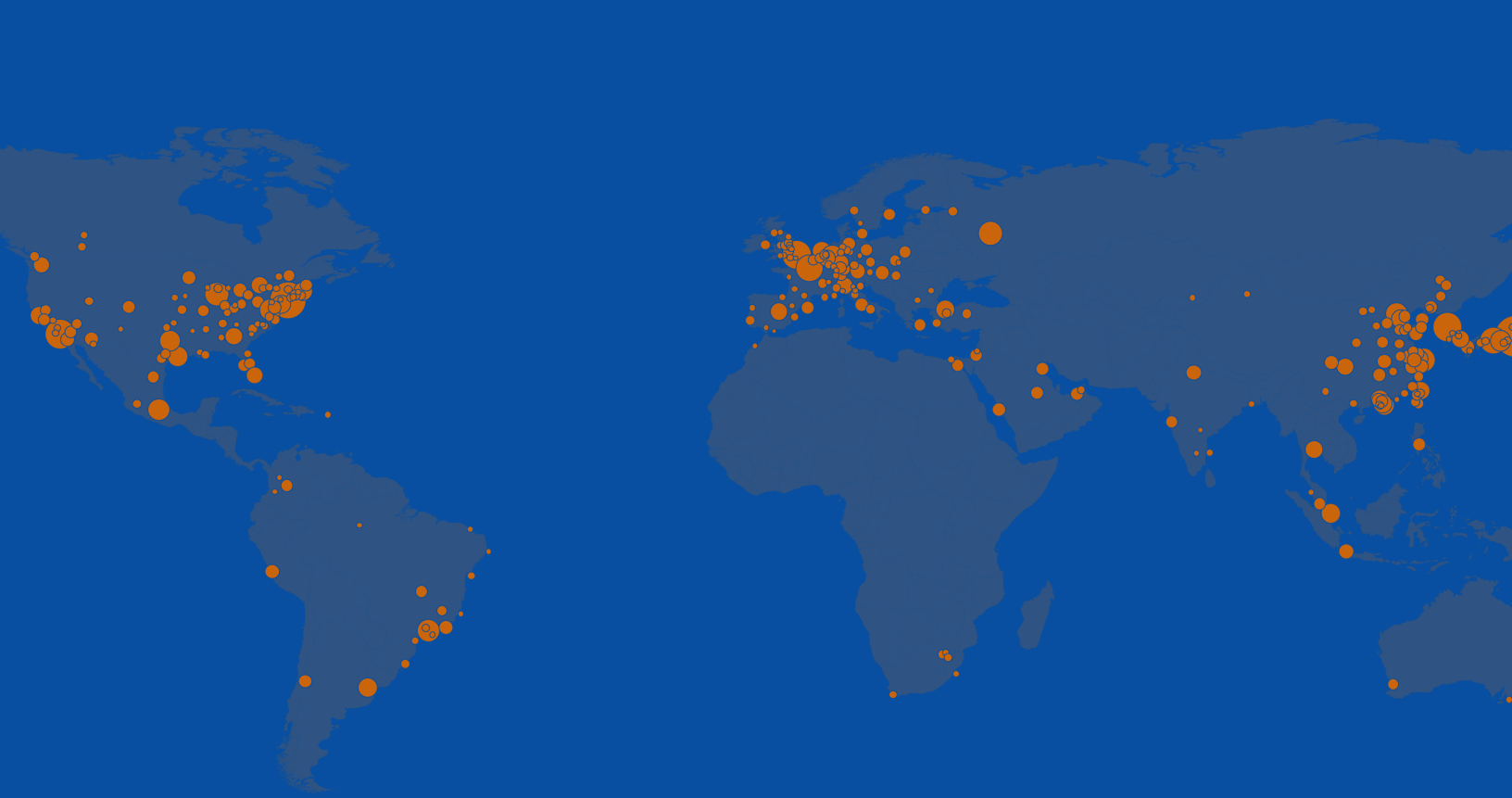


GLOBAL METRO MONITOR 2012

SLOWDOWN, RECOVERY, AND INTERDEPENDENCE

Metropolitan Policy Program
at BROOKINGS

GLOBAL METROMONITOR 2012

SLOWDOWN, RECOVERY, AND INTERDEPENDENCE

EMILIA ISTRATE AND CAREY ANNE NADEAU

FINDINGS

An analysis of GDP per capita and employment changes from 2011 to 2012 for the largest 300 metropolitan economies worldwide, which account for nearly one-half (48 percent) of global output but contain only 19 percent of world population, shows that:

- **Three-quarters of the fastest-growing metropolitan economies in 2012 were located in developing Asia, Latin America, and the Middle East and Africa.** By contrast, almost 90 percent of the slowest-growing metro economies were in Western Europe and North America. These recent trends reflect the accelerating shift of economic growth from developed metro areas in the global West towards developing metropolitan areas in the global South and East.

- **Compared to their countries, more than half of metro areas outperformed on employment growth in 2012, but only 40 percent achieved faster GDP per capita growth.** Fifty-six (56) metro areas were pockets of growth in their countries, with both GDP per capita and employment expanding at a faster pace than national averages.

- **Almost three-quarters of the 300 metro areas had higher levels of employment and/or GDP per capita in 2012 than in 2007.** Most metro areas in the developing Asia- Pacific and Latin America regions suffered no recession in the last five years or fully recovered to pre-recession levels, while only five North American metro areas managed to recover in both employment and GDP per capita. About 46 percent of metro areas, mostly in North America and Asia-Pacific, achieved higher employment and/or GDP per capita growth rates in 2011-12 than before the worldwide downturn.

- **Growth rates of both GDP per capita and employment slowed between 2011 and 2012 compared to the previous year for half of the 300 metro areas.** Only in developed Asia- Pacific metro areas did combined GDP per capita growth accelerate last year, and among developed economies only North American metro areas achieved faster aggregate job growth in 2012 than in 2011.

- **Both national and local factors influence metropolitan economic growth.** The previous year's metro GDP per capita, the previous year's national GDP per capita growth, and industry performance most affect annual changes in metro GDP per capita growth in the short-term. Over the long run (2000 to 2010), factors including national GDP per capita growth, initial metro GDP per capita, metro industry specialization, and metro human capital stock influence changes in a metro area's standard of living.

While the global economic recovery slowed in 2012, the world's largest metropolitan economies continued to have very different growth experiences. Disparities loom both across major world regions and within them, reflecting differences in metro industrial structure, national growth rates, and metro starting points. These differences did not obscure the underlying long-term shift of economic growth from developed to developing metro areas. Yet 2012 also highlighted the interdependence among these metro areas, with macroeconomic shocks traveling quickly through financial and trade channels and through extended global supply chains. Metro areas cannot build their way to prosperity on their own, and must work with national and state governments, and other metro areas at home and abroad, to establish "collaborative advantage" and secure future growth.

INTRODUCTION

The slowing of the global recovery continued in both developed and developing countries in 2012. After a weak 2011, many hoped for stabilizing global growth in 2012 and accelerating growth in future years. As the year progressed however, the chances of this scenario grew dim. In April 2012 the International Monetary Fund (IMF) improved slightly its forecast for global output relative to January 2012, but returned to its initial predictions by the end of the year, revising downward growth projections for both developed and developing countries.[1]

Some metropolitan economies defied the slowdown trend with accelerating growth in 2012 or recovered to pre-recession levels.

Major unresolved issues from 2011 carried over into 2012. The European Union continued to battle fiscal and debt problems, and the U.S. recovery struggled to gain a foothold. Low growth and uncertainty in developed economies affected both large and small emerging economies, exposing domestic weaknesses in those markets. No major national economy is powering a global recovery.

These assessments, however, overlook the fact that the economy is not organized at the super-regional or national levels, but rather in the cities and metropolitan areas that make distinctive contributions to global growth and prosperity. Now, more than ever, it is essential to examine growth patterns in these places. Because metropolitan areas concentrate national and global population and output, understanding their dynamics crucially informs the broader macroeconomic picture. And grim national outlooks miss the variable performance of metropolitan areas and the clues it provides to the sources of growth and recovery. Some metropolitan economies, in contrast to their countries, defied the slowdown trend with accelerating growth in 2012 or recovered to pre-recession levels.

This edition of the *Global MetroMonitor* is the third in a series started in 2010, initially co-produced by Brookings and the London School of Economics Cities Program.[2] The *Global MetroMonitor* also builds on the model of the U.S. *MetroMonitor*, which tracks, on a quarterly basis, key economic trends in the 100 largest U.S. metropolitan areas. The goal of this annual report is to compare growth patterns in the largest metro areas around the world, with a focus on the past year's performance.

This 2012 *Global MetroMonitor* assesses the economic performance of the world's largest metropolitan economies in 2012 in three key dimensions: relative to one another; relative to their countries; and relative to their own performance in 2011 and before the worldwide recession, including the degree to which they have recovered from the downturn. The report also examines which national and metropolitan-level factors most influence metro economic growth in the short-and long-term.

DATA AND METHODS

The Global MetroMonitor forms part of an increasing array of research reports aimed at understanding the performance and position of cities and metropolitan areas worldwide.[3] Most of these reports reflect an increasing demand for information on metro areas from both the public and private sectors in the United States and abroad. While the majority of the other reports released in 2012 focused on the growing purchasing power and global influence of major cities, this edition of the *Global MetroMonitor*, like its predecessors, offers a different perspective on metropolitan areas.[4]

The *Global MetroMonitor* is one of the few reports that attempts to identify and select more accurately metropolitan areas and not mere cities. Metropolitan areas are integrated regional economies, comprised of cities and surrounding suburban and rural areas. These regional economies reflect better patterns of local economic exchange, which are not constrained by administrative city boundaries. This edition involved significant additional work to better identify the geographical extent of metropolitan areas in both developed and developing countries. (For more details on the selection and definition of metropolitan areas, see Appendix A and for geographical information for each of the 300 metropolitan areas, see Appendix B and Appendix C.)

Second, this research focuses exclusively on recent metropolitan economic dynamics, ranking the sampled metro areas based on their growth rates of GDP per capita and employment (see Box 1). The annual *Global MetroMonitor* identifies the position and trajectory of the world's major metropolitan economies through the most recent year, based on forecasted data from major economic consultancies. While such data should be viewed with appropriate caution, they offer a critical window on contemporary global economic dynamics from the vantage point of the world's most important economic centers. Similar to previous editions, the 2012 *Global MetroMonitor* draws on information regarding the economic performance of metropolitan areas dating back to 1993. (For more information on the index rankings, recovery status, and other economic data for all the 300 metropolitan areas, see Appendix B.)

Third, the *Global MetroMonitor* identifies the drivers of growth across metropolitan areas. With the help of industrial analysis, this edition explains the most recent trends in economic performance in the world's major metropolitan economies. It also pinpoints a series of national and metropolitan factors that influence metropolitan GDP per capita growth over the short-and long-term.

This update of the *Global MetroMonitor* largely follows the methodology used in the previous editions, developed in collaboration with LSE Cities.[5] Therefore, this section focuses primarily on changes introduced in this year's edition. (For more details on definitions, methodology, and data, see Appendix A.)

This study defines a metropolitan area as an economic region with one or several cities and their surrounding areas, all linked by economic and commuting ties (see Appendix A). It employs the size of a metropolitan economy as the main selection criterion, given the focus on metropolitan economic performance. This year's sample is comprised of the 300 largest metropolitan economies in the world for which economic trend data were available based on the size of their economy in 2010, at purchasing power parity rates (PPP). The 300 metro economies were selected based on McKinsey Global Institute's Cityscope 2.0 database, which provides 2010 estimates and 2025 forecasts of a series of economic and socio-demographic variables for more than 2,600 metropolitan areas worldwide.[6]

This edition employs two main data sources: Moody's Analytics for metropolitan areas in the United States, and Oxford Economics for the rest of the sample. For the United States, this study also uses the U.S. Census Bureau's population estimates. Similar to previous editions, the 2012 *Global MetroMonitor* employs a few key variables to assess the economic performance of metropolitan areas: Gross Domestic Product (GDP), employment, population, and GDP per capita, from 1993 to 2012 (see Appendix A).[7] In addition, the study uses Gross Value Added (GVA) and employment by major industry sector.[8] For static analysis, this study employs nominal GDP and GVA data, in US dollars at purchasing power parity rates. For trend analysis, it uses GDP and GVA data at 2005 prices and expressed in U.S. dollars.

KEY TERMS USED IN *GLOBAL METROMONITOR*

Gross Domestic Product (GDP): the sum of the market value of goods and services produced in an economy, such as a metropolitan area, country, or the world.

Output (Gross Value Added) of an industry: the difference between an industry's gross output and its intermediary purchases, domestic or imported.

Employment: the number of people who performed any work at all in the reference period, for pay or in-kind, or who were temporarily absent from a job for such reasons as illness, maternity or parental leave, holiday, training, or industrial dispute.

GDP per capita: the size of an economy relative to population. It is not personal income or household income, and does not reflect the distribution of income, but proxies the average standard of living in an area.

Population: the number of residents of a metropolitan area or country.

The report focuses on metropolitan performance on two key economic indicators: annualized growth rate of real GDP per capita; and annualized growth rate of employment. These two indicators reflect the importance that people and policymakers attach to achieving rising incomes and standards of living (GDP per capita), and generating widespread labor market opportunity (employment). They are combined into an economic performance index on which the 300 metro areas are ranked for 2012 (see Appendix A).[9]

The time period analyzed stretches from 1993 to 2012 to capture metropolitan area performance measures before and since the onset of the 2007 financial crisis:[10]

- The period from 1993 to 2007 provides the *long-run* trend each metropolitan area followed prior to the recession.[11] It provides a benchmark for assessing the degree to which metro areas have returned to their long-run growth trends during 2011-2012
- The year of minimum growth (for GDP per capita and employment separately) between 2007 and 2011 shows the maximum impact of the recent volatile economic period on each metro area
- Finally, and most prominently, the report assesses performance from 2011 to 2012, the latest year in this study's time series. It compares metropolitan performance in this latest year to the 2010 to 2011 period, identifying metro areas where GDP per capita and employment is growing faster, growing slower, or actually declining

As with last year's edition, the 2012 Global MetroMonitor also examines the extent of the economic downturn and subsequent recovery at the metropolitan level, comparing 2012 levels of GDP per capita and employment to their pre-crisis peaks. [12] Along these lines, it classifies metro economies into seven performance categories:

- *No recession:* uninterrupted annual growth on both economic indicators since 2007
- *Minor recession, full recovery:* decline in either GDP per capita or employment (but not both) in at least one year from 2007 to 2011, but recovered to previous peak by 2012
- *Major recession, full recovery:* decline in both GDP per capita and employment in at least one year from 2007 to 2011, but recovered to previous peaks by 2012

- *Minor recession, partial recovery:* decline in either GDP per capita or employment (but not both) in at least one year from 2007 to 2011, has not yet recovered to previous peak but growing in 2012

- *Major recession, partial recovery:* decline in both GDP per capita or employment in at least one year from 2007 to 2011, has not yet recovered to previous peaks but growing in both indicators in 2012

- *Partial recession:* declining GDP per capita or employment (but not both) in 2012

- *Full recession:* declining GDP per capita and employment in 2012

To interpret metro economic performance, this report classifies metropolitan areas by their countries' income levels and world region. The 300 metropolitan areas are classified as "developed" and "developing" based on their primary country's 2011 gross national income (GNI) per capita.[13] Using World Bank's 2012 list of economies, "developed" status is equivalent to "high income" level, or GNI per capita in excess of $12,476.[14] "Developing" metro areas are in countries with national income (GNI) per capita under that level. Of the 300 metropolitan areas in this study's sample, 202 are in developed countries and 98 are in developing countries.[15]

Based on World Bank and IMF definitions, this study identifies seven world regions in which the sampled metropolitan areas lie:

- ***Western Europe:*** 74 metro areas in the European Union member countries before the 2004 enlargement (EU-15), plus Norway and Switzerland

- ***North America:*** 76 U.S. and six Canadian metro areas

- ***Developed Asia-Pacific:*** 33 metro areas in higher-income Asia-Pacific countries (Australia, Hong Kong, Japan, Macau, New Zealand, Singapore, South Korea, Taiwan)

- ***Developing Asia-Pacific:*** 59 metro areas in lower-income Asian nations (China, India, Indonesia, Malaysia, Philippines, and Thailand)

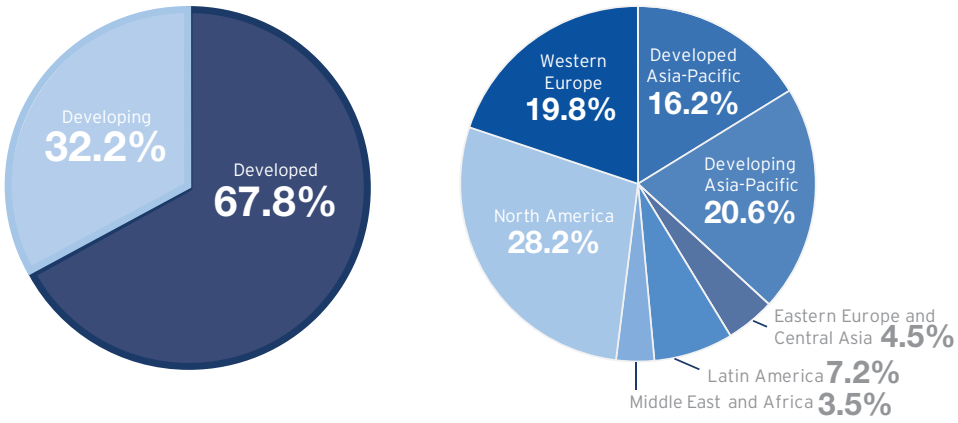
- ***Latin America:*** 23 metro areas in Argentina, Brazil, Chile, Colombia, Mexico, Peru, and Puerto Rico;

- ***Eastern Europe and Central Asia:*** 14 metro areas in Bulgaria, Czech Republic, Hungary, Kazakhstan, Poland, Romania, Russia, and Turkey

- ***Middle East and Africa:*** seven metro areas in Middle Eastern countries (Israel, Kuwait, the United Arab Emirates, and Saudi Arabia) and eight metro areas in African nations (Egypt, Morocco, and South Africa). This study includes only five Sub-Saharan African metro areas (all in South Africa), because of the small size of their metro economies and severely limited data availability/reliability for other metropolitan areas in this region[16]

Developed metropolitan areas represented two-thirds of the combined GDP of the largest 300 metropolitan economies worldwide in 2012. North American metro economies had the highest share of the sample GDP at 28.2 percent, while Middle East and African metro areas were smallest economically, at only 3.4 percent of combined GDP (Figure 1).

FIGURE 1. SHARE OF THE 300 METROPOLITAN ECONOMIES GDP, BY DEVELOPMENT STATUS AND REGION, 2012



Source: Brookings analysis of data from Oxford Economics, Moody's Analytics, and U.S. Census Bureau

Note: The 2012 metropolitan GDP is forecasted, in billions of dollars, at PPP (purchasing power parity) rates

This edition follows the same industrial categorization as in 2011 *Global MetroMonitor,* comprised of eight major industrial sectors for which GVA and employment data are available at the metropolitan level (see Appendix A).

Finally, this edition of the *Global MetroMonitor* analyzes for the first time the short- and long-term effects of national and metropolitan factors on annual changes in metro GDP per capita, using data for 296 of the 300 metropolitan economies.[17] A panel data analysis estimates the short-term effect of one year lagged variables on the annual change of metro GDP per capita between 1990 and 2012. For the long-term, this study employs a regression to examine the effect of the 2000 level of a series of variables on the average annual change of metro GDP per capita between 2000 and 2010.[18] Based on available data, the variables included are the following (see Appendix A for more details on the selection of variables and estimation techniques):

- ***Growth of metro GDP per capita***
- ***Initial level of metro GDP per capita***
- ***Growth of national GDP per capita***
- ***A national industry growth index*** that takes into account the metro industry structure and the growth rates of industries nationally
- ***Metro industry specialization,*** combined with the size of the metro industry
- ***Higher education (tertiary) education attainment rates,*** as proxy for the human capital stock

FINDINGS

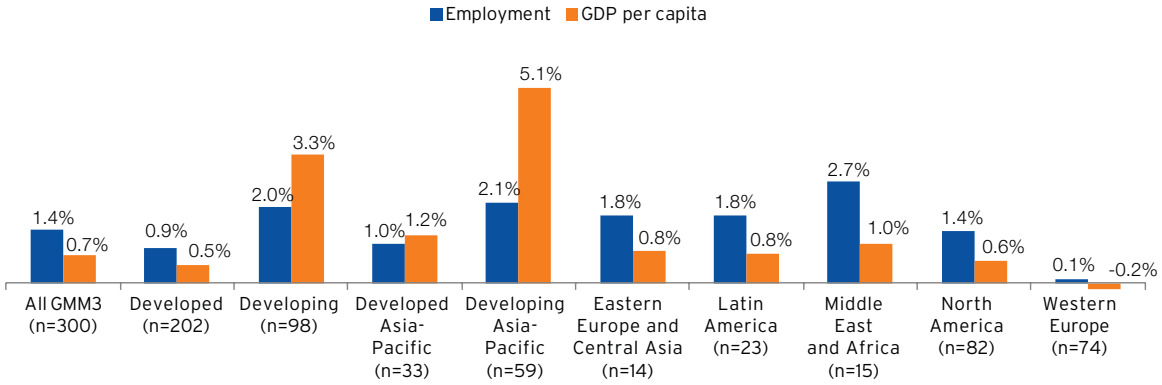
A. Three-quarters of the fastest-growing large metropolitan economies in 2012 were located in developing Asia, Latin America, and the Middle East and Africa.

As described in the Introduction, 2012 marked another year of slow growth for the global economy, reflecting ongoing fiscal and debt problems in Europe, tepid growth in the United States, and cooling down of most of the large emerging economies. Yet this view masked a wide range of economic performance among metropolitan areas both in developed and developing countries, the building blocks of national economies.

In the aggregate, both GDP per capita (0.7 percent) and employment (1.4 percent) grew in the 300 largest metro economies worldwide from 2011 to 2012. Developing metropolitan areas grew faster in both aspects, with GDP per capita increasing 3.3 percent and employment expanding 2.0 percent. In contrast, GDP per capita and employment grew much more slowly in developed metropolitan areas, at 0.5 percent and 0.9 percent, respectively.

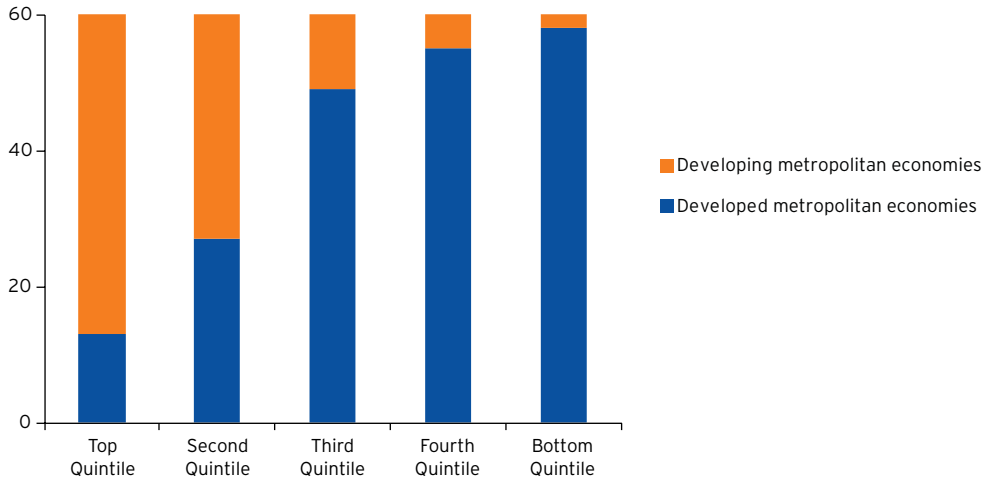
In most world regions, large metropolitan areas registered at least modest growth in GDP per capita and employment in 2012 (Figure 2). However, the economic performance of metro areas in Western Europe reflected Eurozone woes, as combined GDP per capita declined and employment flatlined in 2012. Developing Asia-Pacific metro areas, on the other hand, registered a 5.1 percent increase in their GDP per capita, given high GDP growth relative to other metro areas and moderate population expansion. [19]

FIGURE 2. METROPOLITAN GDP PER CAPITA AND EMPLOYMENT GROWTH RATES BY REGION AND DEVELOPMENT STATUS, 300 LARGEST METROPOLITAN ECONOMIES, 2011-2012



Source: Brookings analysis of data from Oxford Economics, Moody's Analytics, and U.S. Census Bureau

FIGURE 3. DISTRIBUTION OF DEVELOPED AND DEVELOPING METROPOLITAN ECONOMIES IN EACH QUINTILE OF THE 2012 ECONOMIC PERFORMANCE INDEX, 300 LARGEST METROPOLITAN ECONOMIES

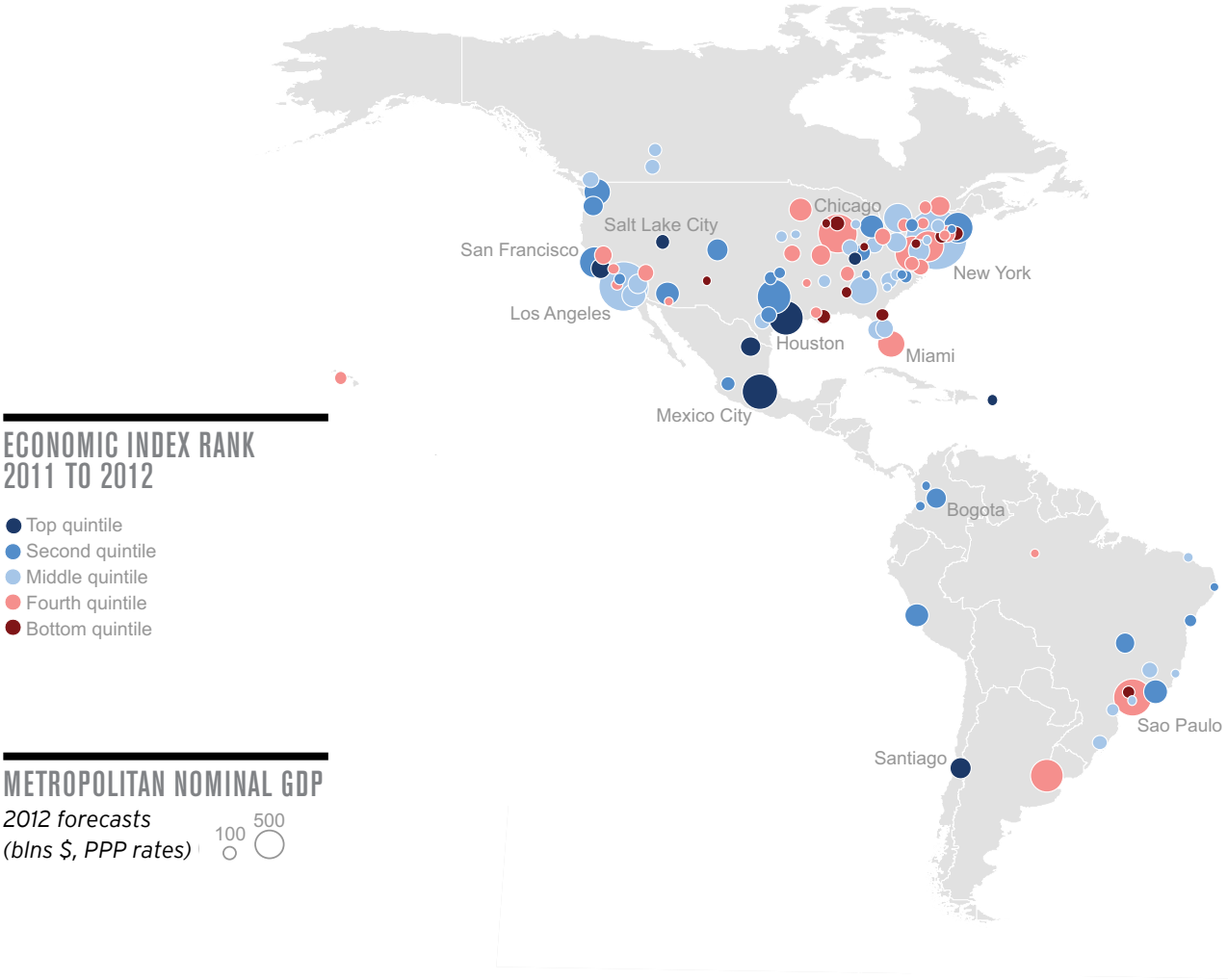


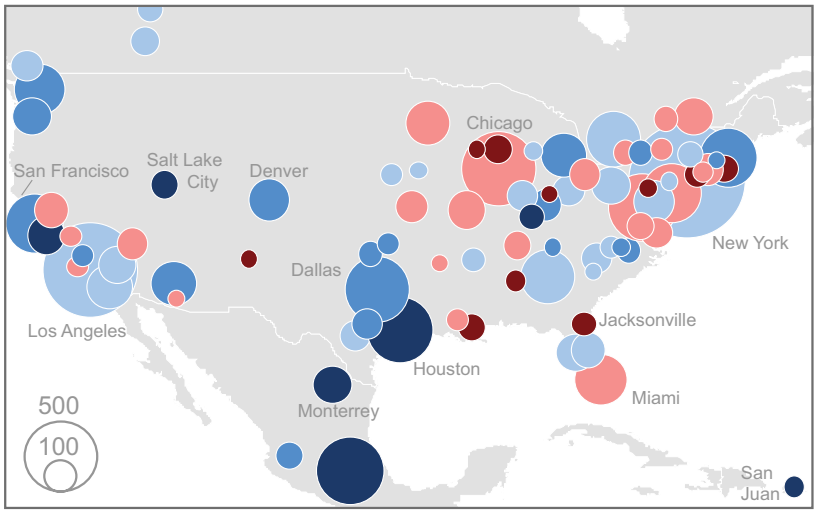
Source: Brookings analysis of data from Oxford Economics, Moody's Analytics, and U.S. Census Bureau

The distribution of developing and developed metro areas across the five quintiles of this study's performance index reflects the contrasting patterns of economic growth across the world (Figure 3). While the top quintile was dominated by developing metro areas, developed metro areas populate most of the lowest quintile.

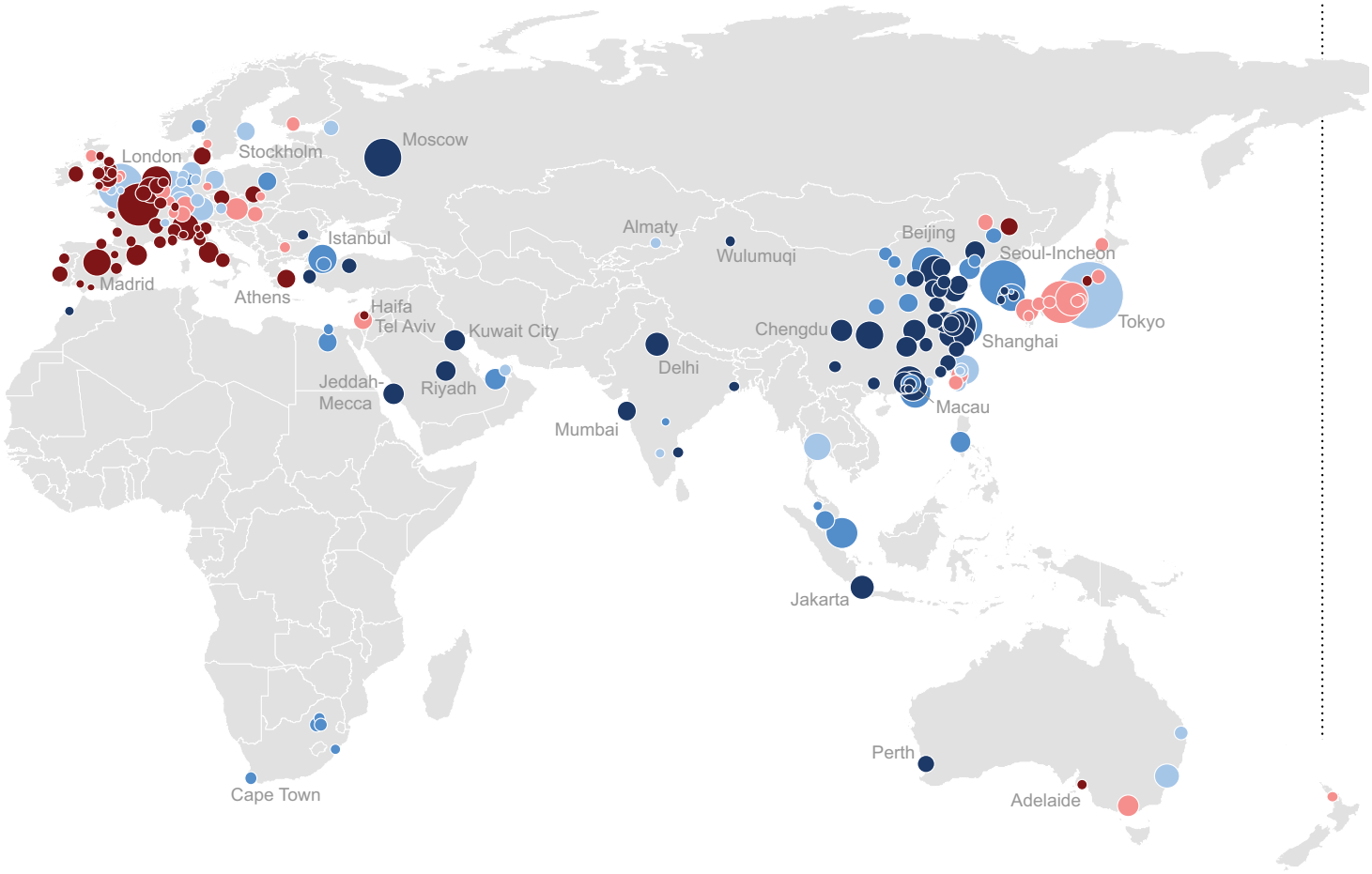
In most world regions, large metropolitan areas registered at least modest growth in GDP per capita and employment in 2012.

MAP 1. 2011–2012 ECONOMIC PERFORMANCE INDEX RANKINGS, BY QUINTILE, 300 LARGEST METROPOLITAN ECONOMIES





Source: Brookings analysis of data from Oxford Economics, Moody's Analytics, and U.S. Census Bureau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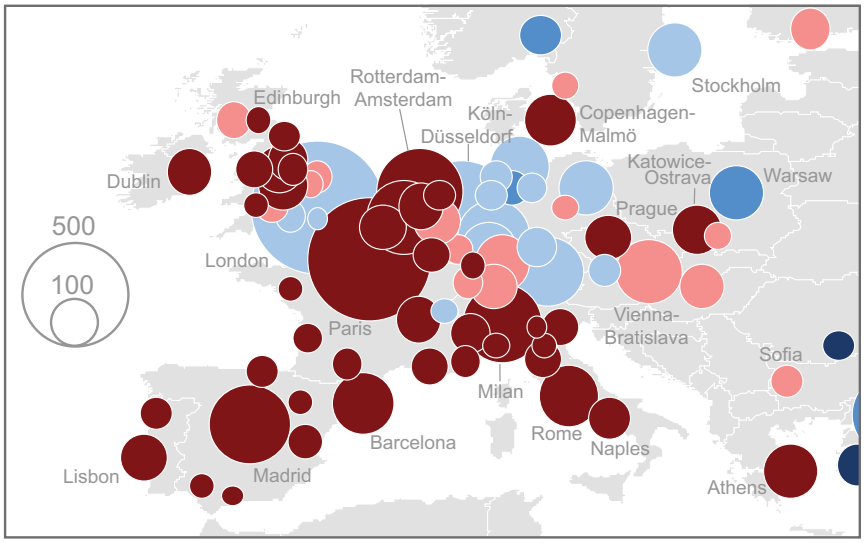
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500
100
London
Paris
Vienna-
Bratislava
Sofia
Milan
Rome
Naples
Barcelona
Lisbon
Madrid
Athens

Chinese metro areas dominated the top quintile (the 60 best-performing) of the economic performance index, with 34 of the 48 mainland Chinese metro areas ranking among the top performers (Map 1). The typical metro area in the top quintile achieved 2.7 percent employment growth and 5.0 percent GDP per capita growth in 2012. Wuhan, an 8 million-person metro area in Central China, registered 9.7 percent GDP per capita growth, the highest among the 300 largest metro economies worldwide. With one exception, manufacturing contributed the most to the growth of metro output in the Chinese metro areas, similar to other high performers such as San Juan, Puerto Rico and Daegu, South Korea. In 26 of the 34 fast-growing Chinese metro areas, manufacturing was also the industry delivering the largest share of job growth.

Drawing on the strength of mainland China metro areas, Macau was the top performer in the 2012 index (see sidebar). Other developed metro areas, Perth and Riyadh, ranked second and third. Four North American metro areas (Houston, Louisville, Salt Lake City, and San Jose) managed to rank among the 60 fastest-growing metro economies. The industry drivers for the 13 developed metro economies in the top quintile were as diverse as their specializations, from business and financial industries and manufacturing to commodities, trade and tourism, and local/non-market services.

MACAU: THE TOP PERFORMER IN THE 2011-2012 ECONOMIC PERFORMANCE INDEX

Located along the southern coast of China on the South China Sea, Macau is one of the two special administrative regions of China. The former Portuguese colony has operated under a "one country, two systems" regime since the 1999 transfer of power from Portugal to China. Roughly one-third the size of Manhattan in land mass and with a population of only 567,000, Macau has depended heavily on the growth of mainland China to fuel its rise as the nation's only legal gambling center.

Since its transfer to China, Macau's economy has developed rapidly, averaging 12.5 percent annual GDP per capita growth and 7.7 percent annual employment growth from 2002 to 2007. The rapid growth of disposable income among Chinese urbanites over the last decade helped drive this growth trend. Gaming is Macau's main industry, and since the opening of the industry to new investors in 2002, its output doubled and employment grew by 45 percent from 2002 to 2007.[20]

These factors helped Macau achieve the top spot on this study's 2012 economic performance index. The metro area registered growth rates of 5.1 percent in GDP per capita and 5.7 percent in employment, the latter topping all other metro areas in 2012. While it suffered declines in both employment and GDP per capita between 2008 and 2009, Macau rebounded strongly, recovering to pre-recession levels and growth rates in both indicators. Local/non-market services, mainly the gaming industry in Macau, representing more than half its economy, and delivered 70 percent of output growth and metro job growth in 2012.

For all intents and purposes, Macau remains a one-industry metro area and relies heavily on tourists from China. Aware of this structural weakness, the administrative region plans to build a more diverse and sustainable economy by developing infrastructure and increasing the supply of skilled labor. A bridge connecting Macau directly to Hong Kong and Zhuhai is currently under construction, with the goal of making travel and trade easier and more efficient.[21] In 2013, the University of Macau will expand its campuses to nearby Hengqin Island, a prefecture-level city in Guangdong province, in an attempt to increase the labor pool necessary for the development of knowledge-based industries.[22]

The second-strongest growing group of metro economies in the world split almost evenly between metro areas in developed and developing countries and had a widespread geographical distribution. Austin and Seoul-Incheon bookended this group of 60 metro economies, with a median 2.0 percent employment growth and 1.7 percent GDP per capita growth. Western Europe had only two metro areas in this second-strongest group, Oslo and Hannover, which were the fastest expanding metro areas in the region. Business and financial services and manufacturing delivered the largest share of the growth of output in these metro economies, while trade and tourism and local/non-market services added the largest share of the new jobs.

Developed metro economies populated the majority of the middling group on economic performance, where median growth rates were 1.4 percent for employment and 0.8 percent for GDP per capita. One-third of all North American metro areas could be found in this middle quintile, joined by metro areas from better-performing Western Europe countries (Austria, Germany, Sweden, Switzerland) and some metro economies from developed Asia-Pacific (especially Taiwan). Weak but positive employment growth saved these metro economies from worse rankings, given that GDP per capita stalled or declined in many of them in 2012. Local/non-market services, business and financial services, and trade and tourism delivered most of the employment growth in these metro areas.

The best way to characterize the 60 second-weakest growth metro areas is stagnation. The median employment growth rate of the metro areas in this quintile was 0.7 percent, and median GDP per capita growth was 0.4 percent. Fully 55 of the 60 metro areas in this quintile were in developed nations. Fourteen (14) North American and Western European metro areas registered slight declines in GDP per capita, reflecting shrinking output or economic growth lagging population growth.

Nearly all of the bottom-ranking metro areas in 2012 were from advanced economies, and the median metro area in this group experienced no employment growth in 2012, along with a 1 percent decline in GDP per capita. Fifty-three (53) of the 60 weakest-performing metro areas were from Western Europe and North America, joined by a variety of metro areas from Eastern Europe (Prague, Katowice-Ostrava), Middle East (Haifa), and developed Asia- Pacific (Adelaide and Niigata). Only two metro areas from developing countries (Haerbin from China and Campinas from Brazil) ranked in the bottom quintile. Declines in manufacturing production, business and financial services, and the construction sector dragged down the performance of these metro economies.

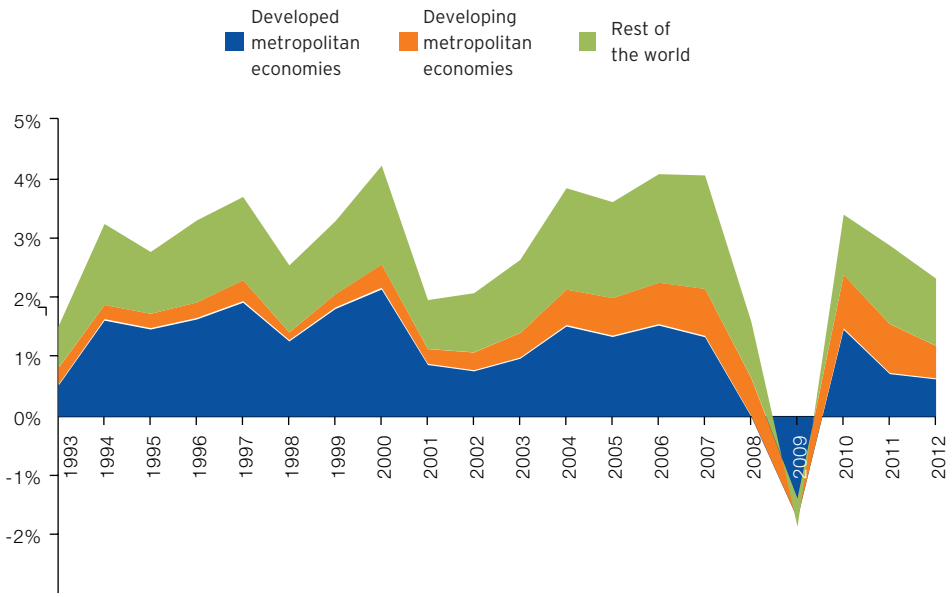
The 300 metropolitan areas combined delivered 51 percent of global economic growth in 2012.

Western European metro areas had a bad year overall in 2012. Not one cracked the top quintile, and three-quarters of the lowest-performing metro economies were from Western Europe. Athens was the bottom performer for a third straight year, reflecting the ongoing crisis in Greece. Many of the other European metro areas from the 60 worst-performing metro areas hailed from troubled national economies, such as Spain, Greece, and Italy. But it was not a story about only Southern Europe. Several metro areas in the United Kingdom, France, Netherlands, and Belgium registered declines or almost zero growth in employment and/or GDP per capita in 2012, sending them to the bottom of the rankings.

These 2012 trends were consistent with the accelerating shift of economic growth from developed metro areas in the global West towards developing metropolitan areas in the global South and East. The 300 metropolitan areas combined delivered 51 percent of global economic growth in 2012, slightly higher than their 48 percent share of the world economy, which has remained relatively stable over the last 20 years.[23]

What has changed much more dramatically is the contribution of metro areas from developing countries to global economic growth (Figure 4). In 2007, metro economies in developing countries accounted for 19.5 percent of global economic growth, up only slightly from 18.7 percent in 1993. Five years later, developing metro areas delivered 23.6 percent of global economic growth, approaching the 27.3 percent contribution of metro areas in developed countries. The rapid growth of Chinese metropolitan economies contributed significantly to this trend.

FIGURE 4. DEVELOPED AND DEVELOPING METROPOLITAN AREA SHARES OF WORLD GDP GROWTH RATE, 1993-2012



Source: Brookings analysis of data from Oxford Economics, Moody's Analytics, and U.S. Census Bureau

While GDP growth slowed across both developed and developing countries in 2012, the structural shift towards the global East and South not only maintained its course, it quickened its pace.

Some metro areas represented bright spots in an otherwise dreary global economy in 2012.

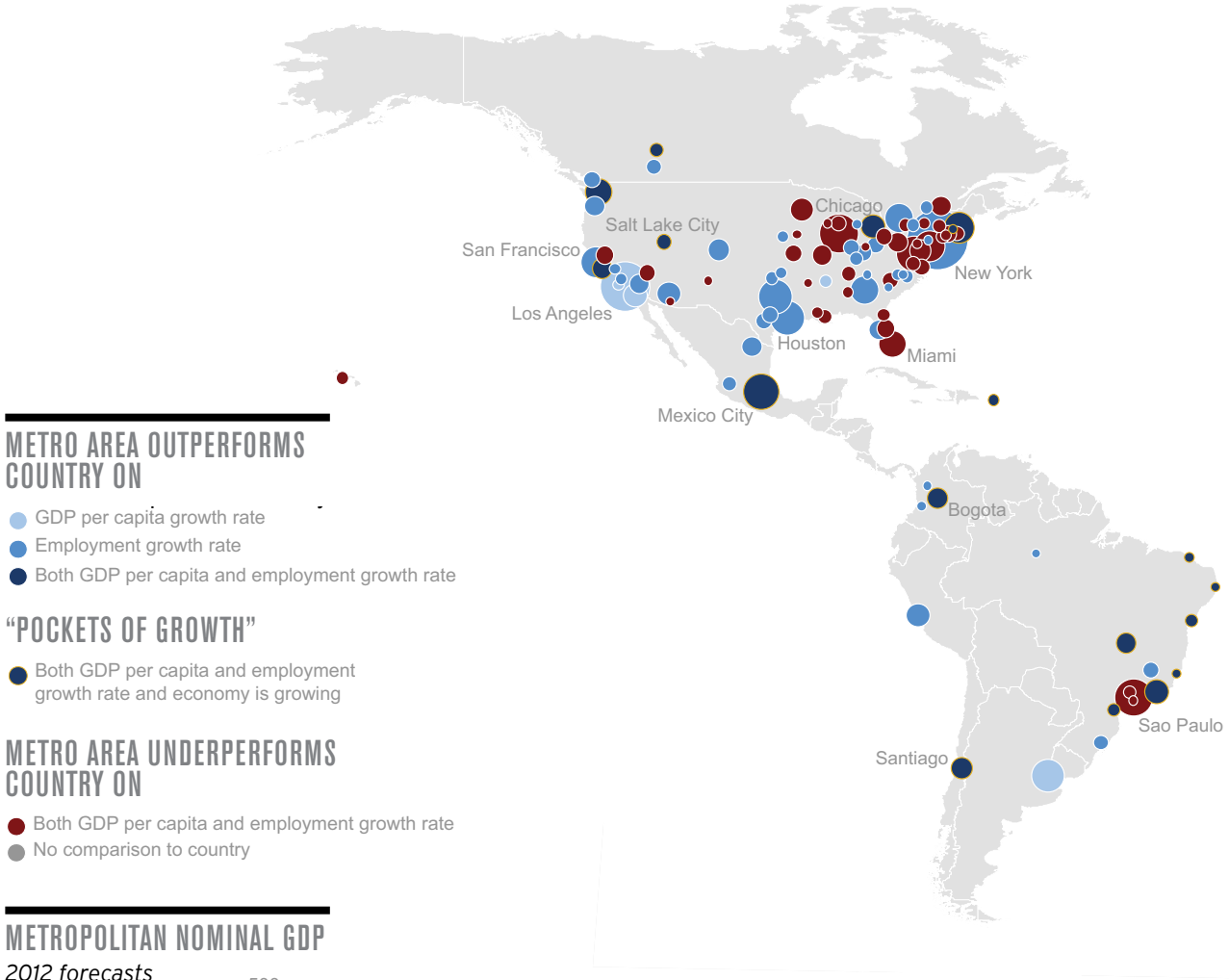
B. Compared to their countries, more than half of metro areas outperformed on employment growth in 2012, but only one-third achieved faster GDP per capita growth.

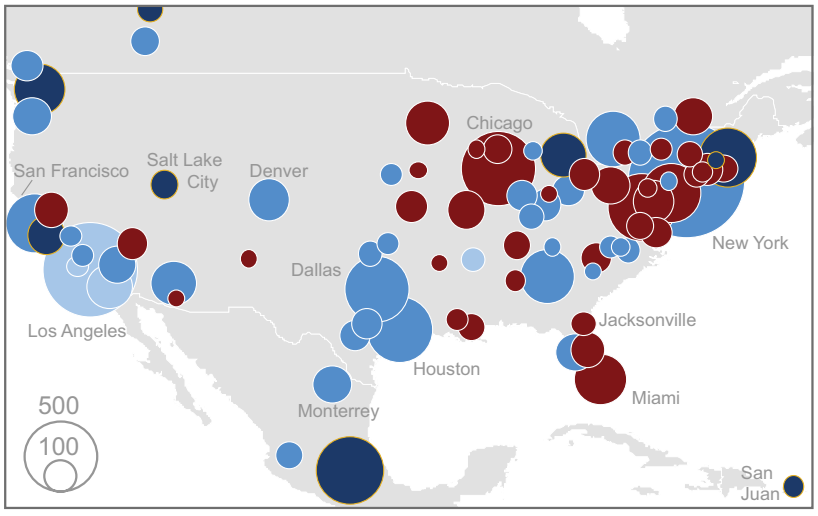
National factors affect significantly metro growth trends, but metro areas respond differently to these external shocks based on their industry mix, their endowments, and specific metro characteristics. As a result, metro economies often perform differently from national economies, especially in countries with a large number of metropolitan areas.

By world region, most of the 295 metro areas (excluding five who are also countries) achieved either GDP per capita and/or employment growth rates that exceeded national averages in 2012. Middle East and Africa metro areas grew faster than their countries on both GDP per capita (2.1 versus 1.6 percent) and employment (2.6 percent versus 2.3 percent). And while Western European countries overall registered declining employment, their metro economies managed to stabilize employment (0.1 percent growth).

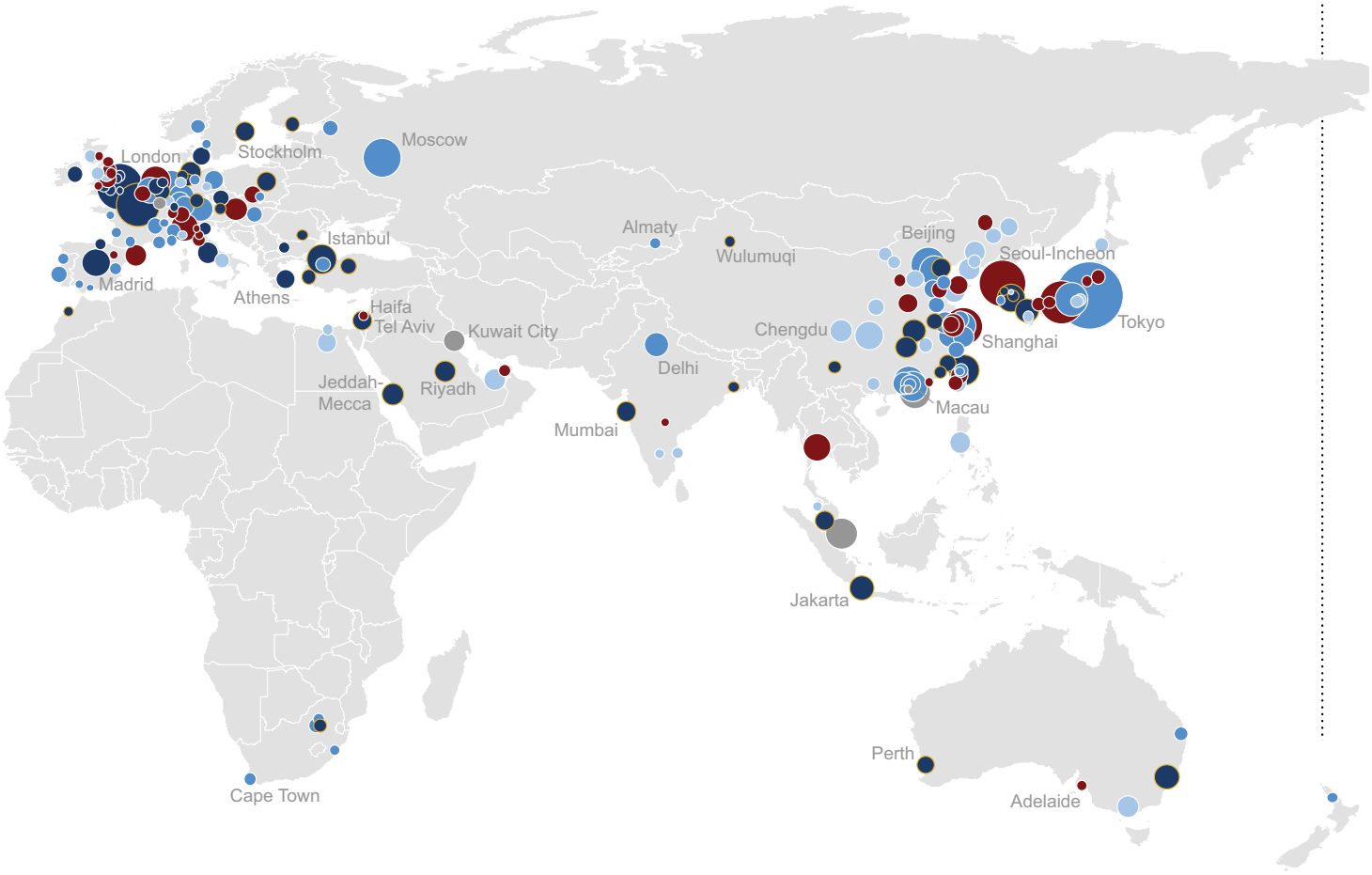
More than half of the 295 metro areas did better than their countries on employment in 2012 (Map 2). Perth led the contingent, with 4.9 percent job growth compared to 0.6 percent Australia-wide. Local/non-market services delivered most (42 percent) of employment growth in Perth. At the other end of the spectrum, Haerbin lost jobs at a 3.1 percent rate, while Chinese employment overall grew by 1.6 percent in 2012. Many of the metro areas that outperformed national averages on employment were in Western Europe, growing faster than their countries (e.g., Brighton, Hannover, London, Munich, and Stockholm) or losing jobs at a lower rate than their country overall (Athens, Dublin, and Seville).

MAP 2. METRO ECONOMY-COUNTRY GROWTH DIFFERENTIAL PERCENTAGE POINTS, 295 LARGEST METROPOLITAN ECONOMIES, 2011-2012





Source: Brookings analysis of data from Oxford Economics, Moody's Analytics, and U.S. Census Bureau
Note: Five metro areas are excluded because they are countries or autonomous economic entitles (Singapore, Macau, Hong Kong, Kuwait, and Luxembourg).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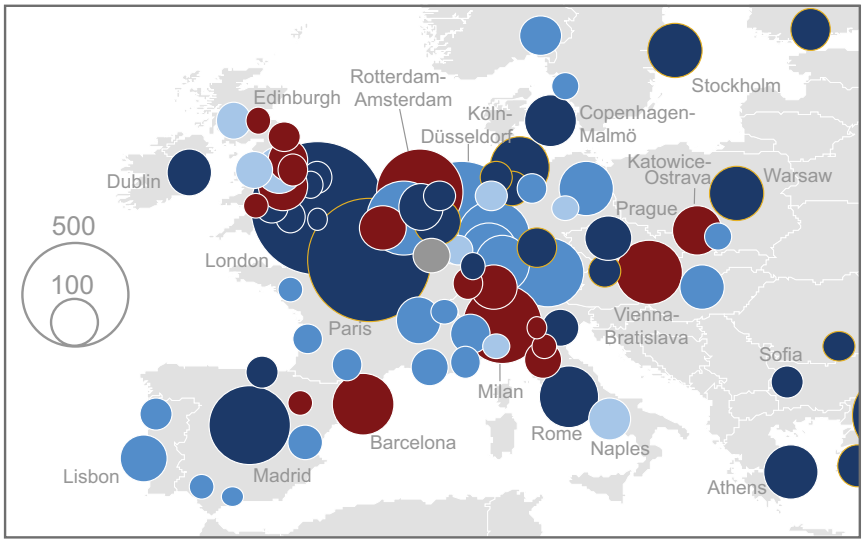
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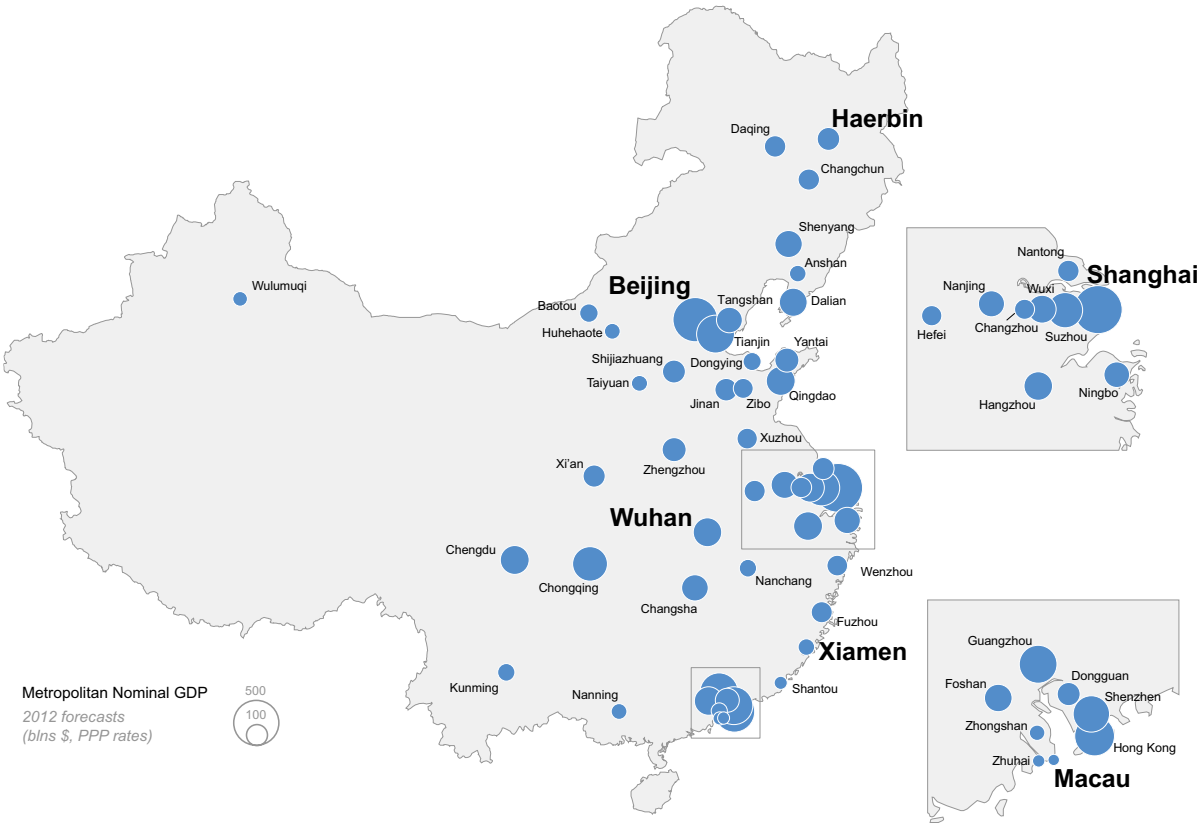
Paris
Vienna-
Bratislava
Sofia
Milan
Rome
Naples
Barcelona
Lisbon
Madrid
Athens

A smaller share of metro areas, about 40 percent of the sample, outperformed their countries on GDP per capita growth. Perth held the top spot here, too, with its 6.9 percent GDP per capita growth tripling the national average in 2012. Business and financial services, together with a strong commodities sector, generated more than two-thirds of Perth's output growth. In Beijing, by contrast, GDP per capita growth of 2.3 percent was only about one-third the Chinese growth of 6.5 percent (see sidebar).

Some metro economies represented bright spots in an otherwise dreary global economy in 2012. Fifty-six (56) metro areas outperformed their countries on both GDP per capita and employment change while experiencing growth on both indicators in 2012. These metro "pockets of growth" were spread around the world. Twelve developing Asia-Pacific metro economies included several in China, but also in India (Mumbai and Kolkata), Indonesia (Jakarta), and Malaysia (Kuala Lumpur) (Map 2). The Middle East and Africa and Eastern Europe and Central Asia regions included five metro pockets of growth each. Nine Western European metro areas grew faster than their countries on both indicators, two more pockets of growth than North America registered. Four were German metro areas (Bremen, Hamburg, Hannover, Hamburg), joined by others in Scandinavia (Stockholm, Helsinki), Austria (Linz), and France (Paris). Business and financial services was the largest contributor to output expansion in these outperforming Western European metro areas.

MAP 3. 48 MAINLAND CHINA METROPOLITAN AREAS AND THE SPECIAL ADMINISTRATIVE REGIONS OF HONG KONG AND MACAU, PART OF THE 300 LARGEST METRO ECONOMIES WORLDWIDE, 2012



Source: Brookings analysis of data from Oxford Economics

THE DIVERSITY OF ECONOMIC PERFORMANCE OF THE CHINESE METROPOLITAN AREAS

The different paths among metro areas worldwide reflect the diversity of growth patterns not only across countries, but also within them, particularly in large urbanizing nations like China. China is the most populous country in the world with 1.3 billion inhabitants, more than Europe and North America combined.[24] While only 26 percent of China's population resided in urban areas in 1990, that proportion doubled to more than half by 2011.[25] China's GDP per capita grew by 6.5 percent and the country added jobs at a 1.5 percent clip in 2012, but economic performance varied widely among the 48 Chinese metro areas featured in this report (Map 3).

China rapidly ascended to global economic powerhouse status in the last two decades. Its export-focused economy helped it achieve a staggering 9.3 percent annual GDP per capita growth rate from 1993 to 2007, and 2.4 percent annual employment growth over the same time period. However, this economic model might have reached its limit. With the Eurozone in recession and no other major economy making up the gap in demand for China's goods, its economic growth has slowed over the last two years.

Nearly one half (22) of major Chinese metropolitan areas grew faster than the national GDP per capita and 25 metro areas expanded their jobs more than the national average. For example, Xiamen, located on the southern coast of China, ranked highest on the 2012 index of economic performance among Chinese metropolitan areas, surpassing national averages on both GDP per capita and employment growth. Aided by large foreign investments, Xiamen's manufacturing sector output grew more than 9 percent from 2011 to 2012, driving its strong performance.[26]

By contrast, Beijing underperformed China's GDP per capita growth rate in 2012. The capital city of China saw GDP per capita increase by 2.3 percent, much lower than the nation. Local/non-market services in Beijing delivered over one-third of metro output growth over the past year, and half of new jobs created between 2011 and 2012. The large size of local/non-market services might be a cause of concern for Beijing in the future. As a recent Chinese provincial government study shows, the large size of Beijing's municipal government led to a drop in its efficiency.[27]

Haerbin in northeastern China not only underperformed national employment growth rates, but also it is the only Chinese metro areas that ranked in the bottom quintile on the 2012 performance index. In 2012, its employment shrank 3.1 percent, with over half of job losses resulting from contracting local/non-market services and manufacturing industries. Relative to other Chinese metro areas, Haerbin received less foreign direct investment over the years, limiting the growth of its manufacturing industry and its job multiplier effects on the local/non-market services sector. [28]

The recent leadership change in China has the potential to change these trends. While former Chinese President Hu Jintao led a faction of the Chinese Communist Party targeting social cohesion and the growth of inland regions, incoming leader Xi Jinping represents another bloc of the Party focused on GDP growth and coastal regions.[29] This change of power and policy priorities will determine not only the sustainability of China's economy in the long term, but also China's metropolitan growth patterns.

C. Almost three-quarters of the 300 metro areas had higher levels of employment and/or GDP per capita in 2012 than in 2007.

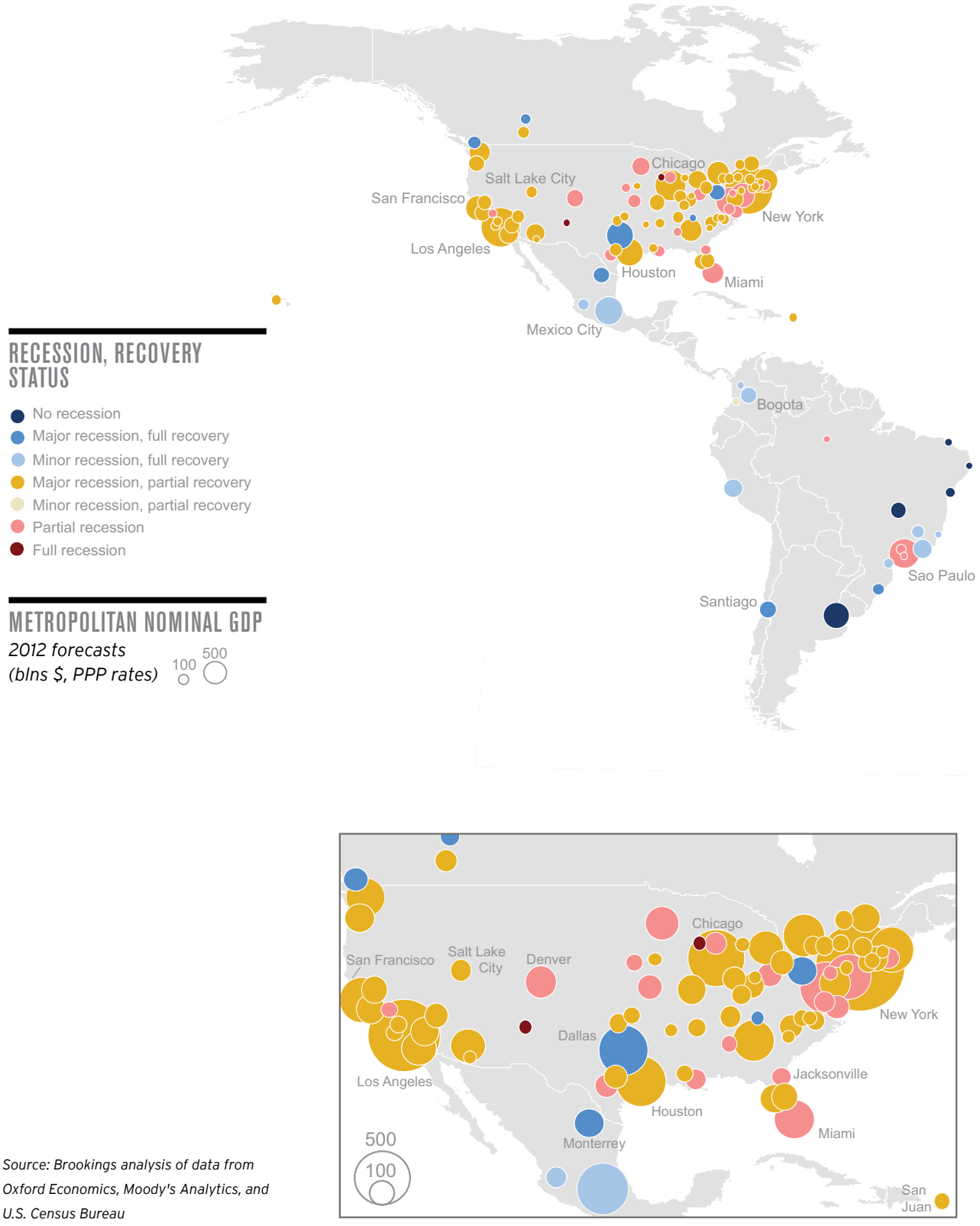
Similar to the global economy, the combined employment and GDP per capita of the 300 largest metropolitan areas worldwide experienced declines after the 2007 financial crisis, but recovered to pre-recession peaks. By 2012, the combined 300 metro economies had 27 million more jobs than in 2007, but also 67 million more people. Aggregate metro GDP per capita in 2012 was 2.5 percent above its pre-crisis level. However, not all metro areas followed this pattern of recovery.

By 2012, the combined 300 metro economies had 27 million more jobs than in 2007, but also 67 million more people.

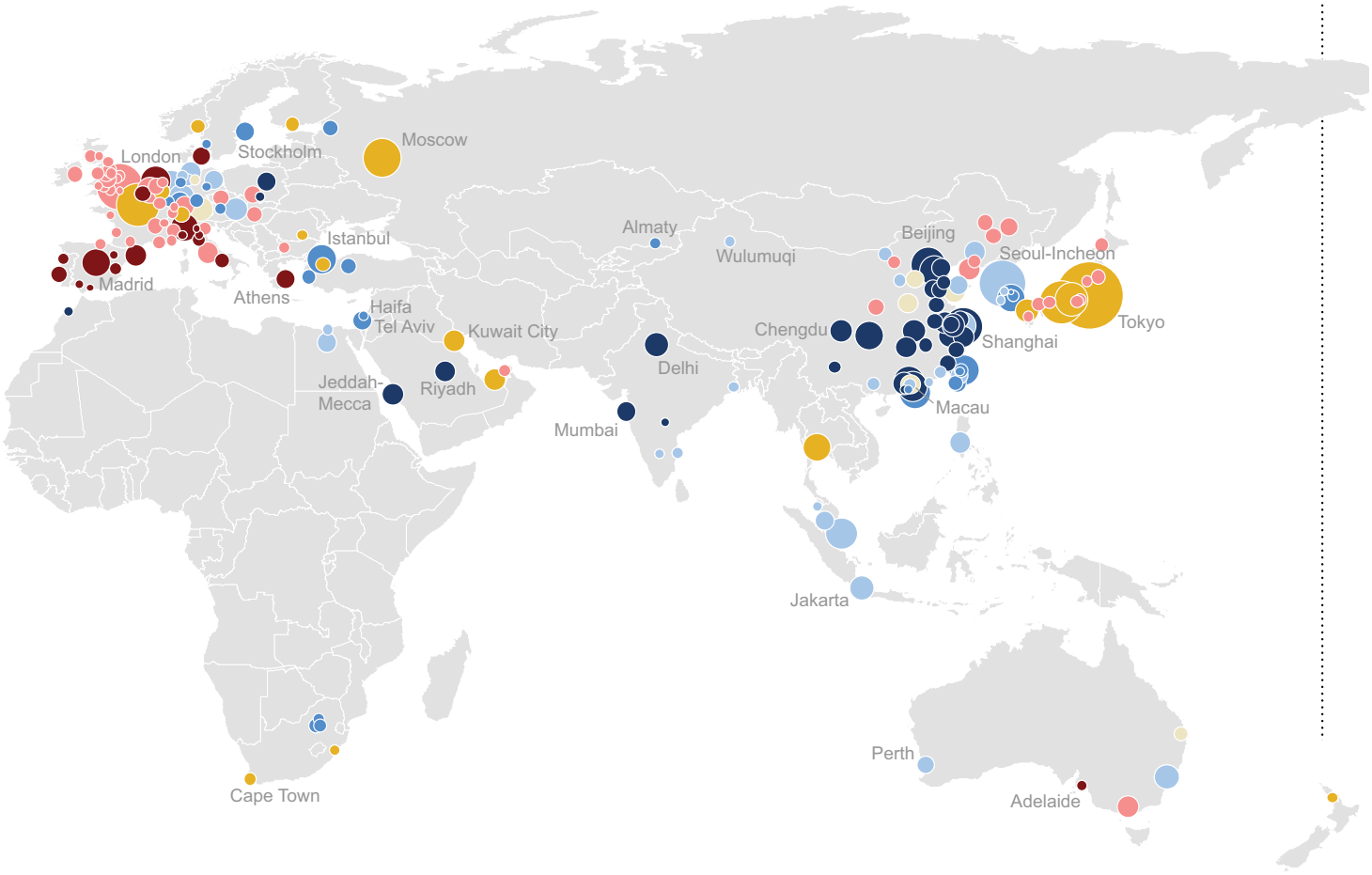
Almost three-quarters of the 300 metro areas registered higher levels of employment and/or GDP per capita than in 2007. More metro areas recovered their pre-crisis employment levels, given their growing populations, than recovered previous GDP per capita levels. North American metro areas represented almost two-thirds of those still below 2007 levels of both GDP per capita and employment, signaling not only the U.S. fragile recovery but also the "bubble" economy that preceded the crash.

The largest 300 metro areas worldwide had peaks and valleys at different times during the volatile growth of the last five years. As a result, metro areas ranged from having experienced no recession at all to registering declines in both GDP per capita and employment in 2012, based on a comparison of their 2012 GDP per capita and employment levels to previous peaks between 2007 and 2011 (Map 4).

MAP 4. RECESSION/RECOVERY STATUS, 300 LARGEST METROPOLITAN AREAS, 2012



Source: Brookings analysis of data from Oxford Economics, Moody's Analytics, and U.S. Census Bureau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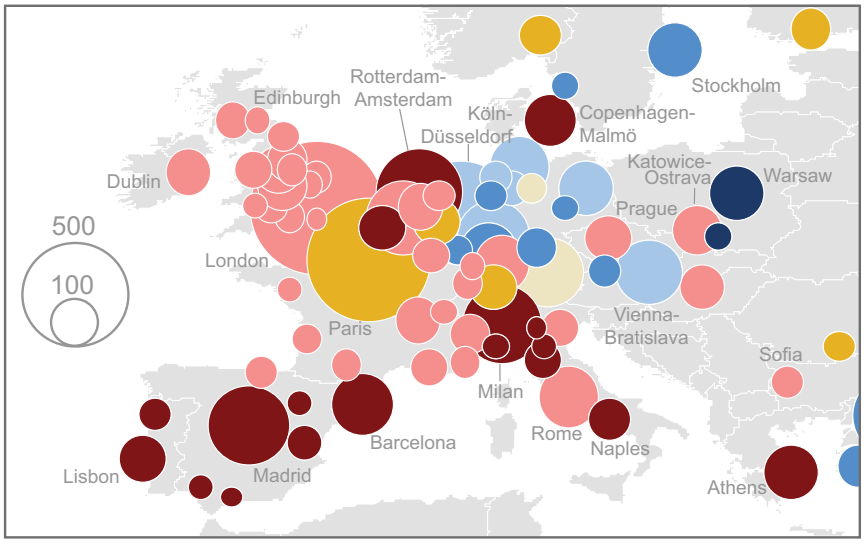
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Milan
Rome
Naples
Barcelona
Lisbon
Madrid
Athens

Several global metro economies experienced little to no ill effects from the worldwide downturn. Forty-seven (47) of the 59 developing Asia-Pacific metro areas achieved new peaks of GDP per capita and employment in 2012. Thirty (30) were Chinese and Indian metro areas that suffered no recession at all. Other developing Asia-Pacific metro areas, such as Jakarta, recovered strongly from small declines in previous years (see sidebar).

JAKARTA: A RESILIENT METRO ECONOMY DURING THIS GLOBAL VOLATILE PERIOD

Jakarta is the capital and the largest city of Indonesia, an archipelago of over 17,000 islands off the coast of Malaysia and Australia located in the Java Sea. The Jakarta metropolitan area is one of the most populated in the world, with over 31 million residents. Contributing 19 percent of national GDP, Jakarta is the center of economic activity of Indonesia.

For Jakarta, the 1993 to 2007 period was marked by the 1998 Asian financial crisis and the fall of the Suharto regime. The Asian financial crisis had devastating effects on Indonesia and Jakarta as well. Between 1997 and 1998 Jakarta's output shrank by almost a quarter. Following the crisis and President Suharto's resignation, Indonesia enjoyed robust economic growth, averaging 5.8 percent annual growth between 2002 and 2007.

Other than a modest decline in employment in 2011, the Jakarta metro area weathered the global volatile period of the last five years well on the strength of its services base and Indonesia's high rate of growth. The metro area recovered its previous employment peak by 2012. At the beginning of the world downturn, Indonesia instituted a policy of low interest rates, meant to spur economic growth.[30] Jakarta's main sectors, business and financial services and trade and tourism, benefited from this policy. Business and financial services generated a quarter of metro output growth in 2012, and trade (retail and wholesale) sector accounted for more than one-third of additional metro jobs. Jakarta also thrived due to continuous national economic expansion over the last five years, as Indonesia enjoys proximity to many trading partners in the Southeast Asia-Pacific and relatively low costs of labor.

The Indonesian capital is preparing for future growth by revamping its current infrastructure. For example, the state airport operator Angkasa Pura II recently started an expansion at Soekarno-Hatta International Airport aimed at increasing the capacity of Indonesia's global air gateway three-fold. [31] Japan has already seized on this market opportunity by signing an agreement with Indonesia for the construction of roads, railways, airports, and other strategic infrastructure in Jakarta and its neighboring cities. [32]

In contrast, all metro areas in developed Asia-Pacific, North America, and Western Europe experienced recessionary losses on at least one of the indicators. Few, however, have recovered fully from those losses. Metro areas in developed Asia-Pacific achieved the highest recovery rates among the three regions, with about half returning to GDP per capita and employment levels higher than their peaks since 2007. Only five North American metro areas—Dallas, Edmonton, Knoxville, Pittsburgh, and Vancouver—fully recovered on both fronts.

In 2012, the recovery to pre-recession levels in some metro areas was accompanied by a worrying trend: an increasing number of metro areas falling into recession, suffering declines in metro employment and/or GDP per capita.

Ninety-eight (98) metro areas, 11 more than in 2011, were in "partial" or "full" recession in 2012, losing ground on at least one of the economic measures. This increase is attributable to Eurozone weakness, with more Western European metro areas slipping back in recession after gains in 2011. For example, Brussels was recovering in 2011 from GDP per capita declines in 2008 and 2009, but lost ground on GDP per capita in 2012, turning the European Union capital's "partial recovery" into a "partial recession." More Eastern European and Central Asian metro areas also entered at least partial recession in 2012, given their close financial and trade ties with the Eurozone metro areas. Adelaide, Australia flipped from no recession in 2011 to losses on both GDP per capita and employment the following year. While its country-mate Perth is one of the fastest growing metro areas in 2012 due to a growing business and financial services sector catering to a strong commodities industry, Adelaide's business and financial sector serves a weak manufacturing industry under stress because of the high Australian dollar.[33]

In addition to restoring pre-recession *levels* of employment and GDP per capita, another indicator of recovery is whether a metro economy has returned to its long-term pre-recession *rates* of economic growth. About 46 percent of metro areas registered higher growth on GDP per capita and/or employment than before recession, mostly in North America and developing and developed metro areas in Asia-Pacific.

About 46 percent of metro areas registered higher growth on GDP per capita and/or employment than before the recession.

On GDP per capita growth, metro areas in Saudi Arabia (Riyadh and Jeddah-Mecca) and Southeast Asia (Jakarta) that had no downturn or fully recovered by 2012 outperformed their trend growth rates (Table 1). Some Japanese metro areas, Sapporo and Kumamoto, also did better than their GDP per capita long-run growth rate, spurred by post-tsunami reconstruction. Chinese metro areas were the biggest under-performers relative to their long-run GDP per capita growth rates, as their economies "slipped" into high single-digit growth rates.

In terms of employment growth rates, Athens and the Spanish metro areas showed the largest declines from long-term trend rates, reflecting the problems confronting peripheral Eurozone economies. The metro areas that added most jobs relative to the trend are a diverse group, most of which had weaker long-run growth rates. San Juan tops the list, with 5.5 percent employment growth in 2012, well above its low trend employment growth rate of 1.2 percent.

TABLE 1. LARGEST CHANGES IN GDP PER CAPITA AND EMPLOYMENT GROWTH RATES, 300 LARGEST METROPOLITAN ECONOMIES, 1993-2007 TO 2011-2012

	Income Growth Rate (%)				Employment Growth Rate (%)			
	Gains				Gains			
		2011-2012	1993-2007	Change		2011-2012	1993-2007	Change
1	Nanning	8.8	4.4	4.5	**San Juan**	5.5	1.2	4.3
2	**Jakarta**	5.0	1.2	3.9	**Bucharest**	3.3	-0.3	3.6
3	Perth	6.9	3.6	3.2	**Anshan**	-0.2	-2.8	2.6
4	Riyadh	4.9	1.7	3.2	**Shenyang**	0.9	-1.3	2.2
5	Abu Dhabi	2.1	-0.4	2.5	Perth	4.9	2.8	2.1
6	**Bangkok**	4.3	2.0	2.3	**Baotou**	0.1	-2.0	2.1
7	Mexico City	2.6	0.4	2.2	Louisville	3.1	1.1	2.0
8	Jeddah-Mecca	4.3	2.6	1.7	Cape Town	2.6	0.6	2.0
9	Sapporo	2.2	0.6	1.6	Daejon	3.1	1.2	1.9
10	Kumamoto	2.7	1.3	1.4	Daegu	2.7	0.7	1.9
	Losses				**Losses**			
291	**Suzhou**	5.9	14.5	-8.6	Kuwait	2.8	9.2	-6.3
292	**Baotou**	6.8	15.5	-8.6	Seville	-3.4	3.1	-6.4
293	**Hangzhou**	3.9	12.5	-8.6	Bilbao	-4.3	2.7	-7.0
294	**Guangzhou**	3.3	12.0	-8.7	Valencia	-4.3	2.9	-7.2
295	**Ningbo**	3.8	12.7	-8.8	Dubai	2.7	10.6	-7.9
296	**Huhehaote**	6.6	15.6	-9.1	Barcelona	-4.6	3.4	-8.0
297	Athens	-5.1	4.0	-9.1	Madrid	-4.3	3.8	-8.0
298	**Wenzhou**	3.6	12.7	-9.1	Saragossa	-5.1	3.0	-8.0
299	**Zhongshan**	4.4	14.2	-9.8	Malaga	-3.7	4.6	-8.3
300	**Dongguan**	3.9	16.1	-12.1	Athens	-6.9	2.1	-9.0

Source: Brookings analysis of data from Oxford Economics, Moody's Analytics, and U.S. Census Bureau; developing metro areas shown in bold.

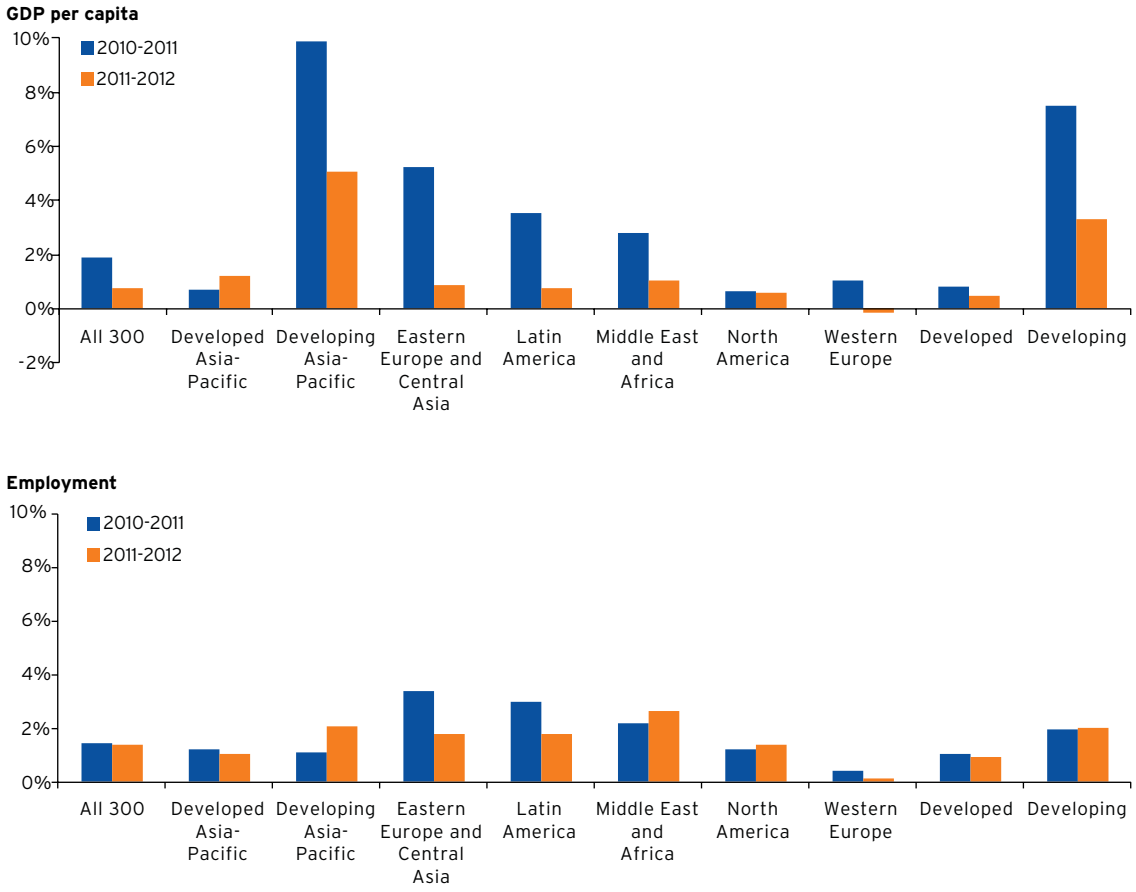
Overall, 2012 further distinguished a group of metro areas that fully recovered to their previous peaks on employment and GDP per capita, from a large number that slipped back into recession. Ongoing problems in the Eurozone were a major driver of an increasing number of metro areas falling into recession, including those outside the Eurozone in the United Kingdom, Czech Republic, Hungary, Poland, and Bulgaria. At the same time, the situation in North America improved slightly, with metro areas starting to exceed their pre-recession peaks on one or both indicators.

D. Growth rates of both GDP per capita and employment slowed between 2011 and 2012 for half of the 300 metro areas.

A global economy that was growing but losing momentum in 2011 gave way to further slowdown in 2012, affecting both developed and developing countries. This was reflected in the aggregate experience of the 300 largest metro economies. Their employment growth rate held steady at 1.4 percent from 2011 to 2012, but their GDP per capita growth decelerated rapidly, from 1.9 percent in 2011 to 0.7 percent in 2012. Developing metro areas exhibited the same pattern of stable employment growth and markedly reduced GDP per capita gains, while developed metro areas posted lower growth rates on both indicators (Figure 5).

Metro employment growth patterns relative to 2011 varied significantly across regions (Figure 5). Metro areas in developing Asia- Pacific, the Middle East and Africa, and North America posted faster gains in employment in 2012 than in the prior year. Twenty-four (24) metro areas managed to stop their job losses in 2012, including eight British metro areas and three American ones (Albany, Little Rock, and Sacramento). In contrast, employment growth rates almost halved in metro areas in Eastern Europe and Central Asia, slowed considerably in Latin America, and nearly flatlined across Western European metro economies.

FIGURE 5. METROPOLITAN GDP PER CAPITA AND EMPLOYMENT GROWTH RATES BY REGION AND DEVELOPMENT STATUS, 2011-2012 AND 2010-2011



Source: Brookings analysis of data from Oxford Economics, Moody's Analytics, and U.S. Census Bureau

Metro areas in all world regions experienced slower combined GDP per capita growth in 2012 than 2011, except those in developed Asia- Pacific, mainly the effect of Japanese reconstruction after the tsunami. Still, about one-quarter of the 300 metro areas had faster gains in GDP per capita than in 2011. Sendai, one of the areas most affected by the tsunami, topped the charts, turning a plummeting 7.4 percent decline into 2.0 percent GDP per capita growth (Table 2). On employment growth, San Juan, the Egyptian metro areas (having emerged from political revolution in 2011), and a number of Asia-Pacific metro areas had a better 2012.

Less promising are the half of the 300 largest metro areas that experienced declines in the growth rates of both GDP per capita and employment between 2011 and 2012. In this group, developing Asia- Pacific metro areas, particularly those in China, dominated the ranks of metro economies witnessing the most significant slowdowns in GDP per capita growth relative to 2011. Turkish metro areas (Ankara, Istanbul, and Bursa) also witnessed a braking of their job expansion, drawing them closer to the growth rates of their Eastern European neighbors.

TABLE 2. LARGEST CHANGES IN GDP PER CAPITA AND EMPLOYMENT GROWTH RATES, 300 LARGEST METROPOLITAN ECONOMIES, 2010-2011 TO 2011-2012

	Income Growth Rate (%)				Employment Growth Rate (%)			
	Gains				**Gains**			
		2011-2012	**2010-2011**	**Change**		**2011-2012**	**2010-2011**	**Change**
1	Sendai	2.0	-7.4	9.4	San Juan	5.5	-0.9	6.3
2	Perth	6.9	1.2	5.7	Jakarta	4.0	-2.2	6.1
3	Sapporo	2.2	-2.1	4.3	Sendai	-0.2	-6.0	5.7
4	**Bangkok**	4.3	0.2	4.1	**Bangkok**	0.5	-4.4	4.9
5	Okayama	1.9	-1.7	3.7	**Dongguan**	1.8	-1.8	3.6
6	Sydney	3.4	0.3	3.1	Perth	4.9	1.5	3.5
7	Tokyo	2.0	-1.1	3.0	**Cali**	1.4	-1.6	3.1
8	Hiroshima	1.8	-1.0	2.9	Daegu	2.7	0.0	2.7
9	Baton Rouge	0.4	-2.3	2.7	**Alexandria**	2.3	-0.3	2.6
10	Ottawa	0.7	-2.0	2.7	**Cairo**	2.3	-0.3	2.6
	Losses				**Losses**			
291	**Chengdu**	7.7	15.2	-7.5	Seville	-3.4	-0.1	-3.3
292	**Baotou**	6.8	14.3	-7.5	**Ankara**	3.4	7.3	-3.8
293	**Zhuhai**	3.2	10.8	-7.5	**Istanbul**	2.5	6.7	-4.2
294	**Mumbai**	4.5	12.1	-7.6	**Santiago**	1.9	6.1	-4.2
295	Almaty	1.3	8.9	-7.6	**Bogota**	2.2	6.5	-4.3
296	**Zhongshan**	4.4	12.1	-7.7	Edmonton	1.1	5.6	-4.5
297	**Wulumuqi**	7.5	15.6	-8.1	**George Town**	1.0	5.7	-4.7
298	**Shantou**	2.7	11.5	-8.7	**Izmir**	3.1	8.2	-5.1
299	**Buenos Aires**	1.6	11.0	-9.5	**Kuala Lumpur**	1.8	7.6	-5.8
300	Macau	5.1	18.2	-13.1	Bursa	2.5	8.4	-5.9

Source: Brookings analysis of data from Oxford Economics, Moody's Analytics, and U.S. Census Bureau; developing metro areas shown in bold.

In contrast, 50 metro areas, most of them in North America, posted accelerated gains in both employment and GDP per capita in 2012. For example, Sacramento, one of the few U.S. metro areas that was still losing jobs in 2011, bounced back to a 2.0 percent employment growth rate, driven largely by recovery in local/non-market services (mainly health-care) after steep cutbacks in state government employment in previous years. Most of these North American metro areas also figured among those posting the largest gains in their performance rankings between 2011 and 2012. For example, San Francisco jumped from ranking 222 in 2011 to 77th in 2012, on the strength of its business and financial services and local/non-market services (see sidebar).

SAN FRANCISCO: REBOUNDING IN 2012 ON THE STRENGTH OF BUSINESS AND FINANCIAL SERVICES

Located in Northern California's Bay Area, the San Francisco metropolitan area includes the cities of San Francisco, Oakland, and Fremont and their surrounding areas on either side of the San Francisco Bay. The metro area is well known around the world for neighboring Silicon Valley technology companies and top research institutions, including the University of California-Berkeley, Stanford University, and the University of California-Davis. Less known is the deep connection between San Francisco and Asia. San Francisco has been historically the American gateway to Asia and the entry point for many Asians into the United States; 16 percent of the San Francisco metro area's 4.4 million people were born in China.[34]

Between 1993 and 2007, a period that included the "dotcom bubble" that built up during the late 1990s and burst in the early 2000s, San Francisco grew overall, but registered much higher gains in standard of living (2.6 annual GDP per capita growth rate) than employment (0.9 percent annually). Similar to other metropolitan areas in the United States, San Francisco suffered deep declines in both GDP per capita and employment after the 2007 crisis hit its overheated housing market hard. Between 2008 and 2009, the San Francisco area's employment dropped by 5.4 percent and its GDP per capita plummeted 7.2 percent.

San Francisco is recovering quickly, but still has a long way to go to achieve full recovery. Both its employment and GDP per capita accelerated from tepid gains in 2011, helping the metro area move from ranking 222nd in 2011 to 77th in 2012. Comprising over one-third of the metro economy, business and financial services delivered 45 percent of San Francisco's output growth in 2012. Many advanced services firms such as Wells Fargo have their headquarters in the region, and benefit from a large stock of human capital; San Francisco consistently ranks as one of the most highly educated U.S. metro areas. On employment, local/non-market services, mainly health services, added almost 40 percent of all new jobs in San Francisco.

Another possible key to the accelerating growth in the Bay Area is the strengthening of its global ties, specifically with China. For example, the Center for Economic Development of San Francisco's new economic development initiative, ChinaSF, facilitates trade and investment opportunities for San Francisco businesses. The Bay Area Council, a major economic development institution in the metro area, also recently opened its first office in Shanghai to develop stronger partnerships with China and encourage increased trade. These initiatives leverage San Francisco's proximity and immigration ties to China with the goal of expanding metro exports and foreign direct investment.

E. Both national and metropolitan factors influence metropolitan economic growth.

Gross Domestic Product (GDP) per capita is an important indicator of the well-being of a metro area and its residents, because it measures not only how fast a metro economy grows, but if it keeps pace with the growth of its population. For example, the population of New Orleans increased by 2.6 percent in 2012, but its economic output grew by only 1.4 percent, resulting in a decline in the average New Orleans resident's standard of living. By contrast, the high GDP growth rates of Chinese metro economies over the last decades, coupled with low or moderate population growth, led to a rapid rise in the standard of living for Chinese urbanites. What characteristics of metropolitan economies account for changes in GDP per capita, on both a year-to-year basis and over longer periods of time?

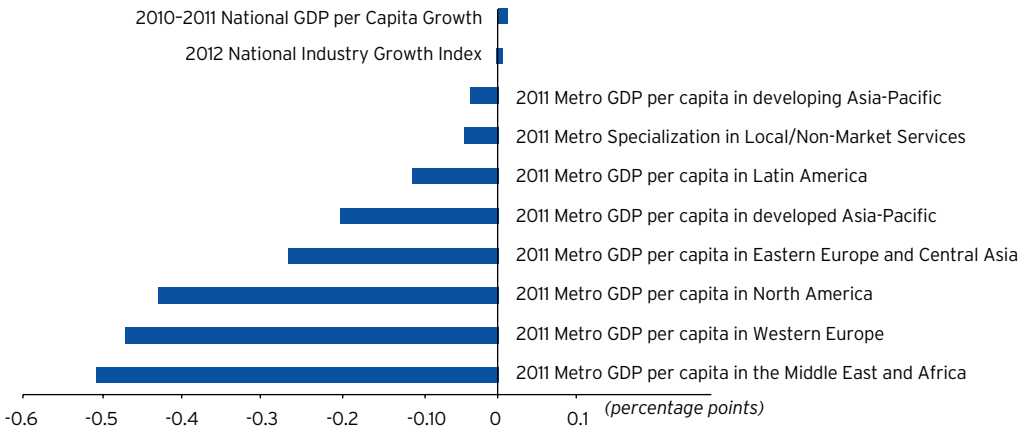
To answer this question, this analysis estimates the individual effect of national and local factors on annual metro GDP per capita growth over the short-and long-term, while holding the other factors constant (see more on model specifications in Appendix A). It compares metro areas that score above average on each indicator to those that score below average to better understand the relative effect of each factor.

Short-term effects

On a year-to-year basis, a metro area's previous year's level of GDP per capita matters the most to its annual change in GDP per capita. While this is to be expected across a sample that combines metro areas from developing and developed countries, the effect holds but varies significantly across the seven world regions identified in this study. From 1990 to 2012, the initial level of metro GDP per capita effect explains about 83 percent of the annual growth of GDP per capita in Middle East and Africa metro areas (the highest) but only 49 percent in Latin America metro areas (the lowest)(see Table A4 in Appendix A). [35]

In 2012, this effect is the strongest for metro areas in the Middle East and Africa, where metro areas with below regional average GDP per capita in 2011 experienced a half percentage point increase in their 2012 GDP per capita growth relative to metro areas in the region with above average regional GDP per capita in 2011 (Figure 6). This points not only to the disparity in metro GDP per capita in the region, with metro areas in both developed (such as Abu Dhabi, Kuwait, Riyadh, and Tel Aviv) and developing countries (Alexandria, Cairo, Casablanca), but also to the remaining growth potential in the poorer metro areas of the region.

FIGURE 6. ESTIMATED SHORT-TERM EFFECTS OF NATIONAL AND LOCAL FACTORS ON ANNUAL METRO GDP PER CAPITA CHANGES, ABOVE-AVERAGE VERSUS BELOW-AVERAGE METRO AREAS, 2011 TO 2012



Source: Brookings analysis of data from Oxford Economics, Moody's Analytics, and U.S. Census Bureau

Note: These are only the statistically significant effects by variable. The metropolitan and time effects were also statistically significant. For a complete list of the coefficients, see Table A2 in Appendix A. An effect measures the difference between the average marginal effect of the variable for metro areas that score above the average for the indicator to the average marginal effect for metro areas that score below average.

In contrast, the effect of the initial level of metro GDP per capita on subsequent annual growth is weakest in developing Asia-Pacific metro areas in 2012. Metro areas with below regional average GDP per capita in 2011 had 2012 GDP per capita growth only 0.04 percentage points higher relative to other metro areas in the region.

Local/non-market services are the only industry specialization that affects the following year's annual changes in metro GDP per capita, explaining about 16 percentage of the increase in that indicator across 1990 to 2012. In 2012, metro areas specialized in local/non-market sector and with above-average employment in this industry had GDP per capita growth 0.04 percentage points slower than other metro areas. The more inward focus of these metro areas may isolate them somewhat from growth-inducing exchanges with other metro areas around their countries and the world.

National growth factors have a positive but small effect on a metro area's annual GDP per capita growth. National GDP growth and national industry growth each explain about 5 percent of metro GDP per capita growth. Metro areas in countries with above-average 2011 GDP per capita growth had 2012 GDP per capita growth 0.01 percentage points higher than other areas. Having a large share of the metro economy in growing national industries (those with above-average growth rates) also added 0.01 percentage points to a metro area's 2012 GDP per capita growth rate. For example, business and financial services, one of the fastest growing industries in Sweden in 2012, represented one-third of Stockholm's economy. In conjunction with other factors, this robust industrial performance led Stockholm to achieve the top spot on GDP per capita growth in Western Europe (see sidebar).

National growth factors have a positive but small effect on a metro area's annual GDP per capita growth.

STOCKHOLM: REFLECTING ROBUST NATIONAL GROWTH AND STRONG LOCAL CONDITIONS

Overlooking the Baltic Sea, Stockholm is the main center of economic activity in Sweden and Scandinavia as a whole. With an economy about the size of the Baltic countries combined (Estonia, Latvia, and Lithuania), Sweden's capital is the largest metropolitan economy in Scandinavia and a well-connected hub in the region.[36] In 2012, Sweden's capital registered 2.7 percent GDP per capita growth rate, the highest among Western Europe metropolitan areas, and the result of a combination of national and local factors.

Robust macroeconomic conditions in Sweden helped boost Stockholm's GDP per capita last year. While part of the European Union, Sweden is not in the Eurozone and managed to avoid the fallout of current fiscal and debt problems across the monetary union. Sweden's public debt, as a share of GDP, is less than half of the Eurozone average, and its budget deficit is miniscule (0.1 percent of GDP).[37] Driven by private investment, Sweden's economy expanded by 4 percent in 2011 and its GDP per capita grew by 3.2 percent the same year. Stockholm fully benefitted from the national economic performance in the previous year and grew even faster than the country in 2012.

Fast-growing national industries had a positive effect on Stockholm's output in 2012, given the metro area's industry mix. Construction and business and financial services expanded their output most in Sweden in 2012, and the latter industries represent slightly more than one-third of Stockholm's economy. Major banks such as Nordea, Swedbank, as well as large insurance companies like Skandia, are headquartered in Stockholm.

At the same time, Stockholm is one of the wealthiest metro areas in the world and its standard of living does not grow by in leaps and bounds as in some developing metro areas. The initial level of metro GDP per capita matters to the growth of metro GDP per capita, but it is not destiny. Stockholm's GDP per capita rose the fastest in 2012 among Western European metro areas, even though the Swedish metro area has one of the highest standards of living on the continent.

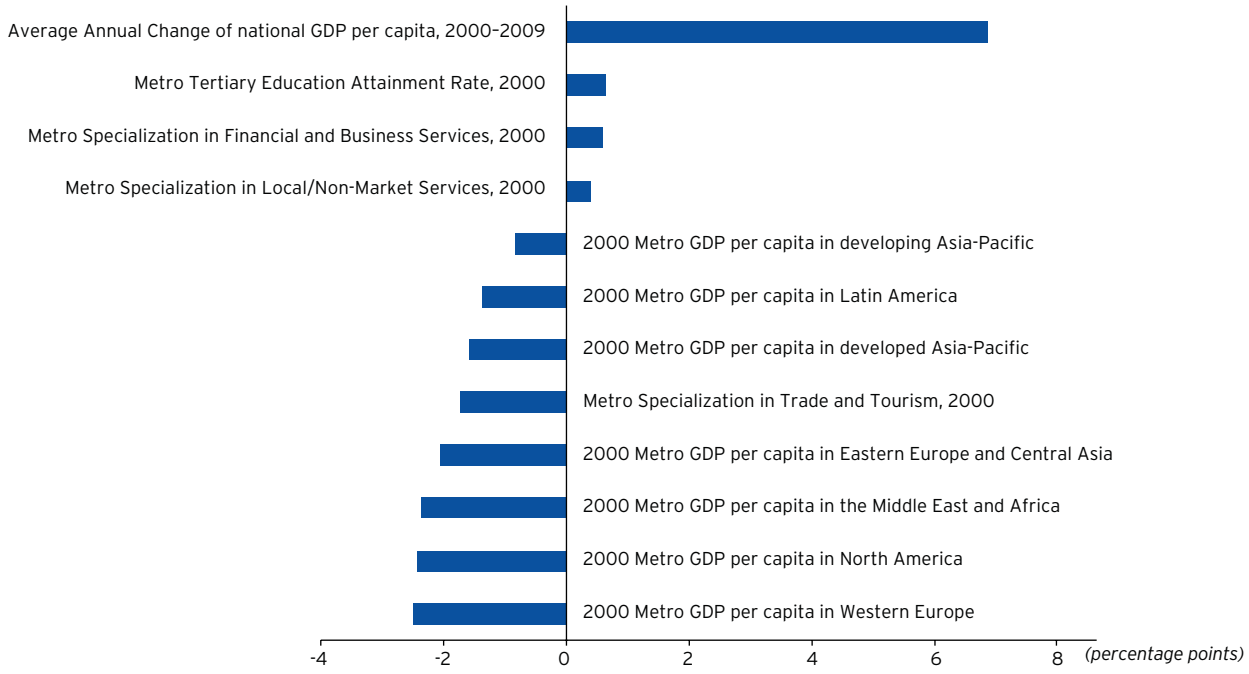
Over the years, several additional factors helped Stockholm become one of the most prosperous metro areas in Western Europe. The metro area nurtured its high value-added services, such as business and financial services, turning into a regional hub of financial activity among Nordic countries and other prosperous Scandinavian metro areas.[38] Furthermore, Stockholm's high level of college degree attainment, (39 percent of adults 25 years and over) caters to its growing business and financial services sector, as well as other knowledge-based industries in the metro area.

Stockholm is betting on innovation to keep improving the standard of living of its residents for the future. The Swedish capital has the highest level of patenting per capita among European metropolitan areas.[39] In 2010, the European Commission awarded the Scandinavian metro area the title of European Green Capital because of its innovative and effective measures towards achieving a more sustainable environment.[40] Stockholm has a strong life sciences cluster as well, with more than 15 new life science companies formed each year during the last decade, comparable to Boston. [41] The national government plans to support this innovation path with an additional $1.74 billion investment in life sciences research nationally between 2013 and 2016.[42]

Long-term effects

The longer-run influences on metro economic growth differ somewhat from those factors that help determine short-term performance. Between 2000 and 2010, national growth was the most important factor for long-term metro growth. A metro area in a country with above-average 2000-2009 annual GDP per capita growth experienced GDP per capita growth of its own 6.9 percentage points higher than other metro areas annually from 2000 to 2010 (Figure 7). Across regions, national GDP per capita growth explains 53 percent of metro growth in the same indicator, with the effect peaking at 58 percent in developing Asia-Pacific metro areas (Table A.5 in Appendix A).

FIGURE 7. ESTIMATED LONG-TERM EFFECTS OF NATIONAL AND LOCAL FACTORS ON ANNUAL METRO GDP PER CAPITA CHANGES, ABOVE-AVERAGE VERSUS BELOW-AVERAGE METRO AREAS, 2000 TO 2010



Source: Brookings analysis of data from Oxford Economics, Moody's Analytics, and U.S. Census Bureau

Note: These are only the statistically significant effects by variable. For a complete list of the coefficients, see Table A3 Appendix A. An effect measures the difference between the average marginal effect of the variable for metro areas that score above the average for the indicator to the average marginal effect for metro areas that score below average

The initial level of metro GDP per capita also has a long-term effect on the growth of metro GDP per capita across all world regions. Metro areas with 2000 GDP per capita levels below their regional averages experienced higher average annual growth rates in their standard of living between 2000 and 2010, by2.5 percentage points in Western Europe to 0.8 percentage points in developing Asia-Pacific. On average, the 2000 level of metro GDP per capita explains about 14 percent of the annual 2000-2010 metro GDP per capita growth rate.

Metro industry specialization, on the other hand, looms more important in the long run than from year to year. Specialization in trade (retail and wholesale) and tourism has the largest effect, explaining about 13 percent of the annual 2000-2010 metro GDP per capita growth rate, and metro areas with that specialization (and above-average employment in the sector) experienced metro GDP per capita growth 1.7 percentage points lower than other metro

areas during the analyzed period. This reflects the generally lower levels of productivity growth in that sector relative to other sectors.

Agglomeration economies in business and financial services industries also have positive effects on a metro area's long-term growth, adding about 0.6 percentage points to the annual GDP per capita growth rate of metro areas specialized in this industry and with an above-average employment in the sector. Business and financial services are prone to benefit from the concentration of other firms in a metropolitan area, the quantity and quality of labor, and proximity to infrastructure that reduces travel and time costs in reaching clients.

While specialization in local/non-market services exerts a negative short-term effect on annual metro GDP per capita growth, it adds about 0.4 percentage points to annual metro GDP per capita growth in the long run for metro areas specialized in this industry and with an above-average employment in the sector. Local/non-market services include education and health care, which are associated with long-term growth.

Finally, a metro area's long-term economic growth depends on its ability to innovate and achieve technical progress, which in turn depend on the quantity and quality of metro human capital. In that regard, a metro area's starting rate of higher educational attainment influences its subsequent GDP per capita growth. Metro areas with an above-average 2000 college degree attainment rate experienced a 0.6 percentage-point higher annual GDP per capita growth rate than other metro areas from 2000 to 2010.

A metro area's starting rate of higher educational attainment influences its subsequent GDP per capita growth.

CONCLUSION

Metro areas remain the hubs of global output and growth. The 300 metro economies analyzed in this report account for 19 percent of world population, but 48 percent of world GDP, and 51 percent of world GDP growth from 2011 to 2012. Yet their performance in 2012 showed the signs of a slowing worldwide recovery.

While a large number of metro areas managed to reach their pre-recession peaks on employment and/or GDP per capita in 2012, growth rates decelerated on both indicators last year for about half of the 300 metro areas, in some cases venturing into negative territory. Ongoing problems in the Eurozone led an increased number of metro areas into at least a partial recession, not only in Eurozone countries but also in other Western European countries (the United Kingdom) and Eastern Europe and Central Asia (Czech Republic, Hungary, Poland, and Bulgaria).The slowdown in the global economy also reduced growth rates in developing Asia-Pacific metro areas, though their rates remained high relative to those in other metro areas around the world. Latin American metro areas were more affected. GDP per capita fell in some Brazilian metro areas, even as Mexican metro areas grew relatively strongly.

Other metro areas had a more positive year. In North America, 2012 was the first year in which some metro areas managed to recover to pre-recession peaks of GDP per capita and employment. In contrast to Western Europe and developed Asia-Pacific, North American metro areas combined posted higher job growth than in 2011. Growth in developed Asia-Pacific metro areas was boosted by Japanese reconstruction after the 2011 tsunami, resulting into higher GDP per capita growth rates relative to 2011. Middle East and African metro economies (with the exception of those in Israel) also had a better year in 2012 than in 2011.

National economic growth matters greatly for metro performance, but metropolitan factors matter, too. In the short run, where a metro area starts on GDP per capita is the most important influence on its year-to-year GDP per capita growth rate, with less wealthy metro areas typically growing faster than their richer counterparts. Over the long run, country growth matters most to metro-level growth. But metro-specific factors such as industry specialization and educational attainment shape the growth potential of metro areas as well.

Slowed global growth in 2012 did not arrest the underlying long-term shift in economic growth from developed metro areas in the global West towards developing metropolitan areas in the global South and East. Indeed, this trend has accelerated in 2012 since the start of the 2007 financial crisis, due in large part to the continued fast growth of Chinese metro areas.

The increasing contribution of developing metro areas to world economic growth reflects a long-term divergence between structural trends in GDP per capita growth for developing and developed metro areas over the last two decades (top panel in Figure A1).[43] However, as the recent generalized slowdown in both developed and developing metro areas shows, short-term fluctuations affect both developed and developing metro areas, because of the interdependence of growth among metropolitan areas (bottom panel in Figure A1).

Perhaps the most important lesson from 2012 is how interdependent metro areas remain, in developed and developing countries, and across world regions, for economic growth. In a global economy where macroeconomic shocks travel quickly through financial and trade channels and extended global supply chains, metro areas are cannot build their way to prosperity on their own. Metro areas must continue to work with national and state governments to strengthen their competitive position and growth potential through strategic investments in innovation, infrastructure, and human capital. But they must also work with other metro areas at home and abroad to organize themselves for trade, and foster purposeful new relationships that help create new "collaborative advantage" for the 21st century.

APPENDIX A: ADDITIONAL METHODOLOGICAL INFORMATION

Selection and Definition of Metropolitan Areas

This third edition of the *Global MetroMonitor* employs the size of metropolitan economy as the main selection criterion, given the focus on metropolitan economic performance. It increases to 300 the number of studied metro areas, up from 150 in the inaugural report and 200 in last year edition. As a result, the sample is comprised of the largest 300 metropolitan economies in the world for which economic and time-series data were available, based on the size of their economy in 2010, at purchasing power parity rates. The sample is based on McKinsey Global Institute's Cityscope 2.0 database.[44]

This study uses the general definition of a metropolitan area as an economic region with one or several cities and their surrounding areas, all linked by economic and commuting ties. In the United States, metro areas are defined by the federal Office of Management and Budget (OMB) to include one or more urbanized areas of at least 50,000 inhabitants plus outlying areas connected by commuting flows.[45]

For the European Union countries, Switzerland and Norway, the European Observation Network for Territorial Development and Cohesion (ESPON) defines metro areas as having one or more functional urban areas of more than 500,000 inhabitants.[46] This study uses the most accurate metropolitan area compositions of European metro areas, because the current ESPON 2013 database employs commuting data at the municipal level to define functional urban areas, the building blocks of metropolitan areas.[47] This identification method is the most consistent with the U.S. definition of metros based on commuting links, with possibility of a metro crossing jurisdictional borders, and having multiple cities included.

For metropolitan areas outside of the United States and Europe, this study uses the official metropolitan area definition from national statistics or other official sources. Not all countries, especially developing ones, have created statistical equivalents of a metropolitan area. Due to data limitations, some metropolitan areas in this report do not reflect properly regional economies, but the federal city (Moscow, St. Petersburg), provincial level- and prefecture-level cities in China, or administrative region (Casablanca). For example, this study treats Jeddah and Mecca together, because of the lack of individual metropolitan economic time-series data and the use of the entire Makkah province as a substitute. For the same reason, this study uses data for the state of Kuwait to represent the Kuwait city metropolitan area.

In mapping the metropolitan areas, this research constructs geographic boundaries according to the metro area-specific definitions; the centroids of these polygons represent the metropolitan areas on the maps in this study. Polygon files were extracted from official sources or were constructed based on the official definitions (For geographical information and sources for each of the 300 metropolitan areas, see Appendix C).

Baseline Variables and Data Sources

This *Global MetroMonitor* employs a few key variables to assess the economic performance of metropolitan areas: Gross Domestic Product (GDP), employment, population, and GDP per capita, from 1993 to 2012. In addition, the study uses Gross Value Added (GVA) and employment by major industry sector. For static analysis, this study employs nominal GDP and GVA data, at purchasing power parity rates. For trends analysis, it uses GDP and GVA data at 2005 prices and expressed in U.S. dollars.[48] The study includes data on tertiary education attainment rates in 2000 for a smaller number of metro areas in the explanatory model. Data availability and comparability at metropolitan level precluded expanding the economic analysis to other indicators of interest, such as housing prices, employment rates, and unemployment rates.

This edition employs two main databases for analysis: Moody's Analytics for metropolitan areas in the United States, and Oxford Economics for the rest of the sample. For the United States, this study also uses the U.S. Census Bureau's population estimates.

Moody's Analytics derives GDP by metropolitan area (estimated and forecasted) based on the U.S. Bureau of Economic Analysis' (BEA) GDP by state estimates.[49] Oxford Economics collects data from national statistics bureaus in each country or from providers such as Haver, ISI Emerging Markets, and Eurostat. It calculates forecasted metro GDP as the sum of forecasted industry GVA at the metropolitan level.

For population, this study uses the U.S. Census Bureau's intercensal population estimates for the United States and Oxford Economics' collected data from national statistical agencies. To forecast 2012 population for U.S. metro areas, annualized growth rates from 2007 to 2011 are applied to 2011 estimates. Oxford Economics forecasts metro-

politan population based on official population projections produced by national statistical agencies and/or organizations such as Eurostat, adjusting migration assumptions on a case-by-case basis.

For the long-term explanation of metro growth rates of GDP per capita, this study uses additionally tertiary education attainment rates, defined as International Standard Classification of Education (ISCED) levels 5 and 6. Education attainment rates for the U.S. metro areas are calculated based on American Community Survey (ACS) data, while Oxford Economics collected or constructed the data for other metro areas. A big caveat of the education attainment rates used in this research is the variety of base years used by different countries to report education attainment rates. Oxford Economics compiled these data for a future Brookings project on the demographics of the 300 largest metropolitan areas worldwide.

For industry analysis, this report collected industry-level data and estimates for metropolitan employment and GVA. This edition uses the eight major industrial sectors from the previous edition of *Global MetroMonitor*, for which GVA and employment data were available at the metropolitan level (see Table A1). In large part, this industrial identification was driven by data availability with the goal of reaching a balance between industry disaggregation and consistency of categories across metros and countries.

TABLE A1. INDUSTRY CATEGORIES IN *GLOBAL METROMONITOR*

Industry Category	Corresponding Industry for U.S. Metro Areas	Approximate NAICS 2007
Commodities (agriculture and mining)	Agriculture, Forestry, Fishing and Hunting	11
	Mining, Quarrying, and Oil and Gas Extraction	21
Manufacturing	Manufacturing	31-33
Utilities	Utilities	22
Construction	Construction	23
Trade and tourism	Wholesale Trade	42
	Retail Trade	44-45
	Accommodation and Food Services	72
Transportation	Transportation and Warehousing	48-49
Business, financial, insurance, and real estate services	Finance and Insurance	52
	Real Estate and Rental and Leasing	53
	Professional, Scientific, and Technical Services	54
	Management of Companies and Enterprises	55
Local/non-market services	Administrative and Support and Waste Management and Remediation Services	56
	Educational Services	61
	Health Care and Social Assistance	62
	Arts, Entertainment, and Recreation	71
	Other Services (except Public Administration)	81
	Government	
	Information	51

This industry identification was applied to a subset of the overall 300 metropolitan economies due to lack of industrial data in four metropolitan areas – Bangalore, Chennai, Hyderabad, and Kolkata. While the industry concepts might be consistent across these categories, the industry GVA and employment may be calculated slightly differently on a country-by-country basis.

For U.S. metro areas, Moody's Analytics provides GVA and employment by industry, using the North American Industry Classification System (NAICS) 2007. For European metros, Oxford Economics collects GVA and employment by industry, based on the Statistical Classification of Economic Activities in the European Community (NACE) version 1. For metro areas outside of the United States and Europe, Oxford Economics reports data available from local and national statistical agencies.

Moody's Analytics bases industry employment forecasts for U.S. metro areas on two U.S. Bureau of Labor Statistics series: the monthly Current Employment Statistics (CES) and the Quarterly Census of Employment and Wages (QCEW). In forecasting industry GVA and employment for metro areas, Oxford Economics employs different methods depending on the type of industry. For tradable sectors (primary industries and business and financial services), the GVA forecasts take into account the historical relationship between the growth of the industry in a metro area compared with the respective national average. Public services industries forecasts follow the same method, adding metro population to reflect the nature of demand for local services. GVA forecasts for trade and tourism, and transportation are modeled against the performance of the previous two categories of industries (tradable sectors and public services), to reflect local multiplier effects. Industry employment forecasts are based on GVA industry forecasts and trends in labor productivity.

Metro Economic Performance Score

The report focuses on the economic performance of metropolitan areas using a standardized score composed of two indicators: the annualized growth rate of real GDP per capita and the annualized growth rate of employment. These two indicators reflect the importance that people and policy makers attach to achieving rising incomes and standards of living (GDP per capita), and generating widespread labor market opportunity (employment). Identifying economic data available across the entire sample of 300 metro areas limited the choice and number of additional indicators to be included in the standardized score. For example, while changes in the employment rate or the unemployment rate may better indicate labor market opportunity, there are no consistent data on the number of unemployed people or the size of the labor force across metropolitan areas worldwide.

The scoring method compares each value of a variable (X_i) to the median (X_{med}), then divides their difference by the distance between the value of that variable at the 90th percentile of the distribution (X_{90}) and the 10th percentile (X_{10}):

$$Standardized\ score = \frac{Xi \quad - X_{med}}{X_{90} - X_{10}}$$

Each of the two indicators (annualized growth rates of income (GDP per capita) and employment) is standardized using this method for each time period (1993-2007, minimum year of growth 2007-2011, 2011-2012). Once standardized, the scores for each of the two indicators are added for each metro area, therefore yielding a total score and ranking for each metro area for each time period.

Inter-decile range standardization helps minimize the influence of outliers by using the 90th and the 10th percentile values instead of the minimum and maximum values, and best reflects the non-normal distribution of metro economic growth rates. This method was judged more appropriate for these data than Z-score standardization, which compares each value of a variable to the mean and divides their difference by the standard deviation, as they do not follow a normal distribution. It was also preferred to range standardization (which compares each value of a variable to the minimum and divides their residual by the distance between the minimum and the maximum) because of the sensitivity of this latter method to outliers.

Case Studies

The study offers profiles of metropolitan economies that illustrate the findings of the analysis or factors contributing to extreme high or low rankings for economic performance.

Determinants of Metro GDP per Capita Growth

This study employs a panel data analysis to determine the short-term effect of national and metropolitan factors on the annual change of metro GDP per capita between 1990 and 2012. Equation (1) shows the baseline regression, in which Y is GDP per capita, Region i is the world region to which that metro area belongs, I is a national industry growth index reflecting metro industrial composition and national industry growth, Agg_j reflects metro industry specialization in industry *j*, m reflects metropolitan area effects, and t indicates time effects.

$$\ln\left(\frac{Y_{m,t}}{Y_{m,t-1}}\right) = \alpha + \beta_{1i}\ln(Y_{m,t-1}) \times Region_i + \beta_2 \ln\left(\frac{Y_{c,t}}{Y_{c,t-1}}\right) + \beta_3 I_{m,t} + \beta_{4j}\ln(Agg_{m,j,t-1}) + m + t + u_{m,t}$$

Equation (1)

where

$$I_{m,t} = \sum_{j=1}^{8}\left[\left(\frac{Employment_{m,j,t}}{Employment_{m,t}}\right) \times \ln\left(\frac{Employment_{c,j,t}}{Employment_{c,j,t-1}}\right)\right]$$

$$Agg_{m,j,t} = Employment_{m,j,t} \times \left[\left(\frac{Employment_{m,j,t}}{Employment_{m,t}}\right) \Big/ \left(\frac{Employment_{c,j,t}}{Employment_{c,t}}\right)\right]$$

m= metropolitan area
c=country
t= year, 1990-2012
i= world region, from 1 to 7
j= industry category, from 1 to 8

This baseline regression follows the specification of a similar panel analysis conducted in an OECD study to determine the drivers of regional economic growth for TL2 regions between 1995 and 2005.[50] This research includes the following variables, based on available data:

- ***Growth of metro GDP per capita,*** as indicator of the health of a metro economy
- ***Initial level of metro GDP per capita.*** Neoclassical economists emphasize capital accumulation and the importance of the initial level of GDP per capita, theorizing that places starting from lower levels of GDP per capita tend to grow faster.[51] This research estimates the effect of initial metro GDP per capita by world region to show how the strength of the effect of the initial metro GDP per capita on the growth rate of the indicator varies by world regions and whether it stays statistically significant across regions. Based on the convergence literature, the expected relationship is negative
- ***Growth of national GDP per capita.*** The role of the national economy is usually a chicken-and-egg problem; metro economies are the places where the national economy happens, but macroeconomic policies and factors such as exchange rates, fiscal policy, and trade policy are beyond the control of metro economies. The national GDP per capita growth rate is lagged by one year to avoid the endogeneity issues between metro and national growth. It is expected that a high growth national rate in the previous year has a positive effect on the current metro growth rate, given everything else stays constant
- ***A national industry growth index*** that takes into account the metro industry structure and the growth rates of industries nationally. This index illustrates the effect of changes in national industries on metropolitan growth through metro area's industrial mix, similar with the sectoral composition index employed by Barro and Sala-i-Martin in their original work on convergence among U.S. states.[52] In other words, a metro area with large employment in industries that are doing well nationally is expected to do well on GDP per capita growth

TABLE A2. PANEL REGRESSION OF NATIONAL AND METROPOLITAN FACTORS ON ANNUAL CHANGE OF METRO GDP PER CAPITA, 1990–2012

Level of GDP per capita in Western Europe metro areas, lagged one year	-0.1408***
	-0.0277
Level of GDP per capita in North America metro areas, lagged one year	-0.1280***
	-0.026
Level of GDP per capita in developed Asia-Pacific metro areas, lagged one year	-0.0566***
	-0.02
Level of GDP per capita in developing Asia-Pacific metro areas, lagged one year	-0.0151***
	-0.0055
Level of GDP per capita in Eastern Europe and Central Asia metro areas, lagged one year	-0.0880***
	-0.0188
Level of GDP per capita in the Middle East and Africa metro areas, lagged one year	-0.1499*
	-0.092
Level of GDP per capita in Latin America metro areas, lagged one year	-0.0450*
	-0.0263
Annual Change of national GDP per capita, lagged one year	0.2218***
	-0.0754
National Industry Index	0.4602***
	-0.0786
Metro Specialization in Financial and Business Services, lagged one year	-0.0002
	-0.0046
Metro Specialization in Manufacturing, lagged one year	-0.0062
	-0.0096
Metro Specialization in Commodities, lagged one year	0.0008
	-0.0014
Metro Specialization in Trade and Tourism, lagged one year	-0.0017
	-0.0043
Metro Specialization in Transportation, lagged one year	-0.0012
	-0.003
Metro Specialization in Utilities, lagged one year	-0.0026
	-0.0016
Metro Specialization in Construction, lagged one year	0.0018
	-0.0029
Metro Specialization in Local/Non-Market Services, lagged one year	-0.0280**
	-0.013
Constant	0.5085***
	-0.1045
Year Fixed Effects	Yes
MSA Fixed Effects	Yes
Observations	6216
Number of Metropolitan Areas	296
R-squared within	0.3154
R-squared between	0.5624
Overall R-squared	0.3354
Standard errors clustered by country	55 clusters

*Note: Standard errors in parenthesis, *** p<0.01, ** p<0.05, * p<0.1*

- ***Metro industry specializations,*** especially in industries that are a major share of the metro economy, reflect the presence of agglomeration economies. New economic geography theories stress agglomeration economies in driving regional economic growth.[53] These are increasing returns to scale to activities in a metro area, as the result of a combination of factors such as the presence of industry clusters, labor and inputs pooling, and savings in transport and information costs by locating close to business partners and clients. This indicator reflects not only the concentration of a particular industry in a metro area relative to the country, but also the size of that metro industry employment

The panel analysis uses metropolitan fixed effects, to control for omitted metropolitan variables and unobserved metropolitan characteristics, and time fixed effects, to capture year-specific variations. A Hausman test rejects the hypothesis that the metropolitan omitted or unobserved effects are uncorrelated with the other variables in the model, confirming the choice of fixed effects for the model. In addition, the estimation allows for potential relationships between metro variables in the same country, to obtain robust standard errors. Clustering standard errors by country is allowed in this case, because the number of clusters is above the critical threshold of 50.[54] All the variables are in logarithm form to deal with potential heteroskedasticity.

This research attempted other specifications with additional metro variables (tertiary education attainment rates in the previous year, foreign-born rates in the previous year, patent rates in the previous year), but no meaningful or statistically significant results were obtained. In the case of tertiary education attainment rates, the effect is longer than one year, as shown by the statistically significant results obtained in the long-term effects model. Foreign-born rates were available for a rather small number of metropolitan areas and few years. Metro patents from the OECD REGPAT database are calculated using a different definition of metropolitan areas and are available for a small share of the largest 300 metro areas worldwide. Employment per capita (a proxy for employment rate) was not included in the analysis, because of collinearity with initial level of metro GDP per capita.

For the long-term, this study employs a variation of the baseline regression, examining the effect of the level of macroeconomic and metropolitan factors in 2000 on the average annual change of metro GDP per capita between 2000 and 2010 (See Equation 2):

$$\frac{1}{10}\ln\left(\frac{Y_{m,2010}}{Y_{m,2000}}\right) = \alpha + +\beta_{1i}\ln\left(Y_{m,2000}\right) \times Region_i + \beta_2 \times \frac{1}{9}\ln\left(\frac{Y_{c,2009}}{Y_{c,2000}}\right) + \beta_3 I_{m,2000-2010} + \beta_{4j}\ln\left(Agg_{m,j,2000}\right) + \beta_5 Ed_{m,2000} + \varepsilon$$

Equation (2)
where

$$I_{m,2000-2010} = \sum_{j=1}^{8}\left[\frac{1}{10} \times \left(\frac{Employment_{m,j,2000}}{Employment_{m,2000}}\right) \times \ln\left(\frac{Employment_{c,j,2010}}{Employment_{c,j,2000}}\right)\right]$$

$$Agg_{m,j,2000} = Employment_{m,j,2000} \times \left[\left(\frac{Employment_{m,j,2000}}{Employment_{m,2000}}\right) \Big/ \left(\frac{Employment_{c,j,2000}}{Employment_{c,2000}}\right)\right]$$

m= metropolitan area
c=country
i= world region, from 1 to 7
j= industry category, from 1 to 8

TABLE A3. REGRESSION OF NATIONAL AND METROPOLITAN FACTORS ON AVERAGE ANNUAL CHANGE OF METRO GDP PER CAPITA, 2000 – 2010

Level of GDP per capita in Western Europe metro areas, 2000	-0.0074***
	-0.0019
Level of GDP per capita in North America metro areas, 2000	-0.0071***
	-0.002
Level of GDP per capita in developed Asia-Pacific metro areas, 2000	-0.0045***
	-0.0017
Level of GDP per capita in developing Asia-Pacific metro areas, 2000	-0.0056**
	-0.0028
Level of GDP per capita in Eastern Europe and Central Asia metro areas, 2000	-0.0075***
	-0.0024
Level of GDP per capita in the Middle East and Africa metro areas, 2000	-0.0065**
	-0.0025
Level of GDP per capita in Latin America metro areas, 2000	-0.0059**
	-0.0029
Average Annual Change of National GDP per capita, 2000-2009	0.9412***
	-0.07
Metro Tertiary Education Attainment Rate, 2000	0.0214**
	-0.0104
National Industry Index, 2000-2010	-0.0158
	-0.0979
Metro Specialization in Business and Financial Services, 2000	0.0028*
	-0.0015
Metro Specialization in Manufacturing, 2000	0.0007
	-0.0009
Metro Specialization in Commodities, 2000	-0.00004
	-0.0004
Metro Specialization in Trade and Tourism, 2000	-0.0091***
	-0.0019
Metro Specialization in Transportation, 2000	0.0005
	-0.0014
Metro Specialization in Utilities, 2000	0.0011
	-0.0007
Metro Specialization in Construction, 2000	-0.0014
	-0.0014
Metro Specialization in Local/Non-Market Services, 2000	0.0025*
	-0.0016
Constant	0.0401**
	-0.0099
Number of observations	179
R-squared	0.929

*Note: Standard errors in parenthesis, *** p<0.01, ** p<0.05, * p<0.1*

Similar with the panel regression, all the variables in the spatial regression are in logarithm form to deal with potential heteroskedasticity. In addition, this specification includes:

- ***Higher education (tertiary) education attainment rates,*** as proxy for the stock of human capital. The endogenous growth perspective of economic development which is focused on the growth factors internal to a metro economy stresses the role of technological advance as engine of growth, seen as a function of local knowledge spillovers. Human capital plays a significant role in this explanation, because it affects the capacity of metro businesses to innovate, which leads to technological progress and regional growth [55]

Reporting the Relative Effects of Metropolitan and Local Factors on Annual Metro GDP per Capita Growth Rates

To have a better understanding of the individual effects on the annual changes of metro GDP per capita, this study calculates an average marginal effect for each variable. For each of the variables in each of the specifications, the coefficient from the regression model was multiplied by metro specific values for the group of metro areas that are above average and those that are below for that specific variable, by year.

TABLE A4. THE SHARE OF SHORT-TERM TOTAL MARGINAL EFFECT ON ANNUAL CHANGE OF METRO GDP PER CAPITA EXPLAINED BY NATIONAL AND METROPOLITAN FACTORS, ABOVE-AVERAGE VERSUS BELOW-AVERAGE METRO AREAS

	1990-2012 Average				2012			
Region	**Previous Year Metro GDP per capita**	**Previous Year Metro Specialization in Local/Non-Market Services**	**Previous Year National GDP per Capita Growth**	**National Industry Growth Index**	**2011 Metro GDP per capita**	**2011 Metro Specialization in Local/ Non-Market Services**	**2011-2012 National GDP per Capita Growth**	**2012 National Industry Growth Index**
Western Europe	81.4%	8.1%	2.4%	2.4%	82.8%	7.6%	2.1%	1.5%
North America	79.9%	8.7%	2.5%	2.6%	81.4%	8.2%	2.3%	1.6%
Developed Asia-Pacific	64.7%	15.3%	4.4%	4.5%	67.1%	14.6%	4.0%	2.8%
Developing Asia-Pacific	17.8%	35.7%	10.2%	10.6%	26.8%	32.4%	8.9%	6.3%
Eastern Europe and Central Asia	68.8%	13.5%	3.9%	4.0%	73.0%	11.9%	3.3%	2.3%
Middle East and Africa	83.2%	7.3%	2.1%	2.2%	83.8%	7.2%	2.0%	1.4%
Latin America	48.9%	22.2%	6.4%	6.6%	52.4%	21.1%	5.8%	4.1%
Average	63.5%	15.8%	4.6%	4.7%	66.7%	14.7%	4.1%	2.9%

Note: The shares do not sum up to 100 percent because the model specification includes other factors, which had effects not statistically significant at 10% level or below. For full model specification, see Table A2.

TABLE A5. THE SHARE OF LONG-TERM TOTAL MARGINAL EFFECT ON ANNUAL CHANGE OF METRO GDP PER CAPITA EXPLAINED BY NATIONAL AND METROPOLITAN FACTORS, ABOVE-AVERAGE VERSUS BELOW-AVERAGE METRO AREAS

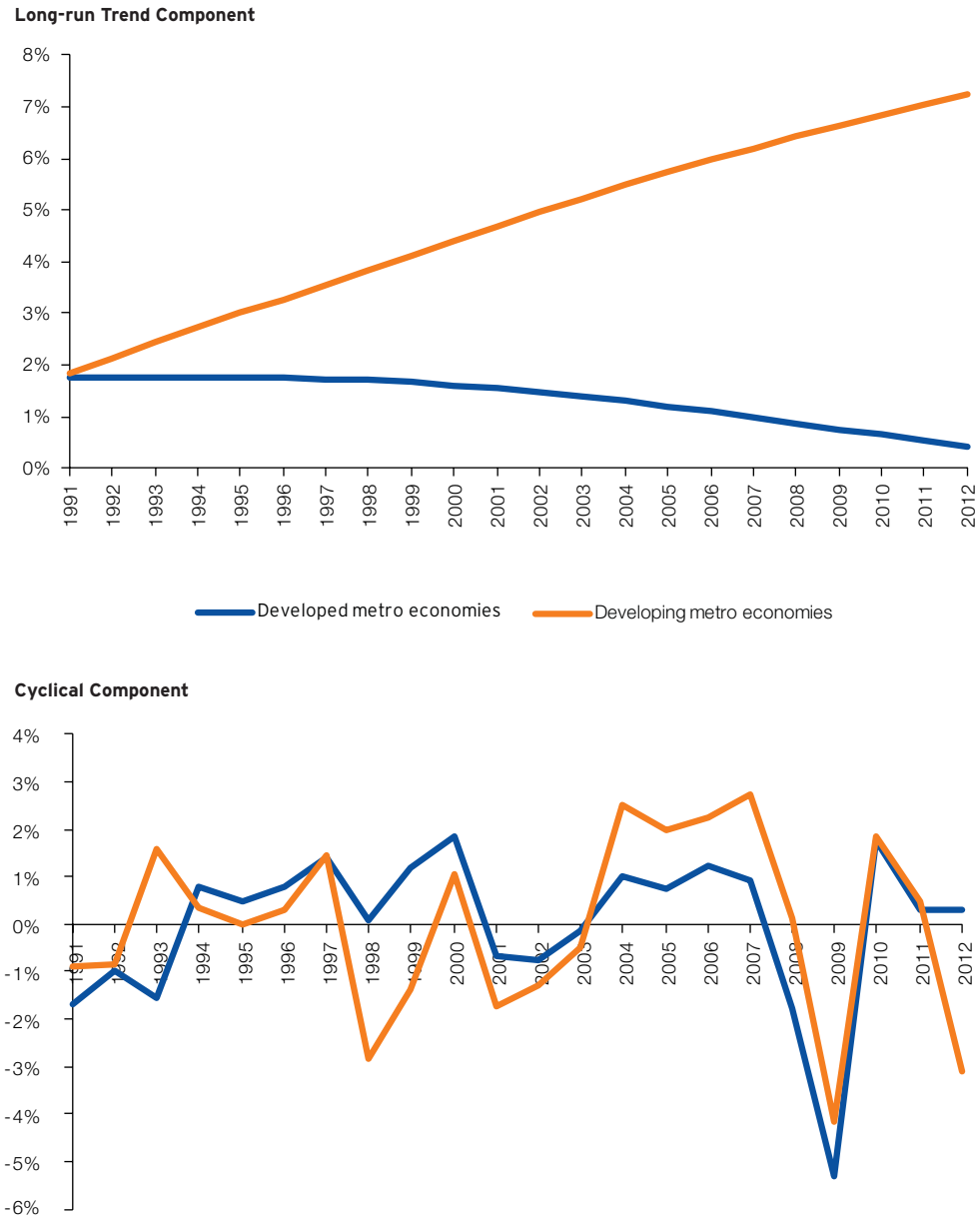
Region	Average Annual Change of national GDP per capita, 2000-2009	2000 Metro GDP per capita	Metro Specialization in Trade and Tourism, 2000	Metro Tertiary Education Attainment Rate, 2000	Metro Specialization in Business and Financial Services, 2000	Metro Specialization in Local/Non-Market Services, 2000
Western Europe	50.9%	18.6%	12.7%	4.8%	4.4%	2.9%
North America	51.1%	18.1%	12.8%	4.8%	4.4%	2.9%
Developed Asia-Pacific	54.6%	12.6%	13.6%	5.1%	4.7%	3.1%
Developing Asia-Pacific	58.1%	7.0%	14.5%	5.5%	5.0%	3.3%
Eastern Europe and Central Asia	52.7%	15.7%	13.1%	4.9%	4.6%	3.0%
Middle East and Africa	51.4%	17.7%	12.8%	4.8%	4.5%	2.9%
Latin America	55.6%	11.0%	13.9%	5.2%	4.8%	3.1%
Average	53.5%	14.4%	13.3%	5.0%	4.6%	3.0%

Note: The shares do not sum up to 100 percent because the model specification includes other factors, which had effects not statistically significant at 10% level or below. For full model specification, see Table A3.

Further, this research calculates an average of the effect for metro areas that are above average and an average for those that are below for that specific variable. The difference in the average estimated effects provides an average marginal effect, holding all else constant. Because the independent variable is the growth of metro GDP per capita (metro GDP per capita this year divided by metro GDP per capita the previous year) and not the growth rate, to obtain the average marginal effect in percentage points this research multiplies the average marginal effect (which would show percent increase in the growth of metro GDP per capita) by the average metro annual GDP per capita growth rate and sums it to the average marginal effect. To calculate the share of the total marginal effect, this research adds the individual marginal effects (in absolute value) to calculate a gross total marginal effect.

To examine the convergence issue between metro areas in developed and developing countries, this study employs a Hodrick-Prescott filter which separates the cyclical component from the long-term trend of the annual growth rate of metropolitan GDP per capita. This methodology, used in business cycle theory, creates two time series based on the raw data of metro GDP per capita growth rate, one that shows the slow-changing trend and another piece illustrating the short-term fluctuations of metro GDP per capita growth rate. In retrospective, this method allows to understand what remains stable over the years in the behavior of a variable and the short-term movement effect. This methodology is not appropriate to predict future behavior of an indicator.

FIGURE A1. LONG-TERM (TREND) AND SHORT-TERM (CYCLICAL) COMPONENTS OF THE GROWTH RATE OF REAL GDP PER CAPITA BY DEVELOPMENT STATUS, 300 LARGEST METROPOLITAN ECONOMIES, 1991–2012



Source: Brookings analysis of data from Oxford Economics, Moody's Analytics, and U.S. Census Bureau

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2. Alan Berube and Philipp Rode, "Global Metro Monitor" (Washington and London: Brookings Institution and London School of Economics, 2010).

3. For an excellent overview of these studies, see Greg Clark and Tim Moonen, "The Business of Cities: City Indexes in 2011" (2011), available at www.gregclark.org.

4. 2012 examples include: McKinsey Global Institute, "Urban World: Cities and the Rise of the Consuming Class" (2012); The Economist Intelligence Unit, "Hot Spots- Benchmarking Global Cities Competitiveness" (2012); A.T. Kearney, "2012 Global Cities Index and Emerging Cities Outlook" (2012).

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7. Data for 2012 are forecasts based on annual trends and data on the first two quarters of 2012.

8. Sources for definitions: U.S. Bureau Analysis, International Labor Organization, United Nations Department of Economic and Social Affairs.

9. Economic performance in this study refers to how well an economy is doing in terms of growth of GDP per capita and employment.

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11. This study uses 1993 as the beginning of the pre-recession period instead of 1990, due to the volatility between 1990 and 1993 in Eastern European countries.

12. In their book about 224 historical banking crises worldwide, Carmen Reinhart and Kenneth Rogoff stress the use of per-capita GDP measure in tracking recovery because it controls for the growth of population. They also take into account unemployment rate recovery to pre-crisis levels, which this study substituted with employment due to unreliable estimates of unemployment rates across metropolitan areas worldwide. Carmen M. Reinhart and Kenneth S. Rogoff, *This Time is Different: Eight Centuries of Financial Folly* (Princeton University Press, 2009).

13 Some European metro areas cross national borders; for purposes of this analysis, these metro areas are considered to lie in the country in which most of the population resides or where the namesake city lies.

14 See World Bank list of economies as of July 1, 2012. The income classifications are in effect until July 1, 2013.

15 While the World Bank explains that a country's classification by income does not necessarily reflect development status, it does note that countries with lower- and middle-income levels are sometimes referred to as "developing," for the convenience of the term.

16 These geographical regions are not identical with the regions used by the World Bank and the International Monetary Fund, given the insufficient number of metropolitan areas in this study's sample from certain regions.

17 The dataset employed in this study does not have industrial or education attainment information for four Indian metro areas—Bangalore, Chennai, Hyderabad, and Kolkata.

18 The period was not extended to 2012 because some 2011 data are estimated, as of October 2012, and 2012 data are forecasts.

19 The high growth rate of developing Asia-Pacific metropolitan areas might be statistically biased because of the underestimated population of the Chinese metropolitan areas. In China, many urban migrants are still registered as residents at their place of origin, therefore, not registered as inhabitants of the metropolitan area in which they work. This residence-registration system (Hukou) results in and overestimated metro GDP per capita in China. Unless there are major annual differences between the growth rate of the metro migrant population and the growth rate of the registered resident population in a metro area, the growth rate of GDP per capita should approximate the actual growth rate of GDP per capita in Chinese metro areas.

20. Gaming output and employment is recorded in "local/non-market services" in Macau.

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23. The 300 metro areas share of the world economy is based on purchasing power rates (PPP), which eliminates the difference in prices for the same goods and services across countries. If the share were calculated based on real GDP as in the previous edition of the *Global MetroMonitor*, the contribution of the largest 300 metropolitan areas to the world economy would be 55 percent. The difference reflects mainly the larger size of the world economy, when the price effect is removed.

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34 Bureau of the Census, *American FactFinder2 database*, available at http://factfinder2.census.gov (October 2012).

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37. The Economist Intelligence Unit forecasted Sweden's public debt at 38.7 percent of GDP in 2012, and the Eurozone equivalent at 91.8 percent. The Economist Intelligence Unit, "CountryData - Annual Time Series" (November 2012).

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