Beijing
Berlin
Buenos Aires
Chicago
Dubai
Hong Kong

Istanbul
Jakarta
Johannesburg
Kuala Lumpur
London
Los Angeles

Madrid
Mexico City
Milan
Moscow
Mumbai
Nairobi

New York
Paris
Rio de Janeiro
San Francisco
São Paulo
Seoul

Shanghai
Singapore
Stockholm
Sydney
Tokyo
Toronto

Cities of Opportunity 6

pwc

Cities of Opportunity 6 *analyzes the trajectory of 30 cities, all capitals of finance, commerce, and culture—and, through their current performance, seeks to open a window on what makes cities function best. This year, we also investigate demographics in a separate study—*Cities of Opportunity 6: We, the urban people*—to provide a rounded view of both the urbanization and demographic megatrends that shape our cities.*

Cover image: Skating rink across from the Eiffel Tower, Paris

Taking the pulse of 30 cities at the heart of the world's economy and culture

The sixth edition of *Cities of Opportunity* continues an investigation that began in 2007 in an effort to help the world's great cities understand what policies and approaches work best for people and economies in a rapidly urbanizing world.

Again this year, we look at a group of 30 cities that embody the energy, opportunity and hope that draw new people every day to city life and make urbanization one of the most powerful megatrends of our time. Jakarta, Nairobi and Rio de Janeiro also join the list in this edition, and Dubai rejoins, replacing Abu Dhabi as a Mideast financial and commercial center.

Our methodology also carries forward from the last edition: *Cities of Opportunity 6* carefully selects a wide range of targeted, consistent and transparent data that reflect the cities' balanced social and economic vital signs. Results do not so much judge as open a window on directions to improve city life for businesses, governments and communities.

In terms of results, London posts the highest score by a good margin after locking in a virtual tie with New York in *Cities of Opportunity 5*. The British capital finishes first in technology readiness, economic clout and city gateway—all measures of its stature as a thriving center of the world economy. New York follows, again winning no indicator categories, but showing a strong balance across the board.

Singapore advances markedly in this edition. The city-state climbs four spots to third place and also finishes first in the two areas it is well-known for—transportation and infrastructure and ease of doing business. Toronto remains in the top five at number four, and San Francisco climbs over Paris and Stockholm to finish fifth.

Beyond that, city life was never meant to remain unchanged, and neither was *Cities of Opportunity*. As in most years, we've revised and improved a number of data variables. For instance, cost of public transport now measures the price of a trip from the city's farthest boundary to the central business district rather than from farthest boundary to farthest boundary in an effort to capture the most typical urban journey.

Even more notably, we asked PwC professionals in our 30 cities to tell us about their own urban experience, and 15,000 of them—an average 20 percent of each office—responded by gauging the ease or difficulty of their commute and telling us their relocation preferences among our 30 cities. (A full analysis of these findings, as well as an in-depth look at the demographics of our cities—*Cities of Opportunity 6: We, the urban people*—will be released as a companion piece to this report.)

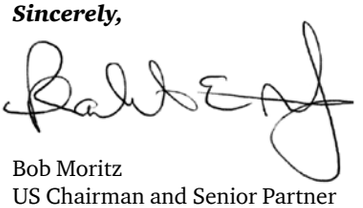
Our 10 indicator categories remain the same as in the last edition, but we've organized them into three families that reflect the balance of urban life. **Tools for a changing world** takes the measure of intellectual capital, technology readiness, and a city's openness as a global hub. **Quality of life** examines tangible and intangible characteristics that set the city's emotional and physical meter, from transportation to hospitals to cultural vibrancy. **Economics** tells us how well the cities are doing as centers of business and finance.

As in other editions, we also try to capture the spirit of the city in ways numbers cannot measure by including interviews, as well as focused reporting. These tell us clearly that creativity is in the urban air, though it manifests itself in many forms, from technological and artistic innovation to heritage conservation, to the embrace of diversity and change, and even to the rise of intelligent machines that threaten traditional employment structures.

Cities of Opportunity 6 marks the first time our study is not conducted jointly with the Partnership for New York City. PwC carries on with genuine thanks to the Partnership as a trusted and dedicated collaborator and ongoing advisor.

All told, we continue *Cities of Opportunity 6* in the same spirit the study began after 9/11—that of lively curiosity and rigorous endeavor in order to shed light on the most effective ways to drive urban life for the greatest common good.

Sincerely,



Bob Moritz
US Chairman and Senior Partner
PricewaterhouseCoopers LLP

Seeking the right balance for healthy urban growth

Cities have long managed themselves on a seesaw between individual will—the freewheeling ways of people to start businesses, reroute streets, celebrate, protest, and, generally, do what they want when they want—and the need for societies to organize rationally and effectively. How does a city balance the "blessed rage to order," as poet Wallace Stevens described the human need to structure reality, with the "messy heterogeneity" that Suketu Mehta, author of *Maximum City: Bombay Lost and Found*, tells us is a key to a thriving, modern city?

It's a hard road to walk—and shedding light on the path is one of the reasons we undertake *Cities of Opportunity*. One way or the other, the thrill of the city is in our blood as is our shared responsibility to make it better.

Overview

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How the cities rank

London claims first place as Singapore nudges right next to New York.

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The study's methodology

Our approach evolves, this year adding a PwC survey.

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"Nothing remains still"

That age-old observation still holds, especially for modern cities. What does it take for cities to stay ahead of the curve at a time of massive urban growth?

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Intellectual capital and innovation

Paris overtakes Stockholm for the top spot, as London and San Francisco also advance.

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Viking invaders beat swords into software

A horde of Stockholm startups stormed Manhattan with Ulla Hamilton, deputy mayor for entrepreneurism, to showcase their innovation.

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The digital divide continues to separate many cities.

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Big data…big city…big dreams

Scientists and economists at the Center for Urban Science and Progress in New York peer through a powerful new looking glass in the age of urban informatics.

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City gateway

More than ever, most roads (and flights) lead to London.

"Stockholm is one of the fastest growing cities in Europe. On population, it is bigger than ever and growing. New businesses are springing up, and it's a very creative city."

"Cities qua cities don't have great visibility in the [US] federal government.…There is no place that thinks about cities as systems of systems… and encourages cities as systems of systems. I would like that to change."

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Attaining the good life is anything but a walk in the park

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Singapore blazes the trail in urban mobility.

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Shanghai balances growth with its living heritage

Wang Lin and Ron van Oers explain how one of Asia's great cities blends urban conservation into its planning for growth.

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Stability and relative affluence are critical.

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Sustainability and the natural environment

Further refinement gives an even more precise picture of our cities' sustainability.

44

The Prado's relationship with Madrid holds a full palette of benefits

Miguel Zugaza oversees one of the world's great art collections. His passion for the art itself and the quality of the viewer's experience keeps the museum prospering despite massive funding cutbacks. And the Prado is aiding Madrid in the process.

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Demographics and livability

Two new variables rejigger the order within the top 10.

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From Mumbai to Manhattan to the *favelas* of Brazil

Suketu Mehta, author of *Maximum City: Bombay Lost and Found*, has lived in and written about many of the world's great cities. Here he shares his thoughts.

"Conservation includes preservation, but it's more than that. It means we can reuse a building or improve it, add new life or new facilities and revitalize it."

"The crisis undresses a country. The crisis leaves you naked. When you take away all the accessories, all the jewels, what it will leave Spain with is the nucleus for the future, the strength of what it has. And no doubt, one of the great things this country has is its cultural heritage. Once we come out of this crisis, everything that has to do with culture in Spain could generate almost 6 percent of GDP rather than the 4 percent it does now."

"Cities are the purest expression of who we are.…There's something about cities, no matter how awful they are, which speaks to something in us as human beings—this need to live in clusters, this metropolitan excitement, this sense that you won't starve as you might in the countryside."

Economics
Paying the way for progress

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Economic clout

London ascends to the summit, but the top five remain remarkably consistent.

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Robots are coming to a city near you…and they want your job!

Erik Brynjolfsson of MIT explains how to stay a step ahead of technological unemployment.

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Ease of doing business

After a while, competitiveness is bred in the bone of the most successful cities.

64

Cost

Mature cities' (higher) wages can successfully compete against emerging cities' (lower) prices.

"Technological change is going to accelerate. But our organizations and institutions aren't keeping up. And if they don't keep up, more people will be out of work…and we'll have even more social and economic disruption.…The best option is to speed up our adaptation to the technology, and that's going to require much more effort in thinking about urban planning, organizational studies, and economics."

Reference

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Key to the variables

Understanding the data points that underpin the study.

On the web

See www.pwc.com/cities for interactive modelers, videos, full-length versions of the interviews, and detailed data definitions and sources.

Stockholm

Overview

London

Cities of Opportunity 6 *reflects the wide range of factors contributing to successful cities and resilient urban communities*

This year, we've organized our 10 indicators into three families that reflect the fundamentals of a well-balanced city: forward-looking tools such as education and technology; quality of life making cities healthy, happy, and sustainable; and the ability to pay the bills for it all. However, reorganization does not cut down on the observations to be gleaned from the 59 overall data points on our 30 cities. Here are some of the most interesting findings from *Cities of Opportunity 6*.

London claims #1 by a clear margin, with New York and Singapore close behind

Although London takes the top spot in our rankings for the first time, it was evident from our last report that it was coming up quickly on New York, finishing a hair's breadth (less than a tenth of 1 percent) behind New York in our last edition in a virtual tie. This year, London clearly takes the lead and is also the only city to finish first in three indicators. New York, on the other hand, while missing out on the top rank in all indicators, shows continuing superior consistency across most of the indicator categories. The other strong contender is Singapore. It scores an unexpectedly robust third place just behind New York (four spots ahead of its previous ranking) and finishes first in two indicators. Overall, nine cities in the top 10 in our last report remain in the top 10 in this one, albeit with some natural movement up or down.

Sydney surprises, but Stockholm remains a constant contender

The only city that was not in the top 10 in our last report but climbs into that select group in this one is Sydney, which also ranks first in two indicators measuring quality of life, sustainability and the natural environment, as well as demographics and livability. Stockholm also finishes first in two quality-of-life indicators (tying Sydney in one of them) and seventh overall, just behind Paris. Two other cities renowned for their exceptional quality of life, Toronto and San Francisco, rank fourth and fifth, respectively, confirming their reputation.

Nobody's perfect…but the top cities are very good at a lot of things

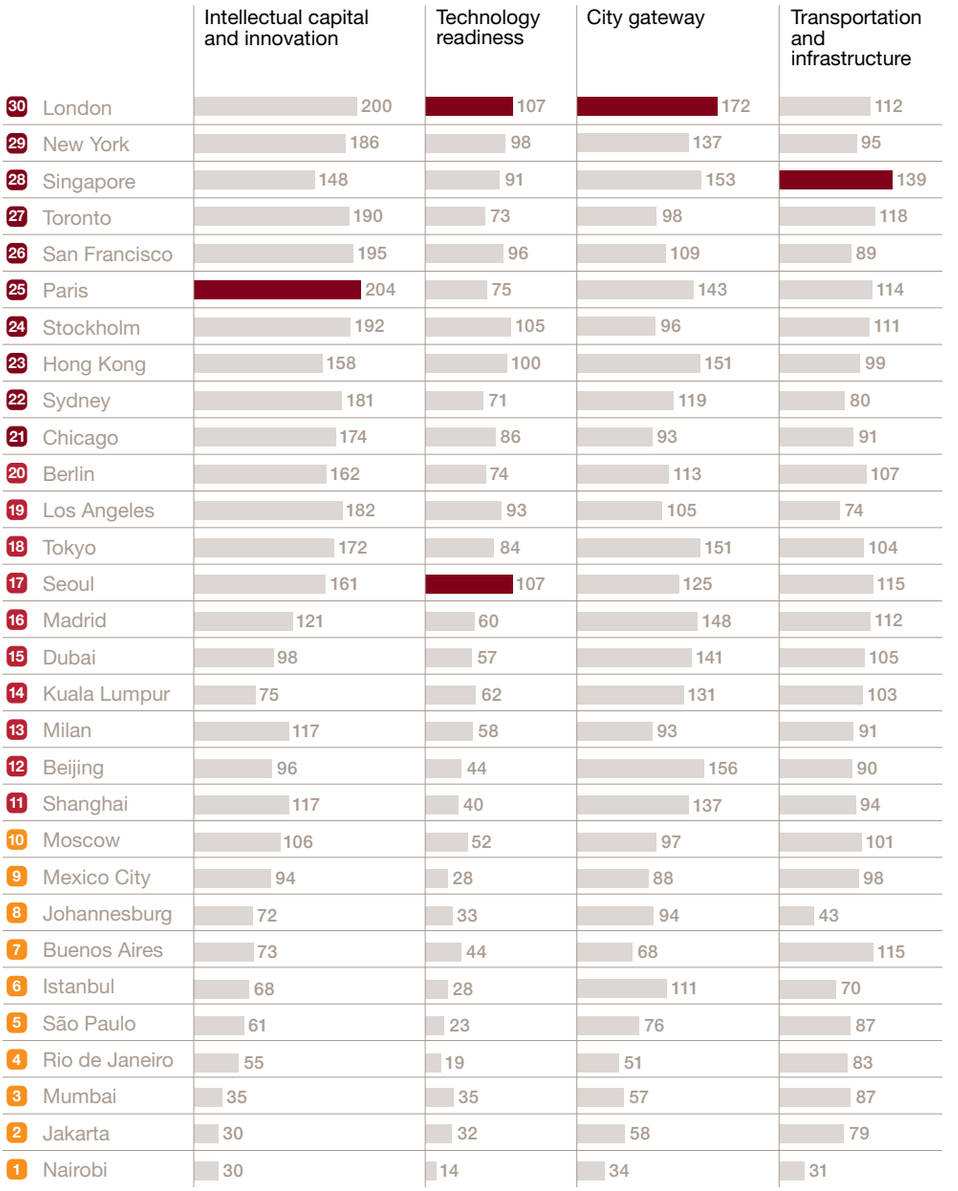
The most consistent finding in our current report, echoing previous results, is what we called in *Cities of Opportunity 5* "a virtuous circle of social and economic strengths." When "great quality-of-life factors…are balanced with strong businesses and solid infrastructure," the resulting formula—or, better yet, network of reinforcing advantages and assets—creates and sustains resilient cities with high standards of living.

Of the cities ranked in the top 10 overall this year, Sydney is the only one that doesn't finish in the top 10 in at least half of our indicators (it makes the top 10 in four out of 10). Most cities score in the top 10 in the majority of indicators, which proves just how comprehensively they attend to most of the factors that enhance (or diminish) urban life and how they actively sweat the details on virtually every aspect of urban policy and organization.

It takes a city to make a citizen and vice versa

Our other major finding is that it really doesn't matter what size a city is as long as it's a city. Every one of our indicators has both small and large cities in the top 10, usually in a good mix. Even our economic clout and city gateway indicators, which are intuitively associated with the larger (more "prominent") cities, have several smaller cities in the top ranks. More to the point, all four quality-of-life indicators have a majority of smaller cities in the top 10.

How the cities rank



This last fact is critical because it also illustrates the relationship between cities and their people. After a certain level of economic success, a city's residents demand more from municipal administrations. In fact, economic success normally is seen as (and historically has been) the basis for those improvements in urban life that lead to a city's infrastructural development, from schools, hospitals, and police to roads, buses, and metros to libraries, parks, and environmental sustainability. While it might be the simple demographic fact of population density and expansion that turns towns into cities, it is the self-consciousness of citizens—and their proud participation in the growth of their respective cities—that urges cities to improve the quality of life of the men and women who live in them.

Parlez-vous *intellectual capital?*

What is perhaps most impressive about Paris's #1 ranking in **intellectual capital and innovation** this year is not so much that it finishes first; after all, it only beats out London by just under 2 percent of the final top score. What is most striking is the group that Paris rises above. Look at the top 10 again: Seven of the cities are English-speaking, and an eighth, Stockholm, is a city in which English is almost a second language (and often a first one in various fields of technology). The only other city in which the natural language of intellectual investigation and research is not English is #10 Tokyo (see page 18).

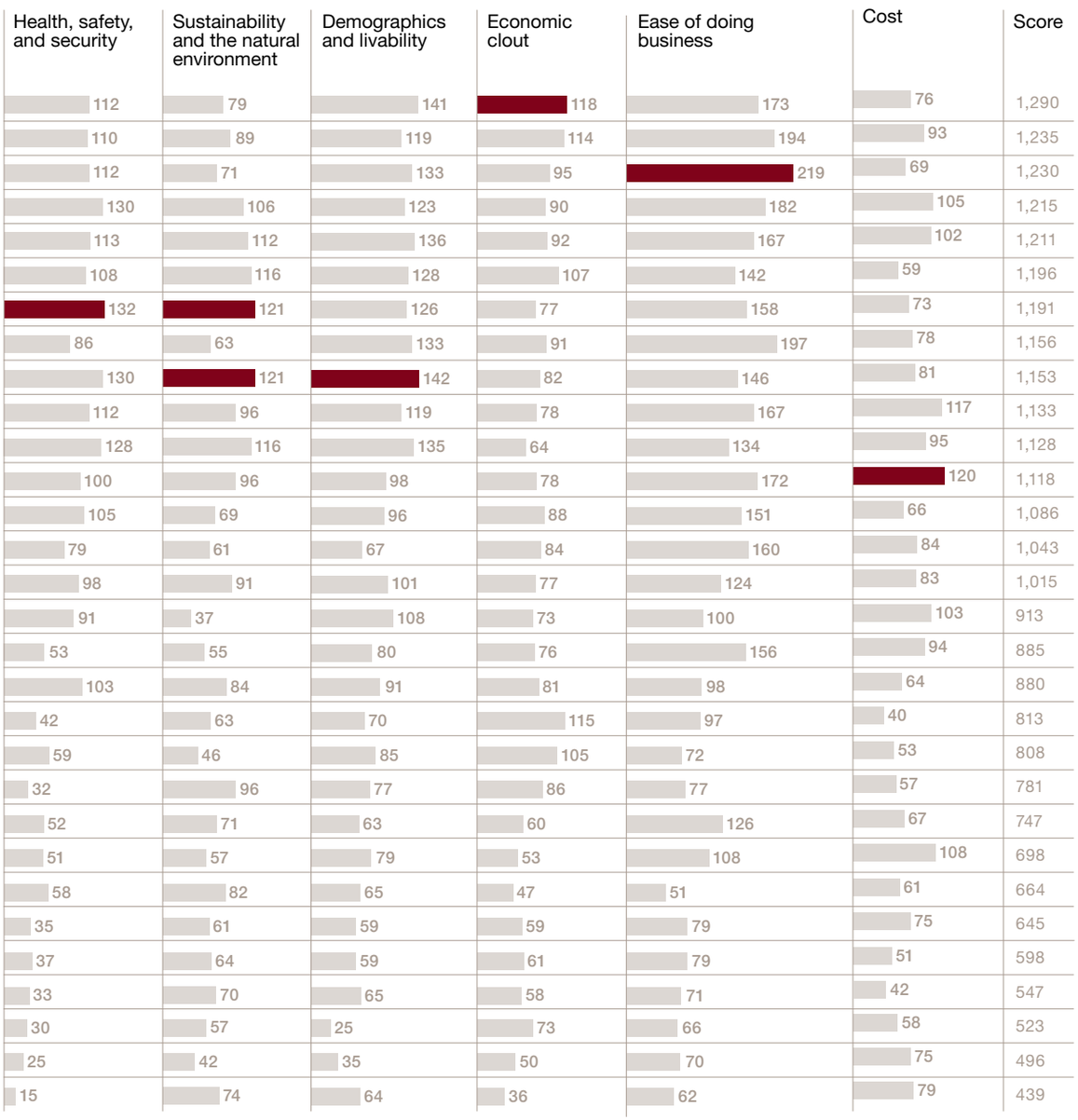
This is a resonant achievement that plainly refutes the notion that non-English-speakers can't compete, intellectually or technologically, within the context of today's globalization of English. It also encourages cities such as Berlin and Seoul—which just fall out of the top 10—not to mention Shanghai and Beijing or São Paulo and Rio de Janeiro. Clearly, these results demonstrate the value of education and innovation in *themselves*—as opposed to the language in which they are conducted—precisely because, as this section says, they are the most important tools of a changing world.

Think locally, connect globally…

Technology's obvious capacity to level the playing field between developed and developing cities (as well as East and West) is confirmed by the technology readiness indicator, in which Seoul ties London for first place. Much more than in our previous indicator, we see a geographical and cultural dispersion among the top 10 here that confirms technology's innately disruptive ability to upend traditional patterns of economic sway and competitiveness.

…but connect, in any case

The city gateway indicator exemplifies the truth that, year after year, the most successful cities are those tenacious, persistent ones that persevere through good times and bad regardless of whatever is thrown at them economically, socially, politically, or environmentally. And a critical reason they survive so well is because they've always been open to the world. London, ranked first in this indicator, is, of course, an icon of global trade and commerce. But if we look at the other nine cities in the top 10, we immediately notice that six are ports—and almost all of them famous ones (see page 30). One



Each city's score (here 1,290 to 439) is the sum of its rankings across variables. The city order from 30 to 1 is based on these scores. See maps on pages 14–15 for an overall indicator comparison.

High
Medium
Low

Highest rank in each indicator

(Paris) is located on a celebrated commercial waterway, and only two, Beijing and Madrid, are inland, although both have rivers running through them (and, in Beijing's case, several).

The city gateway indicator means a number of things, but, before and beyond everything else, it means exactly what it says: city gateway. For a city to be looked upon by the world as a model, a symbol, or even a haven, it has itself to be continually looking to the world and to be open to it for that fundamental exchange of ideas, people, and commerce that, in the past as well as in the future, has always defined a transnational city.

Singapore moves people—and houses them as well

Singapore dominates among the cities of opportunity in **transportation and infrastructure**. It ranked first by a small margin in our previous report; it ranks first by a much larger margin in this one. Moreover, the difference in score between Singapore and #2 Toronto is great (even more than that between the Canadian city and #15 Mexico City). Singapore clearly understands the fundamental role of infrastructure in a city's development and in its contribution to the well-being of its citizens. It is particularly telling that Singapore ranks first in the critical variable that measures the availability, cost, and quality of housing (which shows a strong, positive correlation with the overall social and economic health of a city).

The other noteworthy result in this indicator is the exceptionally wide range of cities that make up the top 10. Buenos Aires and Seoul tie for third place, followed by Paris, London, and Madrid (tied, again, for sixth place), Stockholm, Berlin, and Dubai. This is, to say the least, an unusual mix of cities, which illustrates that good infrastructure is not necessarily a product just of economic clout or global prominence (as measured by our city gateway indicator).

Whether or not small is beautiful, it's decidedly healthy and safe

Although we changed the variables slightly in this edition, the results in **health, safety, and security** have hardly changed from our last report. Stockholm finishes first, with a marginal difference, as it did previously. Sydney and Toronto tie for second, currently with a tiny difference between them, while they finished #2 (Toronto) and #3 (Sydney) in our previous report. In the end, nine of the cities in the top 10 in the last report remain in the top 10 in this one.

What is perhaps more interesting than the actual ranking of the cities is their size. The top five cities in this indicator have an average population of just under 2.5 million. And even if we add the populations of the top 10—which includes London, Singapore, and New York—we're still left with an average just about 1.4 million larger. The result is no less compelling for being so obvious: Larger cities, with larger populations, must strive harder, and expend more resources, to secure the health and safety of their residents.

Where health and safety lead, sustainability follows

Seven of the cities in the top 10 in the previous indicator are also the first seven cities in the top 10 in **sustainability and the natural environment**. And, again, if we average out the populations of these 10 cities, it comes to roughly 3.61 million people—and that's only because of one city, Moscow, whose population is almost 12 million. If we delete Moscow from the average of the other nine cities, the figure drops almost by a million to 2.69 million. Clearly, urban sustainability means just that: *sustainable* urban magnitudes.

Sydney finishes first in livability, but London beckons to would-be expats

Demographics and livability rounds out the quality-of-life section of our study. It is also the indicator that benefits from PwC's global staff survey of 15,000 professionals that supplements this year's *Cities of Opportunity*. Two variables are based on survey results, one of which measures responses to the question, "Of the cities in *Cities of Opportunity* (other than your own), which are the top three in which you'd most like to work?" London places first in that answer. But Sydney finishes a whisker ahead of London in the overall demographics and livability ranking and places third as most desired city for relocation.

As for the other most desired cities for relocation, New York comes in a close second to London (41 percent to 47 percent, respectively)—showing professionals are powerfully attracted to the energy and opportunity of the world's most competitive cities. Sydney, however, comes in third most desirable at just under 28 percent with San Francisco following close behind at 26 percent—suggesting that good quality of life has a powerful pull, perhaps made even more seductive by beautiful beaches and sophisticated culture.

When it comes to economic success, be strong but also be competitive

The final section of our report includes its three economic indicators. Together, they point to the synergies needed if economic growth is to lead to permanent economic strength. It's not surprising that the top five cities in our **first indicator, economic clout**, are London, Beijing, New York, Paris, and Shanghai. They are all legendary cities that mirror the economic history of the urban world during the last couple of hundred years.

Not one city in the top five in **our second indicator, cost**, is in the top five in economic clout, however. But the three cities in the top 10 in cost *and* economic clout are also in the top 10 in **our third indicator, ease of doing business**. In addition to their success in all three indicators, these three mature cities—New York, San Francisco, and Toronto—also rebut the notion that developed cities can't compete on costs. Finally, given that six of the cities in the top 10 in economic clout are also in the top 10 in ease of doing business, our findings validate the obvious expectation that a city in which it is easy to do business will actually do so successfully.

The texture of city life emerges beyond the numbers

While quantitative results tell one sort of story, the human experience of leaders and thinkers at any moment in time adds a different layer of insight. This year, those we spoke with mention technology often but quickly bridge to innovation, creativity, and the need to be one with the spirit of a great city. It seems, to borrow from Dylan Thomas, "the force that through the green fuse drives the flower," drives our urban age.

Roll over Leif Eriksson and tell Valhalla the news!

Accompanied to New York by a horde of Nordic software developers, if not bloodthirsty Vikings, **Stockholm's vice mayor**

From Stockholm to Shanghai, Madrid and to the streets of New York, "the force that through the green fuse drives the flower" appears to drive our creative, urban age.

for entrepreneurism, Ulla Hamilton, told us her small, sustainable city with a powerful broadband network has been "lucky in the area [of entrepreneurism] for several reasons. We have a very interesting mix of life science companies, information and communications technology companies, clean tech companies, and the entertainment industries.…That creates an innovative climate. Also, Swedes are very interested in solving problems, and it has become fashionable to start your own company." One of Stockholm's most successful startups, DICE, even brought us Battlefield 1, 2, 3, and 4. It seems the old Viking spirit is not dimmed by a pair of jeans or a business suit.

Change those bad behaviors or else!

At New York University's Center for Urban Science and Progress (CUSP), **the hope of urban informatics is being explored** everywhere from traffic to health and safety and energy management. But according to CUSP's director Steven Koonin, big data isn't so much a driving force to manage cities but a tool to help people see and improve urban patterns. Koonin explains "science with a social dimension" holds the promise of urban informatics to make city life better, but it's less a technological "fix" than a way to understand our own collective behavior and, with the help of behavioral economics, build better, more logical approaches to city dynamics.

In other words, individually, it may be hard to start healthy eating looking straight at a bowl of vanilla ice cream, but we may be able to push collective behaviors in the right direction guided by the power of information and the need to serve the common good in massive, densely populated cities where we all share in success.

Shanghai surprise: A huge city manages breathtaking growth with an eye on its heritage

"A city is a place for people to live, so you need to adapt and make use of heritage," explains **Wang Lin, director of historic conservation in Shanghai**. Her city's explosion to 14.1 million permanent residents (nearly 24 million in the wider metropolitan area) may not have begun with as big an eye on Shanghai's history, but, today, Lin says "the first important thing is we need to be sustainable. We need to pay more attention to the quality of the city. We need to keep a balance between the environment and the economy. And equality is very important." Careful management of the great city's past—its 12 historic conservation areas—weaves right into the fabric of Shanghai's future. Lin's focus on Shanghai is complemented by Ron van Oers of the World Heritage Institute of Training and Research for Asia and the Pacific and previously UNESCO's World Heritage Cities Programme, who offers a global perspective.

The Prado unveils an Enlightenment approach to crisis management

Despite 60 percent government funding cuts to Madrid's splendid museum, **Prado director Miguel Zugaza** tells us "our reaction was to actually invigorate our activities, do more that would appeal to more visitors." And his approach is working. Extended hours and notable shows are attracting more visitors from the city, the nation and the world. In fact, Zugaza says "one of the ways we will exit the crisis in our country will come from the cultural sector. Spain has a very important asset in its cultural heritage.…It generates excellent employment. It generates appealing activities for tourists. It enriches the economic fabric around us. And it's important that politicians and society know this….Every 1,000 visitors who come to the Prado generate one job in Madrid."

A writer embraces the "messy heterogeneity" that defines a great city

Suketu Mehta is author of *Maximum City: Bombay Lost and Found*, a forthcoming book on New York, as well as many articles on the *favelas* of Brazil. Here he pauses amid travels and teaching to explain the lure of urban life from many angles. "A young person in an Indian village moves to Bombay not just to make more money but because the city signifies freedom. It's also a place where your caste doesn't matter as much." As for rich cities like London, he warns "it doesn't matter how welcoming the city is if you can't find an apartment there for a reasonable price, because you won't be part of the city at all. That's dangerous to the city's well-being. You need the great middle class—good people who will keep faith in the city during a downturn."

Yikes! Robots advance…Are we innovating ourselves out of a day job?

Erik Brynjolfsson, director of MIT's Center for Digital Business and author of The Second Machine Age, keeps his finger on the pulse of economic and technological change. Nowhere is "creative destruction" more potentially dramatic than the rise of smart machines and their ability to do our jobs. How do cities and their citizens avoid future unemployment and potential social unrest? Brynjolfsson says a number of jobs will be even more in demand: "One is creative work. The second is interpersonal interactions. And those are areas where cities can excel. They can stoke creativity by bringing people together…They're attracted partly by the culture, partly by proximity to other creative people. These people will be even more in demand in the next 10 years, and the successful cities will be the ones that cultivate and attract them."

Approach

A global survey of PwC staff gives voice to thousands of professionals in our 30 cities, adding valuable real-life input to our data

Cities of Opportunity has never been a static report. From year to year, we upgrade, enhance, and actively alter our methodology and even our structure to examine urban life in a way that can help our 30 cities (and through them, cities in general) to understand the patterns and pathways toward building healthy, prosperous communities. This year's edition includes two notable changes, in both method and structure.

First, *Cities of Opportunity 6* is the first edition published solely by PwC. Since it was first released in 2007, *Cities of Opportunity* has been published jointly by PwC and the Partnership for New York City. This year, with a mayoral transition in New York for the first time in 12 years, PwC has assumed full responsibility as the Partnership for New York City focuses on, and helps to promote solutions for, the city's core economic issues.

***Cities of Opportunity 6* now includes elements from a global survey of 15,000 PwC staff** from every city in our report, which will shortly be released as part of a separate urban demographic study—*Cities of Opportunity 6*: *We, the urban people* (www.pwc.com/cities). Overall, an average of 20 percent of the staff in each of our cities responded, telling us about their commutes, urban priorities, preferences for relocation within the 30-city sample, and spending patterns, among other revealing points of information.

This internal survey has been used to supplement and enhance our data collection with real-life responses to a battery of questions, primarily about quality of urban life. We believe that this additional tool helps to pragmatically anchor our data in the actual working and living environments found in each of our cities. We've always tried to frame our data within a context that illuminates the meaning behind the raw numbers; with our PwC survey, we've gone farther in that direction than ever before.

But there are also some salient continuities between this report and *Cities of Opportunity 5*. In each edition of our study, we've examined underlying issues affecting our cities. In the last one, we took a tremendous leap forward by projecting the economies, employment patterns, and wealth of cities into the future through indicative forecasts, under several scenarios, of the global urban outlook in 2025. We continue with this "forward vision" this year by projecting each city's demographic realities in 2025.

Moreover, the upcoming release of *Cities of Opportunity 6: We, the urban people* (www.pwc.com/cities) will take a close look at the current and 2025 demographic patterns in our 30 cities, presenting age breakdowns now and in 2025, as well as city comparisons analyzing potential directions. The PwC survey adds insight on an important urban demographic—the educated, working professional all cities need to build the future. Finally, with so many cities around the world dealing with problems of lonely aging, we investigate what some cities, including Seoul, Tokyo, and Stockholm, are doing to assure useful, active lives for their older citizens.

In terms of continuity, the fundamental three criteria governing this report's choices of cities have not changed at all. They focus on:

Capital market centers. All of the cities are the financial centers of their respective regions, and many are hubs of commerce, communications, and culture, so that each plays an important role locally but is also a vital part of a global economic network.

Broad geographic sampling. While each city is a center of finance and commerce regionally, all of the cities *collectively* form a representative international distribution.

Mature and emerging economies. Fifteen mature cities and 15 emerging ones are included this year, with four new cities added and one removed. With a total of 30 cities, the sample size remains compact and flexible enough to allow for an analysis that is both detailed and extensive but still substantial and inclusive enough—in geographic distribution, population size, and overall wealth—to be representative.

This year's total of 30 cities is the largest to date. Besides adding three cities, we've replaced Abu Dhabi with Dubai. Our new cities are Jakarta, Nairobi, and Rio de Janeiro. The first was an obvious choice given Indonesia's growing wealth and role in the G20 (as well as ASEAN) and its capital's corresponding role in the country's economy, contributing roughly a quarter of national gross domestic product.[1] Nairobi is the first African city we've added since Johannesburg became part of the report in 2008. Kenya's capital represents the dynamic growth and future prospects, both of its country and the continent as a whole. Finally, Rio de Janeiro joins São Paulo in this year's edition in recognition of its economic power in Brazil (second only to São Paulo), as well as its enormous cultural vigor and impact globally. It is precisely this worldwide influence that led Rio to become the first South American city to be chosen to host a summer Olympics (in 2016).

As with our last report, the data this year were normalized where appropriate, minimizing the likelihood of a city doing well solely because of size or historic strength. This process eliminated the need to differentiate between variables that reflect a city's raw power (such as the number of foreign embassies or foreign direct investment) and

1 National data for 2012 are from the World Bank at http://data.worldbank.org/country/indonesia; data for Jakarta for 2011–2012 are from The Brookings Institution at http://www.brookings.edu/research/interactives/global-metro-monitor-3.

Fifteen thousand PwC people in our 30 cities told us about their commute to the office, relocation preferences, and more. PwC Istanbul, above.

its quality or intensity (such as percent of population with higher education). Now, more variables are stated in a way that is normalized for either land area or population than in previous editions.

And in regard to land area, *Cities of Opportunity* uses each city's own strict definition of its respective municipal limits, whenever possible, not its metropolitan region. So, to give just two famous examples, New York is limited to its five boroughs, as opposed to its greater metropolitan area, while Paris is defined by its 20 *arrondissements* and not the wider Île-de-France region.

While the 59 variables constituting the 10 indicator groups are the same number as in our last report, more than a dozen variables have been deleted or altered, and more than half a dozen new ones have been added, some based on our PwC staff survey. The only two indicators that remain unchanged from *Cities of Opportunity 5* are technology readiness and transportation and infrastructure.

The one indicator that has benefited directly from our PwC staff survey is demographics and livability. Its last two variables, ease of commute and relocation attractiveness, have been calculated based on the responses of the PwC professionals in the 30 cities of opportunity.

Our own survey notwithstanding, however, *Cities of Opportunity* is mostly based on publicly available information supported by extensive research. Three main sources are used to collect the relevant data:

- **Global multilateral development organizations**, such as the World Bank and the International Monetary Fund
- **National statistics organizations**, such as UK National Statistics and the US Census Bureau
- **Commercial data providers**

The data were collected during 2013 and, in the majority of cases, during the latter half of the year.

In some cases, national data are used as a proxy for municipal data. Use of national data tends to disadvantage the 30 cities in our study, all of which are either national or regional capitals of finance and business that tend to outperform national averages in measures of socioeconomic advancement. This effect might be more pronounced in developing economies and in those with larger rural populations. Nonetheless, as consistent comparisons across all cities are critical to assure objectivity, country-level data are used when other consistent, highly reliable sources of publicly available information are either unavailable or neutral—as in visa requirements, which are obviously the same for all cities in a country—for all 30 cities.

The scoring methodology was developed to enable transparency and simplicity for readers, as well as comparability across cities. The output makes for a robust set of results and a strong foundation for analysis and discussion.

In attempting to score cities based on relative performance, we decided at the outset of our process that maximum transparency and simplicity required that we avoid overly complicated weightings of variables. Consequently, each is treated with equal importance and thus weighted equally. This approach makes the study easy to understand and use by business leaders, academics, policymakers, and laypersons alike.

Taking the data for each individual variable, the 30 cities are sorted from the best performing to the worst. They are then assigned a score from 30 (best performing) to 1 (worst performing). In the case of a tie, they are assigned the same score.

Once all 59 variables are ranked and scored, they are placed into their 10 indicators (for example, economic clout or demographics and livability). Within each group, the variable scores are then summed to produce an overall indicator score for that topic. This produces 10 indicator league tables that display the relative performance of all 30 cities of opportunity. The overall table is the sum of performance in all 59 variables.

Indicator rankings at a glance

Intellectual capital and innovation
page 18

Transportation and infrastructure
page 34

Health, safety, and security
page 40

Economic clout
page 56

Ease of doing business
page 62

Technology readiness
page 23

City gateway
page 30

Sustainability and the natural environment
page 42

Demographics and livability
page 48

Cost
page 64

Map key

- High
- Medium
- Low

The 30 cities are sorted from the best to the worst performing, with each receiving a score ranging from 30 for best to 1 for worst. In ties, cities are assigned the same score.

Tools for a changing world

Tokyo

Smart, prepared and open: The keys to modern city building repeat age-old truths

The three indicators in this section—intellectual capital and innovation; technology readiness; and city gateway—represent a group of criteria with a very long historical relation to the growth of cities.

But, as Heraclitus famously said, "all things move and nothing remains still," even more famously concluding that one can never "step twice into the same stream."[2] Keeping up with change is, therefore, not simply prudent business practice. It is part and parcel of the human condition and of course the evolution of our communities. The financial crisis of the last few years has made that painfully clear in many cities, especially in Europe. Change might be good or bad, but it is inevitable.

Urban viability has been based, first and foremost, on intellectual advance, which, at least since antiquity, has included science and technology. Plato's Academy was founded in the fourth century B.C., as was Aristotle's Lyceum. Both the universities of Paris and Oxford were founded in the 12th century. New York's Columbia was established almost 30 years before the United States (ironically, as King's College), the University of Berlin over 50 years before modern Germany, and the University of Mumbai a hundred years before India.

But while education and science have always driven urban development, they have also historically required another natural element to make them engines of growth: access to navigable water (today, obviously, supplemented by good air and high-speed rail connections). In fact, 27 of our 30 cities are on seacoasts, lakefronts, or, above all, riverbanks (or a combination thereof). As for the remaining three, Mexico City was originally built on a lake, and Milan began constructing its now picturesque *navigli*, or canals, in the 12th century, using them ultimately to expand its trade. Indeed, only Johannesburg apparently has no aquatic history (the Witwatersrand notwithstanding) and is actually the world's largest city not located on a navigable body of water.

Thus, a vibrant town transforms itself into a city of opportunity largely by a combination of education, technology, and openness to the world—that is, interaction with, and a willingness to become a *gateway* to, the rest of the globe. It is noteworthy that three cities—each from a different continent—perform with remarkable reliability across the board. London, New York, and Tokyo finish in the top 10 in all three indicators. Even more remarkably, London ranks first in two indicators, technology readiness (tied with Seoul) and city gateway, and second in the last one, intellectual capital and innovation—an impressive demonstration of excellence and consistency at the very highest level.

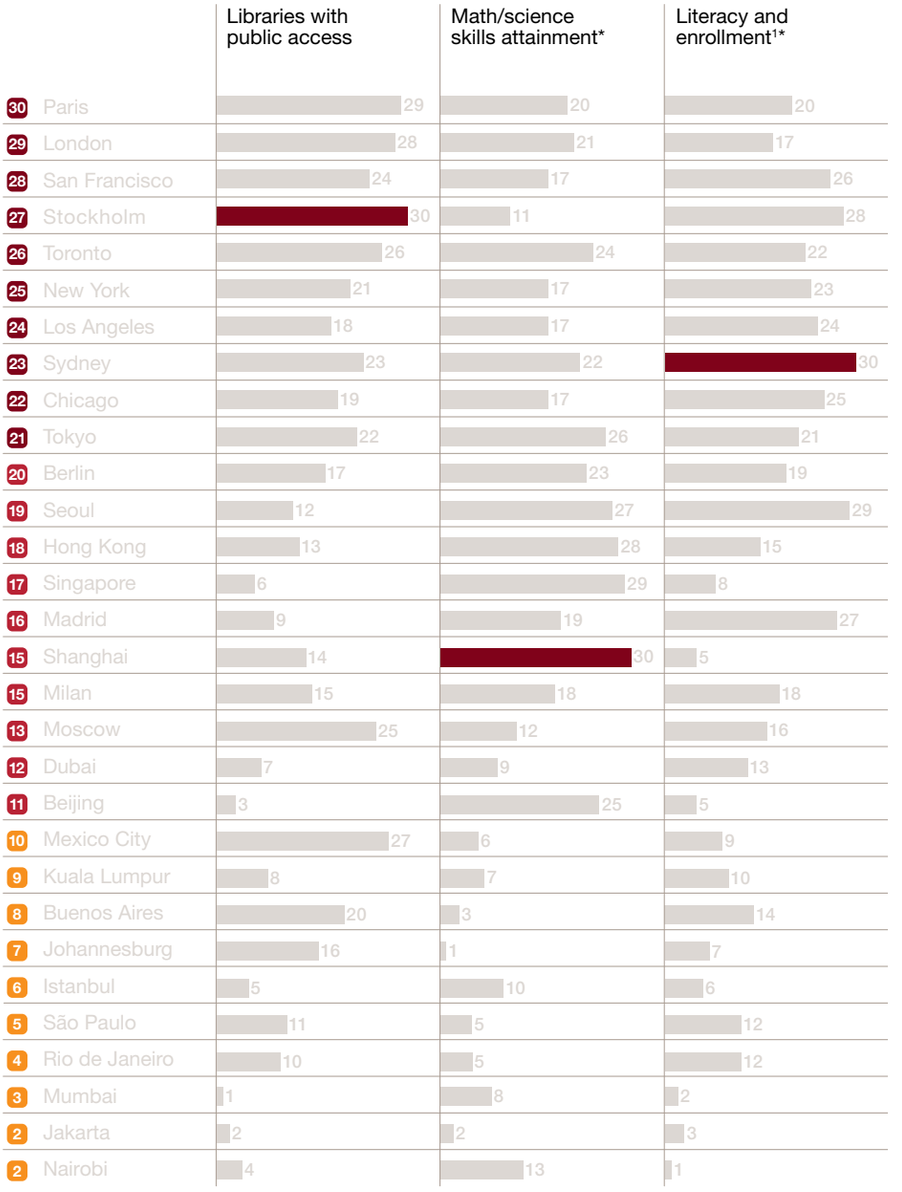
It is not surprising that London does so well, given its long history in each of these three indicators, nor that New York is the only North American city and Tokyo the only Asian one to rank in the top 10 in all three. Indeed, the geographical equality among our cities of opportunity is confirmed further by the fact that seven cities—two from Europe, three from North America, and two from Asia—finish in the top 10 in two of the three indicators in this section. Paris and Stockholm; Chicago, Los Angeles, and San Francisco; and Hong Kong and Singapore all perform well in most of the variables in all three indicators.

In the end, what is most telling in this section is that, out of the total of 17 cities in the top 10 across all three indicators, 10 cities rank in the top 10 in at least two. Again, no surprises here. Intellectual capital, technology development, and an openness to the world have distinguished all 10 of these cities, large or small, West or East, Old World or New, for a very long time.

2 Plato's Cratylus, Section 402a, *Plato in Twelve Volumes*, Volume 12, translated by Harold N. Fowler, Harvard University Press, 1921.

Intellectual capital and innovation

Socioeconomic advance is clearly based on intellectual advancement



1 The Knowledge Economic Index by the World Bank (KEI) measures a country's ability to generate, adopt and diffuse knowledge. This is an indication of overall potential of knowledge development in a given country. The KEI is derived by averaging a country's normalized performance scores on variables in three categories—education and human resources, the innovation system, and information and communications technology. The variables that compose education and human resources are adult literacy rate, secondary education enrollment and tertiary education enrollment.

The importance of this indicator for a 21st-century economy is obvious and can't be overstated. For that reason, we fine-tune its variables, year in and year out, sometimes with substantive changes, sometimes with minor ones. This year's report involves just two changes, one really an attempt to adjust an existing variable to make it even more accurate, while the other is a more basic decision to eliminate a possible "false positive."

The potential "false positive" refers to classroom size, a variable we included in previous reports but have now deleted. The concept itself is fraught with controversy among educators and educational specialists, both in regard to its general effect on education and to the actual ages of students upon whom it might (or might not) make a difference—with both sides citing research in favor of their respective positions. Therefore, we decided to eliminate it. If nothing else, the triennial PISA tests administered by the OECD, whose most recent results were released in December 2013, have added to the international pedagogical debate, given that Shanghai's 15-year-olds once again beat the entire world (as they did in the tests three years earlier) despite the fact that the city's schools do not have particularly small classes.

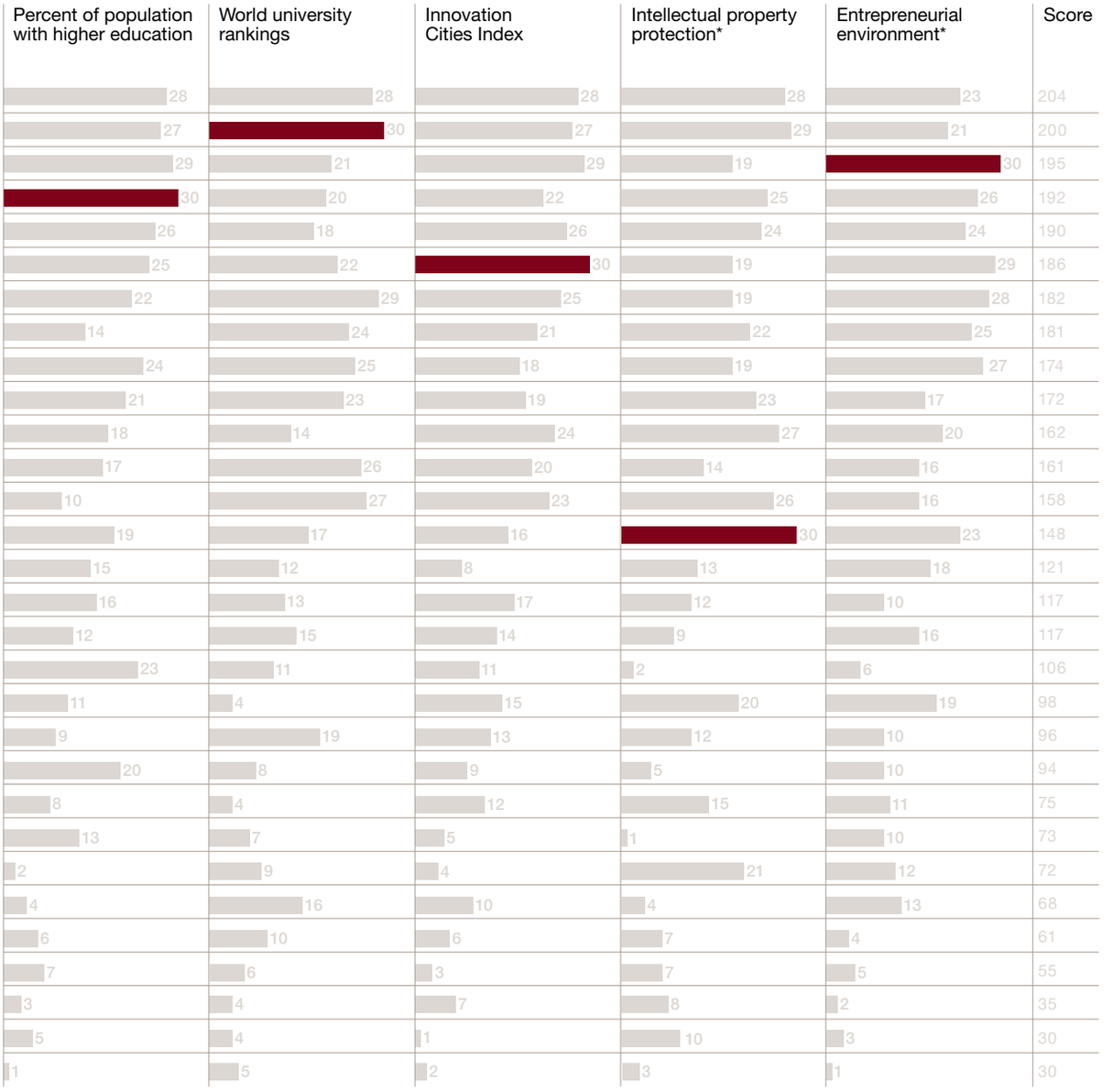
The other change is, essentially, an upgrade. In our last report, we included a variable measuring research performance of top universities. The final score was based on number of articles published by a university's faculty, number of citations of relevant publications, and quantity of highly cited papers. This measure ignored the humanities as a whole, however, while favoring large institutions, universities with medical schools, and institutions primarily focused on the sciences. Our current report replaces that particular variable with the highly (and globally) respected Times Higher Education World University Rankings, which is a more comprehensive and inclusive ranking of the world's institutions of higher education that, in addition to the criteria mentioned above, uses others as well, including peer reputation of an institution's teaching and research.

There are several notable findings in this year's report, some in line with previous reports, some not. The first major difference is that Paris now ranks at the very top in this indicator, overtaking Stockholm, which had maintained the #1 ranking through our two prior reports. Indeed, Sweden's capital currently falls to fourth place, behind #2 London and #3 San Francisco. Moreover, while Paris does not finish first in any of the eight variables, it ranks consistently highly in most of them, finishing second in one, third in four, and just falling out of the top 10 (#11) in only two.

London's rise to #2 in this report from #6 in our last one is also impressive—especially because only a few points separate it from #1. London's top spot in world university rankings is key in that regard, and directly reflects its connections to some of the most storied educational institutions in the world.

San Francisco's rise in this indicator to #3 (from #4 in 2012) is also striking. Three results stand out in particular: The city ranks at the very top in entrepreneurial environment and #2 in both percentage of its population with higher education and the Innovation Cities Index.

Two more points: New York finished tied for #3—with San Francisco—in this indicator in *Cities of Opportunity 4*, #5 in our previous report, and #6 in the current one. Any result



Each city's score (here 204 to 30) is the sum of its rankings across variables. The city order from 30 to 1 is based on these scores. See maps on pages 14–15 for an overall indicator comparison.

High
Medium
Low

Highest rank in each variable

*Country-level data.

in the top 10 is of course a very good one, but still, the city might at least look to stabilizing its overall ranking in this extremely important indicator. To be fair, however, its worst results come in the two variables that use national data (math/science skills and intellectual property protection) in this indicator.

Finally, again in this report, as in our last two, Tokyo is the only Asian city in the top 10. As dynamic as so many of Asia's cities are, this is one area in which they can greatly enhance their competitiveness. The same holds true for the emerging cities of Latin America and Africa.

What distinguishes intellectual capital and innovation is that it is not merely a gauge of technical (or technological) progress, or social development, or economic growth, or cultural advance, or major improvement in quality of life. It is all of these things, together and simultaneously. Investment in intellectual capital leads to an almost universal enhancement of urban society—indeed, of society generally. That is why it is hardly coincidental that the cities that do best in this indicator are also the richest cities, as well as those that so many people throughout the world consider to be the most desirable places in which to live.

Innovation, entrepreneurism, and sustainability spur Stockholm

…according to deputy mayor Ulla Hamilton

Deputy mayor for entrepreneurism, labor, and traffic and previously the environment, Ulla Hamilton has played a leading role in some of the city's greatest successes, including development of Stockholm's broadband network, auto congestion pricing plan, and sustainable housing. Here she discusses those and other efforts to keep the city growing and healthy.

Stockholm is admired around the world for style, sustainability, and openness. What are Stockholm's greatest achievements?

Stockholm is one of the fastest growing cities in Europe. On population, it is bigger than ever and growing. New businesses are springing up, and it's a very creative city. It's a big change from 10 or 15 years ago.

What is Stockholm doing right to attract and keep people?

We have a lot of interesting companies and interesting jobs. Combine that with the city overall—we have good restaurants with great chefs, entertainment, closeness to nature, both in terms of greenery and water. It is a combination of things.

What government programs make Stockholm so attractive?

Sustainable development is very important. Also, we developed a broadband network in the mid-1990s, and that has led to a booming ICT (information and communications technology) industry, the development of game companies like DICE and Spotify. It's a fiber network open to whomever needs to rent capacity.

New York's bike-share program wins a Nordic nod of approval.

Growth is good because the alternative is very bad. To be competitive, to be creative and innovative, it's crucial that the city grow. But we have to grow in a sustainable way.

How did Stockholm put in the information and communications spine without it costing Stockholmers anything?

I was vice chairman of the company when we discussed how to develop the business idea. It was part of an existing network, a cable network that was developed into a fiber network. We thought that small companies that couldn't afford to develop a system on their own could hire the capacity they needed. Now the network covers more than 90 percent of the Stockholm area.

So this is a case where public investment in infrastructure drove the health of the economy?

Yes. And we didn't use any taxpayers' money, because we kept it affordable. We let companies rent the capacity, and we didn't develop the system until we had customers.

Do you think investment in infrastructure generally drives growth or does growth occur and then you invest in infrastructure?

I think that investment in infrastructure is very important in order to get growth.

What would you do to improve Stockholm further?

We should use the tools that we have today to better develop education. We have the game industry. You can use, for example, Battlefield or Minecraft, as a tool to push innovation in education. Young people are used to having smartphones and information communications technology all around them. You have to have something in education that connects to that.

Stockholm has done well in *Cities of Opportunity* for the past three years in areas like sustainability, health and safety, and intellectual capital and innovation. What explains Stockholm's excellent standing?

On sustainability, that goes way back. Stockholm was named the first European green capital in 2010. And that was because we've been dealing with sustainability for a long time. In the 1920s, people began to be interested in how to create green areas in a growing city. That interest has continued, and the city has been developed in a green way.

The city has been so dependent on clean water, and Lake Mälaren, which surrounds Stockholm, is our drinking water reservoir. So it has always been very important to take care of the environment, and to do that, you have to have smart engineering solutions. Beginning in the 1940s we built a big water treatment plant. We started early to develop the subway, and a big percentage of people use public transport. We developed the district heating system in the early 1950s. These are engineering solutions but also environmentally friendly solutions.

In Sweden, what is the balance of power between the city and regional and national governments?

There is always a conflict between the city and the national government and that goes for every country. But it's important that we as a growing city, thanks to the tax structure, keep much of our tax money. It's a good situation.

How will you continue to spur innovation and entrepreneurism?

We are lucky in this area for several reasons. We have a very interesting mixture of life science companies, ICT companies, clean tech companies, and the entertainment industries. And Stockholm is a fairly small city, so it's easy for executives and innovators to meet one another. And that creates a creative, innovative climate. Also, Swedes are very interested in solving problems, and it has become fashionable to start their own companies.

Stockholm is one of the fastest growing cities in Europe. New businesses are springing up, and it's a very creative city. It's a big change from 10 or 15 years ago.

From left: Patrick Bach, Patrick Soderlund, and Karl Magnus Troedsson, all leaders of DICE, a development studio working on the video game Battlefield 4 in Stockholm.

Universities and high schools have become interested in helping students begin their own companies. Before that, the universities were more focused on producing academics. Now we have very close cooperation among businesses, the universities, and the city.

Considering not just Stockholm, but Malmö, Uppsala, Gothenburg, and other cities, what does government do to foster innovation?

A politician should try to find arenas where people can meet to exchange ideas. But a politician must know when not to interfere and disturb development. It's very important to understand the government's role. Also in Stockholm, we have open data resources, so companies—and Stockholmers as well— can develop websites, or apps, or other business ideas.

Small businesses created 800,000 jobs in Sweden from 1990 to 2012 according to your offices, over twice what Sweden had in 1990. What explains that, and what part is government playing?

There has been a big change in Sweden since the present government took over in 2006. During the past decade, a voucher system was created for elderly care, healthcare, schools, and so on. That led more people to consider starting their own companies rather than just being employees. So it was a combination of things.

It's been a tremendous change since the 1970s, when we had a big state and the attitude was the welfare state should take care of you. Today's voucher system has provided the opportunity for big and small companies to provide services rather than the government doing so. The competition in the service area brings development and productivity.

Speaking of public-private partnerships, do you think injecting the profit motive into things like building a hospital is a good thing?

The county council in Stockholm is right now building a new hospital. And it's a public-private partnership with the construction company Skanska. That's one example where the public sector and the private sector can work together to find smart, cost-effective solutions.

Stockholm is growing. Immigrants are coming, and Swedes are doing their duty making more Swedes. Is there a threat of unemployment as technology makes many jobs obsolete?

No. Technical development also leads to development of services. So I don't see that as a threat. Actually, the risk is that the city doesn't grow. In a growing city, you will always have development of new businesses. I'm absolutely sure of that. Five years from now, we will have quite a lot of different services that we can't even imagine today. Just look at the growth of the smartphone, for example.

How do you integrate immigrants into the labor force?

That's a very big challenge, but we are trying hard to see that immigrants can start working as soon as possible. We have programs where people with academic qualifications learn Swedish and work at the same time. We also have programs where, for example, engineering companies connect with trained engineers who recently moved to Stockholm. That makes it easier for immigrants to become part of Swedish society.

What is Stockholm doing to ease traffic congestion?

The challenge is that the city is built on islands. Whether your city is big or small, there are ways to make traffic easier, but you have to regulate to avoid chaos. In Stockholm, we are promoting bicycling and walking as the best ways to move around the city, and having as many people as possible leaving their cars at home when they go to work. To do that, you have to give more space for buses, for example, and give more space for bicycles and pedestrians.

What is your thinking on the future of Stockholm in terms of population growth? Good or bad?

It's good because the alternative is very bad. To be competitive, to be creative and innovative, it's crucial that the city grow. But we have to grow in a sustainable way. We have to have green areas, and people like the closeness to nature. It's a tough challenge.

Learn more

Video of this condensed conversation is available at www.pwc.com/cities, as is a full-length print version of the entire discussion.

Technology readiness

The digital divide continues to separate many cities, especially in education

While all four of this indicator's variables remain the same, the respective methods for determining two of them have been changed and, in one instance, significantly enhanced. Regarding broadband quality, we've replaced the data from the annual Broadband Quality Study produced by Oxford's Saïd Business School and the University of Oviedo (and sponsored by Cisco Systems), which is no longer being published, by the data compiled by Ookla, which compares and ranks broadband quality worldwide. For the software and multimedia variable, we've added a major new source of data, from the World Bank, which both enriches the variable and refines it by adding another analytical element to the measurement.

Given that this indicator has the smallest amount of variables, even limited changes will produce considerable differences. What is most interesting is that most of the significant changes still take place within the top 10 performers—which remain the same overall, although their ranking has altered.

Most obviously, London has leaped from eighth in our last report to the top of the rankings in our current one, tying Seoul, which was in sole possession of first place in *Cities of Opportunity 5*. Stockholm has also improved, finishing third this year (as opposed to fourth last time), although the city that makes the other enormous jump—just under London's seven places—is Hong Kong, soaring from #10 in our last report to #4 in this one. Meanwhile, Berlin rises to #12 this year from #16 in our last report despite the presence of more cities in the current rankings, confirming its steadily rising reputation as a high-tech hub in Europe.

There is, however, one variable in which two mature cities score less well than one would normally expect. In Internet access in schools, we find Tokyo at #16 and Paris at #20. These results are incongruous, especially as both cities finish in the top 10 in intellectual capital and innovation.

	Internet access in schools*	Broadband quality	Digital economy[1]*	Software development and multimedia design	Score
30 London	28	29	20	30	107
30 Seoul	29	30	21	27	107
28 Stockholm	27	27	30	21	105
27 Hong Kong	24	28	25	23	100
26 New York	22	21	29	26	98
25 San Francisco	22	16	29	29	96
24 Los Angeles	22	19	29	23	93
23 Singapore	30	11	25	25	91
22 Chicago	22	14	29	21	86
21 Tokyo	15	22	19	28	84
20 Paris	11	23	17	24	75
19 Berlin	14	26	18	16	74
18 Toronto	25	15	22	11	73
17 Sydney	26	17	23	5	71
16 Kuala Lumpur	16	12	13	21	62
15 Madrid	13	24	16	7	60
14 Milan	5	25	15	13	58
13 Dubai	23	3	14	17	57
12 Moscow	9	20	2	21	52
11 Beijing	18	10	5	11	44
11 Buenos Aires	4	18	7	15	44
9 Shanghai	18	10	5	7	40
8 Mumbai	8	13	3	11	35
7 Johannesburg	1	8	12	12	33
6 Jakarta	12	5	1	14	32
5 Istanbul	10	7	8	3	28
5 Mexico City	7	6	11	4	28
3 São Paulo	3	2	10	8	23
2 Rio de Janeiro	3	4	10	2	19
1 Nairobi	6	1	6	1	14

High
Medium
Low

Highest rank in each variable

*Country-level data.

Each city's score (here 107 to 14) is the sum of its rankings across variables. The city order from 30 to 1 is based on these scores. See maps on pages 14–15 for an overall indicator comparison.

1 This ranking allows governments to gauge the success of their technology initiatives against those of other countries. It also provides companies that wish to invest or trade internationally with an overview of the world's most promising business locations from an ICT perspective.

Big data…big city…big dreams

Scientists and economists peer through a powerful new looking glass in the age of urban informatics

At the temporary headquarters of New York University's (NYU) Center for Urban Science and Progress (CUSP) in downtown Brooklyn, economist Tim Savage stands beside a room-sized array of screens displaying a map of Manhattan, as well as parts of Brooklyn. The map resembles a radar image of storm intensity. At its fiercest in Midtown and the Upper East and West sides of Manhattan, the picture takes on a molten hue, reflecting the intensity of taxi pickups and drop-offs (and what some locals might describe as the heat of tempers in the sidewalk scrum to hail a cab on a rainy night). In fact, the giant display does represent a storm of sorts—a vast set of data points that depict nearly 180 million taxi rides that occurred in 2011 in Manhattan, Brooklyn, Queens, the Bronx, and Staten Island—the five boroughs of New York City.

This is, in effect, a taxi maelstrom. It's one that, like other experiments in the converging research worlds of big data analytics and urban informatics, can now be dissected and analyzed so that previously hidden patterns of traffic flow—and particularly of congestion—can be better understood, remedied, and, as researchers like Savage hope, adopted and used by other cities around the world.

As part of a New York City Applied Sciences Initiative that began four years ago under former Mayor Michael Bloomberg, CUSP is one of a handful of academic and scientific laboratories/ventures around the world dedicated to tracking patterns of behavior embedded in city data streams and finding ways to improve everything from traffic and energy efficiency to noise pollution and community health.

Looking out over Brooklyn and Manhattan, the CUSP facility, in its way, is perched on the frontiers of what's been called the Internet of things, or the machine to machine revolution. In an age of increasing hyper-connectivity and data flow, new methods of global data management and analysis—the big data revolution—are being studied and deployed to improve efficiencies across vast industry and governmental ecosystems—everything from commercial airline fleets to power grids to city traffic management systems and office building operations. In 2012, CUSP won a grant offered by New York City (after Cornell University won the first award and started its own city-focused research facility, the Cornell Technion campus on Roosevelt Island in the East River off Manhattan). By 2017, CUSP plans to move into its permanent home on Jay Street in the heart of downtown Brooklyn. With a new one-year graduate program in applied urban science and informatics recently launched, industry partnerships forming with IBM and Cisco, among others, and collaborative research facilities located in Mumbai, India, and at the University of Warwick in Coventry, England, things are moving very quickly.

The Mumbai research facility opened in September, and Warwick's Institute for the Science of Cities launched January 2014. Indeed, the field is so relatively new, according to Steven Koonin, a theoretical physicist who is CUSP director and previously was US under secretary for science at the Department of Energy, that his researchers are clamoring to meet with colleagues elsewhere—the Boston Area Research Initiative, the Urban Center for Computation and Data in Chicago, and the Center for Advanced Spatial Analysis in London—just to better understand each others' areas of focus and better align efforts.

The explosive growth in urban research facilities comes at a time of global demographic change, a great urban shift in which the UN projects that 67 percent of the global population will live in an urban environment by 2050 (the figure is nearly 90 percent for North America).[3] City problems will increasingly be almost everyone's problems.

At the same time, a technological revolution is under way in the field of big data—a realm that has emerged as researchers look for ways to manage the colossal amounts of information generated by an interconnected world. In 2017, for instance, the gigabyte equivalent of all movies ever made will cross global Internet Protocol networks every three minutes, according to a recent Cisco study.[4] The great data shift, in other words, is so big it has required the development of a new generation of database management systems, like Apache Hadoop, and data scientists who can roam the vast universe of big data. The goal of data management at this scale is to glimpse opportunities to improve efficiencies in city operations and also to "see" into the future.

As it turns out, harvesting and analyzing data at this scale can allow researchers to anticipate events and trends in human behavior using algorithms and other methods. And this sort of predictive analytics can be used to spot health and disease trends, commuting trends, traffic congestion, trends in energy use and building occupation, patterns of noise complaints—the most common complaint in New York City. Anticipating these trends can help city planners and managers marshal their resources more effectively and better evaluate programs to improve city social and economic life.

3 United Nations, Department of Economic and Social Affairs, Population Division (2012). World Urbanization Prospects: The 2011 Revision, CD-ROM Edition.

4 Cisco Visual Networking Index: Forecast and Methodology, 2012–2017, http://www.cisco.com/en/US/solutions/collateral/ns341/ns525/ns537/ns705/ns827/white_paper_c11-481360_ns827_Networking_Solutions_White_Paper.html.

Koonin sees "science with a social dimension" as the promise of the age of urban informatics—less a technological "fix" to urban challenges as the ability for the public to see and understand its own behavior in aggregate, to discern the "shape of the haystack."

An instrumented city, according to Koonin, with data points gathered throughout its infrastructure, will be able to test a variety of incentivizing options, using computer models in advance, "test driving" options to see which policy ideas work best—before they are implemented.

"Cities are where resources are concentrated, where economic activity happens, and where innovation occurs," says Koonin. Because cities will increasingly compete for global talent and capital, and because improved efficiencies of cities will play a big role in global climate issues, "cities must become as efficient as they can be." Nowhere is this more apparent than in the application of big data solutions to urban problems.

Koonin points to early successes— as examples of the promise of urban informatics.[5] These include advances in predictive policing, in traffic management, in the enforcement of building code violations, in estimated improvements of water and electricity usage of between 30 percent and 50 percent over the coming decade. The more you can "instrument a city," as Koonin describes it—place sensors, gather, and analyze its data—the better you can make a city run.

Take the taxi study. CUSP is working with NYU's engineering school on this project. As it happens, the New York City Taxi and Limousine Commission has been, over the years, proactively using *in situ* sensors in its 13,347 regular medallion taxis to collect information about pickup and drop-off locations, time of travel, speed of travel, number of passengers per ride, the amount of fares and tips, and a few other things. "It's a pretty rich source of information," says Savage, who has analyzed all that taxi data. Some of his results highlight a problem that lies mostly hidden from view—nearly 70 percent of cab rides have just one passenger, traveling an average distance of just over two miles, frequently at a speed that is only slightly faster "than someone walking down the street at a brisk pace." Such data reveal "a classic example in economics of a negative externality," says Savage. "In a world where we don't price the streets, time is the equilibrating factor." The seeming convenience of hopping in an inexpensive taxi ride (the study shows that the average cost to go one mile is just $5.26) is overshadowed by greater societal costs—the time that gets wasted by everyone caught in city traffic that has been caused, in part, by so many taxis.

Koonin sees "science with a social dimension" as the promise of the age of urban informatics—less a technological "fix" to urban challenges as the ability for the public to see and understand its own behavior in aggregate, to discern the "shape of the haystack." Once inefficient behaviors are identified, then societal levers can be applied to shape the haystack toward greater efficiencies: regulation, economic incentives, and the exploration of choice architectures. "These societal levers are often more important than technological solutions," says Koonin.

In the taxi example, for instance, one type of solution that could emerge is the application of economic incentives: Slightly higher taxi fares would put a real value on city streets, incentivizing more people to use subway and bus services. Koonin adds that facilities like CUSP will be able to use computer models to see which choices will work best for the most people. Koonin points to the challenges that the city of London had when it implemented congestion pricing. The price signal was so strong, according to Koonin, that many more people than expected stopped driving into the city, which then lost revenue it expected to make from the pricing scheme—revenue that was intended to support the subway system. By contrast, an instrumented city, according to Koonin, with data points gathered throughout its infrastructure, will be able to test a variety of incentivizing options, using computer models in advance, "test driving" options to see which policy ideas work best—before they are implemented.

CUSP is currently tackling its first major challenge, according to Koonin, which involves targeting and making interoperable three basic types of large data sets. The first are data acquired *in situ*, like the taxi sensors, and would involve installing more sensors to measure subway or building occupancy or traffic flow, or water treatment facilities, or energy use. A second set involves what Koonin calls "organic data"—all the types of records a city normally keeps as part of its daily operations. Getting access to all of this information, cleaning it up, and making it interoperable is a monumental effort.

"We're working our way through several thousand data sets," says Koonin—"all the buildings, all the ZIP codes, all the 311 calls [to New York City's information line], all the building energy use data." With strict mandates and protocols in place for privacy and security, city data will eventually be used in correlation with a third and more futuristic method of data gathering—"synoptic data," which will involve specialized instruments mounted on the rooftops of buildings—a methodology that distinguishes CUSP from other research facilities around the world. Koonin calls it the "urban observatory."

As Galileo pointed his telescope into the heavens to usher in the Copernican revolution, so researchers at CUSP and other facilities like it may be on the verge of a revolution in the big data universe, inspired by specialized telescopes, exoplanets and cameras pointing downward, across swaths of a city to measure and analyze the infrared signature of entire neighborhoods or individual office buildings in order to improve their energy use.

5 Steve Lohr, "SimCity, for Real: Measuring an Untidy Metropolis," *The New York Times*, Feb. 23, 2013.

Hyper-spectral imaging mounted on tall buildings will one day be correlated with city records—the "organic data" of utility bills, for instance—to enable city managers, at a moment's glance, to analyze and even predict electricity use or identify inefficiencies. Lidar, a form of laser technology, will measure the movement in buildings (and then extrapolate occupancy) or will identify particulate pollution in the atmosphere. Other instruments that measure magnetic variation may eventually be used to track the movement of trains through the city.

For now, Koonin has his hands full. There are research projects in transit, utilities, and public health to manage. There is the development of an urban informatics Ph.D. program. There is an entire new field of social science fueled by big data to ponder. There are academic and industry partnerships to nurture. And there is a "living laboratory" to establish—a completely wired and sensored neighborhood of about 20 blocks in Manhattan. And there are new opportunities to test and develop urban informatics products and technologies—a field so new that nobody has yet estimated the potential size of the market, though, according to CUSP's Michael Holland, investment in "civic tech" of the sort that will help instrument cities of the future has already garnered more than $430 million from private sector investors and foundations between January 2011 and May 2013.[6]

All in all, the work of CUSP and other research labs like it will maintain a primary focus on big data's ability to improve life in cities. As Koonin likes to say, quoting his friend, the theoretical physicist Geoffrey West, "Cities are the cause of our problems and the source of the solutions."

6 Mayur Patel, Jon Sotsky, Sean Gourley, Daniel Houghton, *The Emergence of Civic Tech: Investments in a Growing Field*, The John S. and James L. Knight Foundation: Dec. 4, 2013, http://www.knightfoundation.org/media/uploads/publication_pdfs/knight-civic-tech.pdf.

As cities hone in on the promise of big data

…they're often lost in the sauce of big government, explains Steven Koonin

Steven Koonin, founding director of NYU's Center for Urban Science and Progress (CUSP), served as under secretary for science at the US Department of Energy from May 2009 through November 2011, overseeing technical activities across the department's science, energy, and security activities. Before joining the government, Koonin spent five years as chief scientist for BP p.l.c. and was professor of theoretical physics at California Institute of Technology from 1975–2006. He is a member of the US National Academy of Sciences and the JASON advisory group.

Let's talk about privacy and security of data. What is it that people tend to misunderstand the most about what research facilities are trying to do with big data?

First, privacy and security have emerged as a key research topic for CUSP, because it's so essential in letting us do the urban research that we want to do. And that's central: CUSP is a research institution. We're not a company, although we work closely with companies. We're not part of the government.

Second, as a research institution, we are subject to independent oversight by NYU's institutional review board under the federal Policy for the Protection of Human Subjects.

Third, we are, of course, not interested in individuals. We're interested in aggregate behavior. And we've got a set of policies that make that very explicit. Finally, we're beginning a larger dialogue about privacy and security in a broader academic context, sponsoring a conference in June [2014] and publishing, *Privacy, Big Data, and the Public Good: Frameworks for Engagement*, this coming June [2014].

If, as your taxi study shows, urban informatics can make plain certain inefficiencies of human behavior, then changing those behaviors would seem to require a revolution in regulation, compliance, and enforcement. Are we moving into an era of greater regulation of individual behaviors?

I would say it's a greater awareness of individual behaviors. It doesn't have to happen through regulation. There's a whole discussion of nudges or, to use a fancier term, "choice architectures," that can influence human behavior but are not actually regulation. We see choice architecture at work with organ donorship and driver's licenses, for example. If you ask people if they want to be an organ donor, perhaps 20 percent choose to do so when they sign up for their license. But when you make your targeted behavior the default option—and oblige people to opt out of the donor program, then donorship increases. It's a simple, non-regulatory mechanism that targets optimal behavior.

If everyone will soon be living in cities, won't federal or national governments have an increasing interest in helping to provide solutions that will help cities run better—financing and/or incentivizing big data or urban informatics solutions, for instance, or subsidizing the retrofits of infrastructure and traffic management systems or electric grid support and water systems that will become the "smart city" of the future?

Cities qua cities don't have great visibility in the [US] federal government. Yes, there's Housing and Urban Development, but it is concerned with one small slice of cities. There is certainly Health and Human Services, concerned with the public health aspects of cities and medical care. And then you've got transportation, and so on, but there is no place in the federal government that thinks about cities as systems of systems—no federal entity that funds, regulates, and encourages cities as systems of systems.

There's a whole discussion of nudges, or, to use a fancier term, "choice architectures," that can influence human behavior but are not actually regulation.

And do you see this changing?

I would like it to change. I and others have been talking in Washington to see if we can get city-focused initiatives cross-cut across the various agencies. Not to look with envy, but the Department of Agriculture, for example, is very much concerned with rural affairs, as one might well imagine, but there is nothing comparable in an integrated way for the interests of cities. Again, not to complain but just to state a fact—cities are legal entities of state governments, so this is a result of how the Constitution apportions power to the states.

As you've said elsewhere, the shape of the future is urbanized, but the current paradigm, in which the federal government has long had an interest in encouraging economic growth, is, in fact, based on an agrarian world.

Absolutely. And I'm no expert on politics or political theory, but one can imagine that the idea of changing this paradigm would cause a lot of—let me just say—discussion, in Washington.

Can you speak to the question of how the smart city solutions that you're creating at CUSP will be deployed in developing cities? What solutions seem to be the most likely candidates for developing cities?

One of the advantages of the developing countries is that the infrastructure is largely yet to be built. So you could try to build some of this in from the beginning. And synoptic observation techniques that we're developing for cities, where you can watch the broad swath of a city from an urban vantage point, may have some real advantages in the developing world, because you can cover large areas without having to put in a sensor infrastructure.

What advantages will New Yorkers gain from CUSP in 10 to 20 years?

First, one goal for CUSP is to just make the city more efficient. New York City has already made the enforcement of illegal building conversions five times more efficient. Second, by putting data about the city in people's hands, you can improve the quality of life. Noise levels are something that we're quite interested in. If people understand, in a more detailed and quantitative way, the noisier parts of the city, you can modulate your living and travel. Real estate prices will no doubt change as a result of what the noise scores look like.

City gateway
More than ever, most roads (and flights) lead to London

A substitution of one variable and the addition of a new one have led to meaningful changes in the standings in this indicator, although five of its original data points remain.

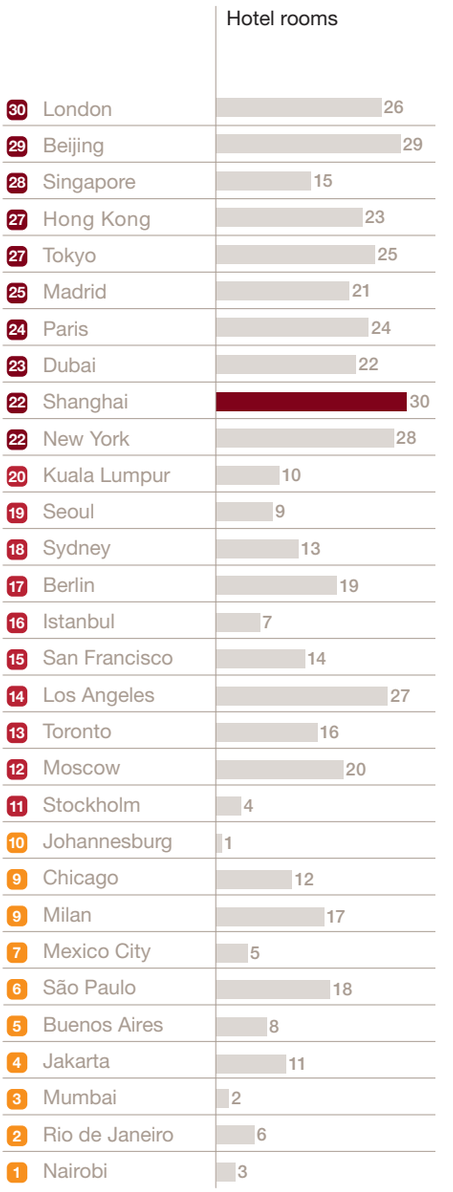
The two new variables are top 100 airports (based on a ranking compiled from a survey of more than 12 million passengers worldwide) and on-time flight departures (measured by the average percentage of flights departing from each city between May–July 2013). The one variable from our last report that was deleted was aircraft movements, as the data generated from it were simply too similar to those of incoming/outgoing passenger flows and, therefore, redundant. (It also doubly rewarded cities that did well in the latter variable while penalizing those that did not).

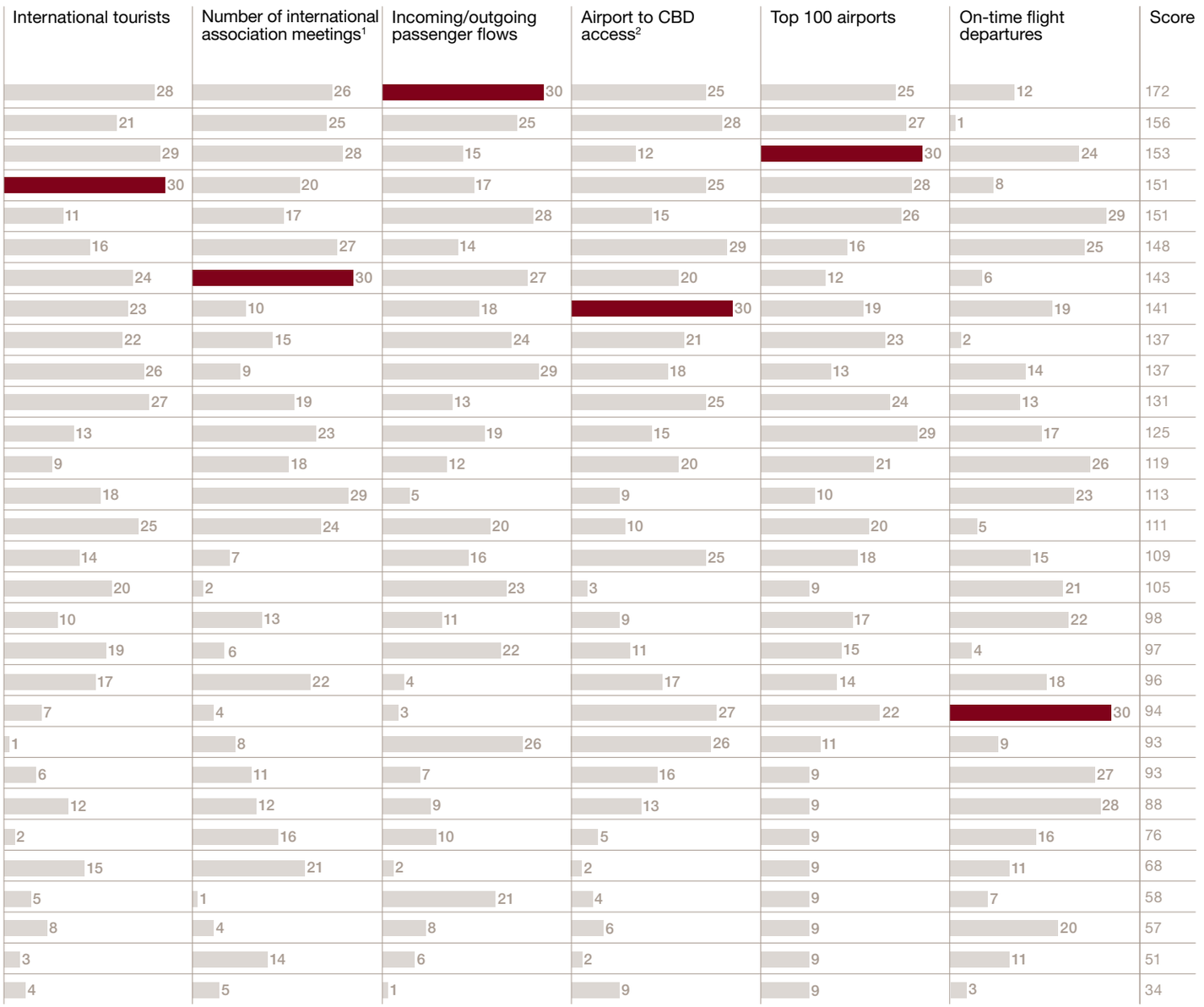
In the end, the fine-tuning of this indicator highlights London's dominance even more. When we first introduced city gateway in *Cities of Opportunity 5*, we stated that its results were best read as a complement to those in the demographics and livability indicator, and vice versa, as this section of our report attempts to quantify both a city's global connections and, even more so, its attraction to the world way beyond its own region and even national borders. Indeed, London's convincing first-place finish here—with a more conspicuous margin of victory than in *Cities of Opportunity 5*—reinforces (and in fact validates) its #1 ranking in global attractiveness in the livability indicator. What is perhaps even more interesting than London's pre-eminence here, however, is the trajectory of two other cities with which it is often linked.

"When it comes to the world's most attractive cities for tourists," we wrote in our last report, "the popular Western consensus has long accepted the trinity of London, Paris, and New York." This year, we received practical confirmation from our PwC staff survey that it isn't just tourists who find these cities attractive but our own professionals, who voted London and New York #1 and #2, respectively, as the cities to which they'd relocate if offered the chance (with Paris a respectable #5). It is notable, therefore, that Paris, which finished second in city gateway by a difference of only two points in our last report, ranks seventh in this one and that New York, which ranked fifth previously, ties Shanghai for ninth place this year. In fact, London is the only non-Asian city in the top five this year.

Nevertheless, we notice the same phenomenon in this indicator that we've noticed in several others; namely, that although specific variables might be altered, dropped, or added, the cities in the ranks of the top 10 remain remarkably unchanged, barring an occasional city rising or falling. Thus, nine of the cities in the top 10 this year were in the top 10 in our last report, the only exception being Los Angeles, which is now replaced by Dubai.

Clearly, the most successful cities, year in and year out, are those that possess—or have learned to create and manage—the kind of deep social and economic resources, and an almost perpetual resiliency, that allows them to stay "in the game" for the long run. What is perhaps the most impressive, and certainly surprising, example of that inherent, long-term urban fortitude and tenacity is the city in sixth place this year—which was also in sixth place in our last report: Madrid. Among such global powerhouses as London, Beijing, Singapore, and Tokyo, Madrid stands out. As the highest-ranked non-Asian city after London here, it beats out Paris and New York. Given the tremendous and varied challenges to the Spanish capital during the last few years, it is a testament to its essential strengths that it continues to do so well in this indicator—which surely bodes well for its future. In the words of Miguel Zugaza, director of the Prado Museum, a crisis "undresses a country. It leaves you naked" (see pages 44–47). But after taking away "all the accessories, all the jewels," the current crisis will leave Madrid, and Spain as a whole, the "nucleus for the future, the strength of what it has."





Each city's score (here 172 to 34) is the sum of its rankings across variables. The city order from 30 to 1 is based on these scores. See maps on pages 14–15 for an overall indicator comparison.

High
Medium
Low

Highest rank in each variable

1 A cumulative count of international association meetings per city per year that take place on a regular basis and rotate between a minimum of three countries from 2007 to 2012. Figures are provided by members of the International Congress and Convention Association.

2 A measure of the ease of using public transit to travel between a city's central business district (CBD) and the international terminal of its busiest airport in terms of international passenger traffic. Cities with direct rail links are preferred to those with express bus service. Cities with rail links with the fewest transfers are ranked higher than those with more.

Quality of life

Berlin

Attaining top infrastructure, sustainability, livability, and health is anything but a walk in the park

This section groups four of our 10 indicators that, together, determine a city's quality of life. As the reader will quickly notice, a fundamental factor in urban quality of life is infrastructure, from mass transit and housing to hospitals to waste management and public parks. The development, upgrading, and continual maintenance of infrastructure contribute enormously and *directly* to a city's quality of urban life, enhancing not only the daily lives of residents but a city's appeal to the wider world at large. This very basic and central significance of infrastructure to urban living helps explain why the top rankings in these indicators are flooded by the mature cities of opportunity.

Three-quarters of the top 10 places in these four indicators (30 out of 40) are held by European or North American cities, with the former taking the largest chunk (17 out of 40). Even more impressively for Europe, three of the four cities in the top 10 in all four indicators are (in declining order of final scores on all variables) Stockholm, Berlin, and Paris, with Toronto being the sole North American city in the group (and scoring above Paris). In addition to the four cities above that do exceedingly well across the board, five other cities rank in the top 10 in three of the four indicators: They are (again, in declining cumulative score) Sydney, Singapore, San Francisco, London, and Chicago. While the geographical breadth here is more extensive than with the previous four cities, covering Asia, Australia, Europe, and North America, there are a couple of notable similarities among these five.

Sydney, San Francisco, and Chicago all finish in the top 10 in the same three indicators, which means that they also all fall out of the top 10 in the same indicator: transportation and infrastructure. Singapore and London also finish in the top 10 in the same indicators, but the indicator in which they fall out of the top 10 is, interestingly, sustainability and the natural environment. This last finding is curious only because one would normally expect two cities as sophisticated and advanced as Singapore and London to be among the leaders, both regionally and globally, in environmental sustainability.

But another result seems even more unexpected. In this section, which evaluates all those urban assets and policies that constitute a consistently high quality of city living, New York ranks in the top 10 in only two indicators. Moreover, in both cases, New York just about squeezes into that select group, finishing ninth in health, safety, and security and tying Chicago for 10th in demographics and livability. Given Paris's success in all four indicators and London's ability to rise to the top in three out of the four (just to mention two conspicuous global peers), New York's rankings in this section are surprising. They are made even more so by the fact that New York was chosen as the #2 city for relocation in our PwC staff survey of 15,000 professionals in our 30 cities.

The only other city besides New York to finish in the top 10 in two out of four indicators in this section is, surprisingly, Madrid. But as we state in our city gateway indicator (page 30), where Madrid ranks sixth overall, what is probably most impressive about the Spanish capital is how it manages to "stand out" among the global powerhouses in *Cities of Opportunity*. To echo the words of Miguel Zugaza, director of the Prado Museum, the crisis it has gone through the last few years will confirm and reinforce Madrid's "strength" and resiliency (see pages 44–47).

Transportation and infrastructure

Singapore blazes the trail in urban mobility

As with several other indicators, while we've maintained the same variables in this one, we've also modified the definitions—and, therefore, the measurements—of two of them and, in so doing, we believe, substantially improved them. These two adjustments have led to considerable reordering of our rankings, both within the top 10 and throughout the indicator generally.

The first change is to the cost-of-public-transport variable, which now measures the price of a trip from a city's farthest boundary to the central business district (CBD) rather than measuring from farthest boundary to farthest boundary, as we did in the past. This seems to be a fairer measurement, both intuitively and practically, not only for travelers and tourists but for most residents of a city, who normally travel to places of work or amusement in the center but rarely (if ever) undertake journeys from one end of a city to the other.

The second change we've made this year is to the variable comparing major construction activity. Under our previous measure, certain cities seemed to register unusually low activity, even in the face of anecdotal evidence to the contrary. We now use data from a global provider of building information that seems to be more robust and gives a more accurate accounting of activity either under way or planned.

While no changes have been made to the measurement criteria from previous years, it is also worth noting that the public transport systems variable does not consider traffic congestion and ease of commute. These factors are addressed individually in our demographics and livability indicator category in order to consider the range of daily challenges that many urban citizens face. In light of this, our public transport systems variable should be interpreted as a reflection of the operational efficiency and general presence of transit options at the foundational level, independent of a city's traffic congestion or ease of commute factors.

For example, while Toronto is rated here as #1 for public transport systems, it is important to note that it ranks #13 for traffic congestion and #12 for ease of commute within our demographics and livability indicator. Toronto's rankings in these two variables also reflect the city's current reality, in which the lack of a fully integrated regional transportation system is one of the leading challenges for Toronto. It is also consistent with rankings and observations made by regional business associations and recent private and public sector studies.

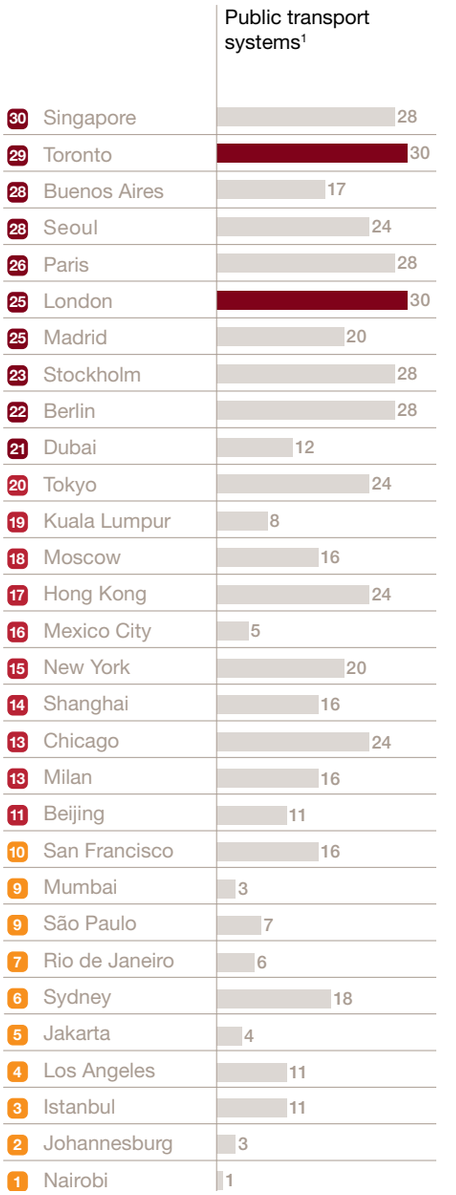
The final results are notable, both for their confirmation of and divergences from our last report. The major confirmation was Singapore, which finished first by a small but clear difference in *Cities of Opportunity 5* and came in first again in this year's report by an even larger margin. Singapore's top ranking, moreover, was the result of consistently high tallies across most variables, as it scored first in housing, third in public transport systems, and in the top 10 in three out of the other four variables (with its lowest score, in cost of public transport, registering at just about the median).

Completing the top five are Toronto (#2), Seoul and Buenos Aires (tied for #3), and Paris (#5). As a whole, the geographical distribution here is much wider than it was in the last report. While Toronto was the only non-Asian city to break into the top five in *Cities of Opportunity 5*, this year, we have two Asian cities, one from Europe, and one each from North and South America. It is significant, however, that sixth through ninth places are all taken by European cities, while Dubai fills out the top 10.

Taking a closer look at these top 10, we notice several crucial differences from our last report. The most obvious is the impressive rise of Buenos Aires, which now ties Seoul for #3. (In our last report, it tied Mexico City for #12.) There is, of course, a certain justice to the "Paris of South America" just beating out the French capital in this indicator. Buenos Aires's metro system celebrated its 100th anniversary in 2013, making it the oldest subway system in Latin America, while (just to mention another facet of urban mobility) its 140-meter, 12-lane Avenida 9 de Julio—the widest avenue in the world—makes the Champs-Élysées look almost pedestrian and New York's Broadway a mere country path. Of course, Buenos Aires did as well as it did mostly because of very high scores in number of taxis and cost of transport, but, still, there is a certain underlying rationale for the city's success that goes back many decades to foundational infrastructure investment.

The other conspicuous divergence from our last report concerns three of the most advanced cities in the world in the field of urban transport—Tokyo, Hong Kong, and New York. While they were all in the top 10 in our last report, they are now, respectively, #11 (down from fourth), #14 (previously tied for fifth), and #16 (down from seventh place).

For New York, the issues of cost of public transport and availability of taxis—which have been consistently problematic for it in a comparative ranking—seem to have become even more so with the addition of three more cities to our report. While it does better than the other three US cities, all four find themselves in the bottom half of this indicator's ranking. Los Angeles finishes worst of all, 27th of 30 cities, only marginally better than in our last report, in which it ranked 25th of 27.



Mass transit coverage[2]	Cost of public transport	Licensed taxis	Major construction activity	Housing	Score
21	14	21	25	30	139
20	6	7	27	28	118
17	29	29	14	9	115
23	22	25	8	13	115
30	9	27	3	17	114
16	1	14	28	23	112
26	12	23	13	18	112
28	3	26	5	21	111
27	5	9	10	28	107
4	15	20	30	24	105
11	16	22	12	19	104
15	26	28	15	11	103
22	24	15	21	3	101
18	8	13	19	17	99
12	28	30	16	7	98
25	7	5	18	20	95
8	20	17	20	13	94
14	10	10	11	22	91
24	12	18	4	17	91
13	27	19	9	11	90
29	4	8	7	25	89
19	25	12	26	2	87
7	19	16	29	9	87
5	18	24	23	7	83
9	2	4	17	30	80
3	30	11	24	7	79
10	17	2	6	28	74
6	21	3	22	7	70
3	13	6	1	17	43
3	23	1	2	1	31

Each city's score (here 139 to 31) is the sum of its rankings across variables. The city order from 30 to 1 is based on these scores. See maps on pages 14–15 for an overall indicator comparison.

High
Medium
Low

Highest rank in each variable

1 Reflects the efficiency, reliability and safety of public transport networks as defined and rated by the Mercer Quality of Living 2013 reports. Cities also received additional points for each multi-modal transport system available to the public including: subway, bus/bus rapid transit, taxi, light rail, tram/trolley/streetcar, commuter rail and bike share systems. The public transport system rankings should be interpreted with the caveat that traffic congestion and ease of commute variables have been measured separately as part of our demographics and livability indicator category.

2 The kilometers of mass transit track for every 100 square kilometers of developed and developable land area within the city's strict municipal boundaries.

Urban conservation takes hold as skyscrapers rise across a powerful, new Shanghai

…Wang Lin and Ron van Oers explain a young city's coming of age as they take afternoon tea on the historic Bund

Wang Lin, director of the historic conservation department in Shanghai's Planning and Land Resources Administration Bureau and a Loeb Fellow at Harvard, has been one of the driving forces in the city's master planning and redevelopment for 15 years. Ron van Oers served for 10 years coordinating UNESCO's World Heritage Cities Programme in Paris before assuming his current role as vice director of the World Heritage Institute of Training and Research for Asia and the Pacific based in Shanghai. Together, they combine insight into Shanghai's evolution with a wide perspective on the world's great cities.

To set the context, how would you define urban preservation? Shanghai's growth seems to defy the notion of keeping anything as it was.

RvO: Preservation is a word typically used by Americans, but conservation in this regard would be better, as it concerns more a collective of processes to retain and reveal cultural significance. Urban preservation, from my point of view, is a contradiction in terms because the urban condition by definition is changing all the time—it's dynamic, it's in flux—and preservation is about strictly keeping something as it is. Urban conservation involves the process of trying to retain cultural significance, which doesn't mean that you have to freeze things. You can reveal cultural significance while you are actually adapting to the current context. I think that is what we are experiencing in Shanghai.

WL: I agree. When I got my doctorate degree in preservation of Chinese historic cities, we talked about the difference between preservation and conservation. Conservation includes preservation, but it's more than that. It means we can reuse a building or improve it, add new life or new facilities

Ron van Oers and Wang Lin sit across from the sprawling Pudong district and atop Three on Bund, the city's first steel-frame structure, built in 1916.

> *Conservation includes preservation, but it's more than that. It means we can reuse a building or improve it, add new life or new facilities and revitalize it. That's more than preservation, especially when you use it together with "urban," because a city is a place for people to live, so you need to adapt and make use of heritage.*
>
> ***Wang Lin***

and revitalize it. That's more than preservation, especially when you use it together with "urban," because a city is a place for people to live, so you need to adapt and make use of heritage.

Why should a city that's growing as fast as Shanghai make conservation a priority? What are the benefits?

RvO: For big cities, and certainly if you're a really big city like Shanghai with nearly 24 million people, I think a keyword is diversity—diversity of workplaces, residential areas, choices where you can spend your money. It's partly for tourism purposes but partly also for the residents who are living and working in the city, so they can actually have a pleasant time out of the office. In my view, conservation is part of offering a diversity of choices in work, leisure, and living. Shanghai practically has got the whole range of residential styles on offer and that makes Shanghai stand out against many other cities, like Hong Kong or Shenzhen, which have just residential towers. There is actually no choice.

People living and working in Pudong, for instance, just take the ferry to Puxi, Shanghai's inner city on the opposite bank of the Huangpu river. I think for them it is wonderful to be working there in one of the glitzy offices, earning a top salary, and a five-minute ride later, they're in a totally different neighborhood, where it's almost like being in a different country. Shanghai emulates to a certain extent the European experience, as you can actually travel around and have different experiences within a day. And the practice of urban conservation contributes to that diversity of experiences.

WL: I totally agree. What makes this city so diverse compared with other cities is that in the central part of Shanghai, we have defined 12 historic conservation areas. Each area has its own character. When you go inside Hengshan-Fuxing Historic Area, it's a different character from when you go into the Bund Historic Area and its waterfront, for instance. [The Bund is a riverside area of Shanghai popular with residents and tourists for its architectural mix.]

Who are the various stakeholders you consider in terms of conservation, and how do you balance interests among government planners, developers, and communities?

WL: At the very beginning, say 20 years ago, not so many people paid attention to historic preservation, so we just listed buildings and got approval by the government. At the time, this was not so complicated. But now we have more than 3,000 listed heritage buildings, and this year, we have begun to collect even more historic buildings to be listed. Now we have a very serious process, because the stakeholders, the planners, the owners, or any of the people living in the city can give their opinion if they want a building or district to be listed or not. Of course, the Historic Conservation Committee makes the final decision. So consultation is part of the legal process now.

Do you involve the people in the community?

WL: Certainly. We show the people the plans for listing and restoration or renovation; we put the plans on the web and in the newspaper and collect their opinion and ideas. If whole neighborhoods are slated for renovation or redevelopment, we have a democratic process where we will ask the people to vote whether they want to move or not. If more than 85 percent of the people who voted, or 75 percent of the families, agree to move, then the whole compound will be moved out and the neighborhood renovated. But this process will be done in two stages. The first stage is general to inquire if they want to move. At the second stage, they will be given very detailed information about where they will be moved, what the conditions will be like, the amount of space of the new house, or the compensation money they will be paid if they move. And then they can vote if they want it or not.

RvO: What's fascinating is that Shanghai is a relatively young city, barely 200 years old, but it is really at the forefront of conservation thinking. That is a fascinating duality: young city, but very advanced in urban conservation practice. Other cities that have a legacy of 2,000 years have not been able to articulate so well what the importance of urban conservation is for the further development of their city.

Looking forward, what are the challenges you still want to address?

WL: I think the first important thing is we need to be sustainable, not just having the most rapid speed of construction. We need to pay more attention to the quality of the city. We need to keep a balance between the environment and the economy. Also equality is very important. We will pay more attention to low-income persons. So we began to look at quality, equality, and ecology—we pay more attention to that now.

Looking at the other cities we cover in *Cities of Opportunity* beyond Shanghai, are there any projects you view as real successes or models for other cities?

RvO: I've been looking recently into a series of Asian cities because of the program that I'm trying to implement in China—UNESCO's Historic Urban Landscape approach. Singapore, for example, is reinventing itself completely, not only as a green city but as a city in a park—you know, not with parks in the city but the city situated in a green ecological area.

There is a significant planning process with financial investments going on in terms of applying green technologies, creating extra parks, but also linking all the undeveloped, ecological areas surrounding Singapore and drawing them into the city. A key project and connecting enterprise in all this is urban farming. Singaporeans, the idea goes, should be able to buy Singapore-grown food, which should be organic—it is very ambitious and at the core of sustainability.

Of course, Singapore has also been quite significant in terms of how it actually pushes forward particular policies, such as attracting a highly skilled and highly trained workforce. They are investing heavily in science parks and biotechnology, but those highly skilled workers would like to have also a high-cultural environment. So culture should be thrown into the mix as well.

The key with urban farming in Singapore is that all the policies need to be aligned to achieve this goal, and I think that is the important lesson from Lin in Shanghai. Historic preservation needs to be integrated into the planning of the city, meaning that various policies—how you deal with housing, how you provide for a working environment, your labor policy—all those policies need to be linked to this goal of historic preservation if you want preservation and development to go hand in hand and not hamper each other. Historic preservation is part of sustainability, and I think that making the city more sustainable means realigning all the policies, including everything you do in terms of business and how you invest your money in the city.

Looking down from Three on Bund at waterfront redevelopment planned by Wang Lin and others. An underground highway allows Shanghainese to cross the road and stroll along the bustling Huangpu River.

WL: Shanghai looked at various cities to see what we could learn, such as Boston, for instance. Boston has a major project —the Big Dig— the purpose of which is to put transport circulation underground and create more public space aboveground. Five years ago, people in Shanghai could not go straight to the Bund. They needed to go underground from a terminal and then walk up again, because there were 10 lanes of traffic on the Bund. What we did—and I was actually involved in and in charge of one part of this project in 2007—is we put six lanes underground and left four lanes above the ground, and we created a 100-meter-wide space for the public. You can now enjoy the waterfront and the historic buildings along the Bund on foot.

We've learned historic preservation from projects in New York, such as the very popular High Line. This project is not only about historic preservation per se but also how to make new public space and to make urban redevelopment happen around it. We also learned from SoHo in New York, because when we renovated the waterfront at Suzhou Creek, where we have lots of abandoned warehouses and factories, we looked at how these projects were done in New York. We did preserve a lot of warehouses and factories, which were renovated and used for creative industries—and the creative industry we learned from London, of course.

Lin, if you came back in 50 years, what would you be most proud of and want to see?

WL: It's my point of view that Shanghai does not need much more new construction. I think when I come back in 50 years, it's important that the Bund will still be the Bund, that it will have kept its original image. But maybe we will have less traffic than today. I would like to see more quality. It means that the level of economic growth may be lower, and we should lower the speed of development. But we would have much more leisure time in the city. I hope, generally speaking, that the overall speed of life in Shanghai will be slower.

Would manufacturing still be part of your vision for Shanghai or would you only see finance, engineering, and other services?

WL: We need manufacturing, but it's the same thing—the quality. We need to change the quality of the manufacturing. We can have a different kind of manufacturing, but manufacturing is a very important part of Shanghai. We could change its style and add more value to it. And we should have more good quality public space, and more museums, more theater, more culture and art—more cultural and life satisfaction in the city.

In 50 years, do you think Shanghai will be the commercial and cultural center of Asia?

RvO: I'm pretty confident in saying yes.

WL: That's our ambition. We set a goal to be like that. I think in 50 years, we will be.

Learn more

A full-length print version of the entire discussion is available at www.pwc.com/cities.

A traditional *lilong* urban alleyway community with offices in background.

Health, safety, and security

Stability and relative affluence are critical to this indicator

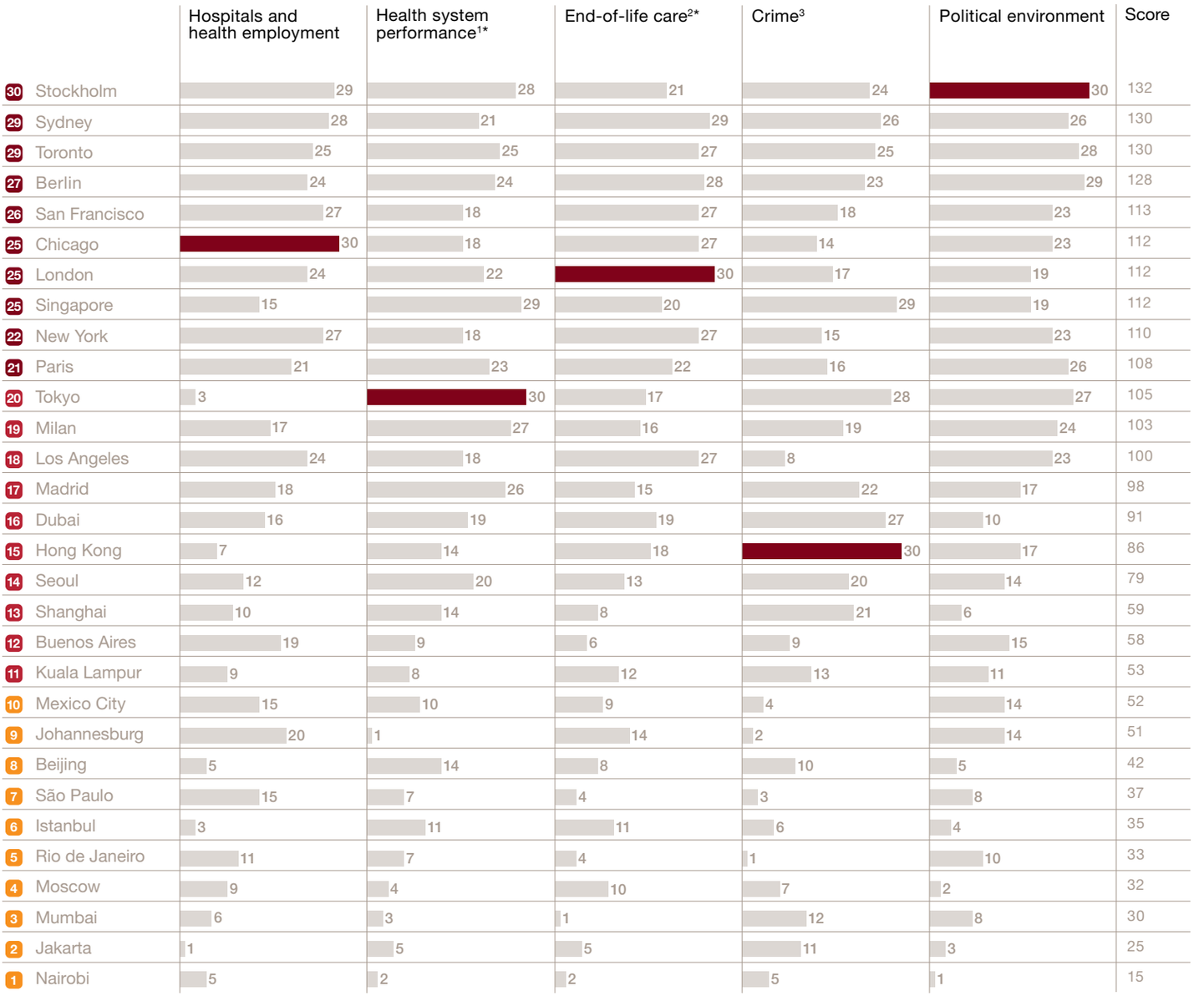
While this indicator has apparently changed very little, a couple of meaningful modifications to and redefinitions of variables have affected the final rankings—not substantially but to a degree, at least in the case of a few cities.

The obvious change is that our former hospitals variable has been renamed, and redefined as, hospitals and health employment. Previously, this variable denoted the ratio of all hospitals within a city accessible to international visitors for every 100,000 members of the total population. Now we've added to, and balanced, the previous figure with the ratio of health-sector employment per 100,000 of the population. As a result, the actual number of people working in healthcare gives us a substantial statistical confirmation of the extent of the health system as a whole and, moreover, takes away any possible advantages that cities with many smaller hospitals might have over those with fewer but much larger institutions.

The other, and even more substantive, change has been to the crime variable. Until this report, crime was based on only one data point. We have now added, in a weighted calculation, two more: 1) a survey of residents' own feelings of security regarding their respective cities and 2) homicide rates. This latter item of information is obviously critical. At the end of the day, a human being's sense of physical safety is the most primal perception of security that he or she has. Supplementing our overall crime variable with this gauge of success—or failure—also adds the most realistic, as well as the most intuitive, assessment of a city's *actual* public safety.

Interestingly, our changes have not fundamentally altered the final rankings in any way. Stockholm finished first, with a marginal difference, in our last report; it finishes first, with a marginal difference, in the current one. Sydney and Toronto tie for second currently, while Toronto finished second, again marginally above Sydney in third place, in our previous report. All in all, nine of the cities in the top 10 in the last report remain in the top 10 in this one. The only difference is that Paris joins them this year, having gained substantially from our refinement of the hospitals and health employment variable (while Milan drops slightly to #12). Once again, this indicator proves that health, safety, and security are the benign legacy of social development and economic advancement.

San Francisco



Each city's score (here 132 to 15) is the sum of its rankings across variables. The city order from 30 to 1 is based on these scores. See maps on pages 14–15 for an overall indicator comparison.

High
Medium
Low

Highest rank in each variable

*Country-level data.

1 Measurement of a country's health system performance made by comparing healthy life expectancy with healthcare expenditures per capita in that country, adjusted for average years of education (years of education are strongly associated with the health of populations in both mature and emerging countries).

2 Measurement of countries according to their provision of care for their citizens at the end of their lives, taking into account the basic healthcare environment, availability, cost, and quality of care.

3 Weighted combination of Mercer Quality of Living 2013 reports' crime score (50 percent); intentional homicide rate per 100,000 of the city population (30 percent); and the Numbeo Crime Index, which is an estimation of the overall crime level in each city based on how safe citizens feel (20 percent).

Sustainability and the natural environment

Further refinement gives an even more precise picture of our cities' sustainability

	Natural disaster risk	Thermal comfort[1]	Recycled waste[2]	Air pollution	Public park space	Score
30 Stockholm	29	7	29	26	30	121
30 Sydney	16	27	25	30	23	121
28 Berlin	28	11	30	25	22	116
28 Paris	25	16	28	18	29	116
26 San Francisco	9	24	26	28	25	112
25 Toronto	28	8	22	29	19	106
24 Chicago	25	9	20	28	14	96
24 Los Angeles	2	28	24	22	20	96
24 Moscow	30	6	19	13	28	96
21 Madrid	26	19	8	21	17	91
20 New York	16	13	10	23	27	89
19 Milan	22	15	18	11	18	84
18 Buenos Aires	16	23	11	17	15	82
17 London	21	17	16	19	6	79
16 Nairobi	9	29	3	7	26	74
15 Mexico City	5	30	12	11	13	71
15 Singapore	21	4	15	21	10	71
13 Rio de Janeiro	16	22	2	6	24	70
12 Tokyo	1	21	13	25	9	69
11 São Paulo	21	25	1	14	3	64
10 Beijing	23	10	7	2	21	63
10 Hong Kong	3	19	21	16	4	63
8 Istanbul	21	21	6	11	2	61
8 Seoul	6	12	27	4	12	61
6 Johannesburg	10	27	5	8	7	57
6 Mumbai	16	6	23	1	11	57
4 Kuala Lumpur	21	1	9	16	8	55
3 Shanghai	7	14	17	3	5	46
2 Jakarta	5	2	14	5	16	42
1 Dubai	16	3	4	13	1	37

Each city's score (here 121 to 37) is the sum of its rankings across variables. The city order from 30–1 is based on these scores. See maps on pages 14–15 for an overall indicator comparison.

High
Medium
Low

Highest rank in each variable

1 A thermal comfort score was created for each city by calculating the average deviation from optimal room temperature (72 degrees Fahrenheit). January, April, July, and October heat indices were calculated for each city using an online tool that integrates average high temperature and corresponding relative evening humidity during each month. A final thermal comfort score was derived by first taking the difference between a city's heat index for each month and optimal room temperature and then averaging the absolute values of these differences.

2 Definition has widened aiming to incorporate any diversion from landfill regardless of method, e.g., Waste-to-Energy.

The city may be cold, but Stockholm's parks, recycling polices and low natural disaster risk create a sustainable glow.

In our last report, we described how difficult it is to design this indicator in a way that reflects, as accurately as possible, the various environmental challenges facing our cities. We wrote then that the variables here have changed over the years simply because the notion of sustainability "is both difficult to define in itself and to implement as a coherent public policy—especially as cities vary widely in terms of climate, geology, demographics, and economic development." Nonetheless, we think that, as we continually refine our method and the quantitative measures by which we assess our variables, we are getting ever closer to the bases of urban sustainability and to an objective description of those cities that are in the forefront of sustainable policies and practice.

In this report, the variables have remained the same, but we've further honed two of them and, even more important, recalibrated another in order to make the indicator as a whole more reflective of actual sustainable practice and environmental quality of life. Regarding the recalibration, we now define recycled waste as *all waste diverted from landfill*. Previously, a city such as Stockholm was penalized for "low" percentages of recycled waste although, in reality, the city's Waste-to-Energy (WtE) programs are so successful that it now "imports" waste for its WtE plants from municipalities *outside of Sweden*.[7]

We have also further enhanced our thermal comfort and pollution variables. For the former, we now factor in high temperatures and evening humidity over four months rather than average temperature and morning humidity over two months, as we did previously (and we've replaced our data source, which is now the World Meteorological Organization). For air pollution, we've supplemented the most recent data from the World Health Organization in order to update it.

The results, in the end, while not radically different, have significantly affected several cities. The clearest improvement this year is for Stockholm, which has leaped five places, from sixth to first, since our last report. It now ties Sydney at #1; moreover, it outscores the Australian city in three out of five variables, ranks in the top five in a fourth (air pollution), and only falls into the bottom 10 (as opposed to Sydney's fourth place) in the one variable in which icy Stockholm is plainly blameless for its result. Geography might not be destiny, but thermal comfort is the one factor that any (very) northern city—including, obviously, Moscow or Toronto—can do very little about—other than know how to cope with and improve it, which Stockholm certainly does.

Berlin and Paris also do very well this year, tying for third place. Germany's capital rises from fourth in our last report, while Paris leaps five places from its eighth-place finish in *Cities of Opportunity 5*. The most impressive advance by far, however, is that of Chicago, which was #13 in our last report and now ties Los Angeles and Moscow for seventh place (which is also a considerable improvement for the southern California city).

A number of cities do less well this year. San Francisco and Toronto, which were tied for second in our last report, are now, respectively, fifth and sixth. New York and Milan, meanwhile, have dropped out of the top 10, with the US city dipping from #9 to #11, while the Italian one has declined even farther, falling from fifth to 12th.

7 John Tagliabue, "A City That Turns Garbage Into Energy Copes With a Shortage," *The New York Times*, April 29, 2013.

Miguel Zugaza in front of Goya's *The Pottery Vendor* at the Portrait of Spain exhibition at Queensland Art Gallery, Australia.

The Prado's relationship with Madrid

…blends a full palette of artistic, cultural, and economic benefits, according to Miguel Zugaza

Since 2002, Prado director Miguel Zugaza has overseen the reinvigoration of one of the world's greatest museums with collections spanning Velázquez, Goya, El Greco, Bosch, Bruegel and Dürer. Attendance has risen by nearly a million annually during Zugaza's tenure—despite the economic crisis— including many more visitors from the Madrid area. Here, Zugaza discusses a museum's responsibility to the public and its multi-faceted contribution to the city. He also tells how, in the face of drastic funding cutbacks, the Prado is continuing research and conservation and still expanding services and public access.

You have said that the Prado has grown without forgetting its reason for being. What would you define as the Prado's reason for being?

Museums were invented toward the end of the 18th century with the ideas of the Enlightenment and haven't changed that much up until our days. What has changed is society and the way society uses museums. I think it's important that museums adapt to the needs that society makes of them but without changing their original mission. However, some museums fall into the temptation of following the demands of society and become something they're not. In a way, museums are a natural reserve of humanity. We have to temper the experience even if it's understood as almost an antiquated ideal. But, it's a unique experience with art.

What are your goals for the people who visit the museum?

First and foremost, a museum's major mission is to take care of its collection. What the visitor ultimately looks for is the authenticity of the collection as it is

Two moments that are important in the transition for the Prado have to do with Madrid and New York. First was the arrival of the Guernica from the Museum of Modern Art. Second was an exhibition of Velázquez that the Prado organized with the Metropolitan. It was society acknowledging the Prado for the first time.

presented: works of art that are unique. That is the first responsibility. Furthermore, we have to put this collection at the disposal of a very heterogeneous public. We have to think of a public that perhaps is highly educated and specialized and present the works in a way that appeals to them, in the same way that we have to think about the visitor who has much less information, is much less versed in the collection whether he or she comes from a small village close to Madrid or from Seoul. I think that's what we have to do.

What is the Prado's relationship with Madrid?

One of the problems we detected early on was that the Prado had largely ignored the city. It was a museum for the tourists. And what we worked on diligently from the beginning was to actually nourish a relationship with the visitor who is closest to us, from Madrid itself. One of the great recent successes is precisely the addition of almost a million new visitors annually from our own community. We have structured our program of exhibitions as a key to that relationship with visitors in close proximity, at the same time as we pursue research.

Do you think that the political changes in Spain in the past 30 years have helped the Prado to become more vibrant and popular?

There are two moments that are very important in the transition for the Prado and Spanish culture. And they both have to do with the relationship between Madrid and New York. The first was the arrival of the *Guernica,* because when it first arrived from the Museum of Modern Art, it came to the Prado. And then, the second was an exhibition of Velázquez that the Prado organized in collaboration with the Metropolitan in '89 and '90. It almost brought traffic disorders because of the amount of success. It was a social gesture of great relevance. It was Spanish society acknowledging, recognizing the Prado for the first time.

Because of Velázquez, because of the Prado, because of the moment in time?

It's a mixture of the three elements. A lot of people at the time of Spanish society thought of the Prado as a museum of the Franco era. The Velázquez exhibition gave society a recognition that changed the relationship with the Prado. That's the moment when Spain began to discuss the need for the Prado to expand because of the relationship to the needs of this new society.

What contribution does a great museum like the Prado make to a city?

No doubt the Prado has a very important cultural impact in Madrid but also a socioeconomic one. Every 1,000 visitors who come to the Prado generate one job in Madrid, symbolizing the economic fabric that surrounds the Prado. There's also an element of pride in the city of Madrid toward the Prado. It's almost a patriotic feeling the city of Madrid and the country itself have toward the Prado.

You have said we must encourage the public to have a conscientious, more mature relationship with the museum. Describe that relationship and how you accomplish it.

I'm always impressed that any person who appears at the door of the Prado, right before coming into the museum, has made a very important, a very relevant decision—which is to come into a museum and have a personal experience with works of art.

When we began here, people used to criticize the groups that came from the far corners of the world and the way they experienced museums. But I reminded them that these tourists had flown thousands of kilometers, taken a part of the little vacation they have every year to come to the Prado.

I remember telling people of Madrid and Spaniards in general, "You criticize these tourists, but you have the museum right next to you across the street. You understand its prestige as an institution, but you don't come in to see what's inside. You're not valuing it in the same way." And the museum can offer many things. And that's why I think we should attempt to bring the Prado to the public, at different levels. If it is a public museum and we would like to invigorate that relationship with the public, one shouldn't have to pay to come in. That's why we looked for a mixed format so a lot of groups can actually enter free.

How have you adapted to the economic crisis?

In the past three years, the Prado has lost 60 percent of the funds that were allocated from the administration. At this point, what the Spanish administration gives to the Prado allows us to pay half of the staff's salaries. But our reaction was to actually invigorate our activities, do more that would appeal to more visitors, and in that way, generate greater revenue. We've readjusted the program of the museum with the idea of being fully able to work within the $42 million year-round budget by 2016. We will generate what we have lost from the Spanish administration by our own means—by having a stronger relationship with society and asking the visitor to pay a slightly greater share. We're a very simple enterprise.

At a time of economic difficulty, what do you say to the public sector, to private philanthropists to convince them the Prado is a priority?

I actually think that one of the ways we will exit the crisis in our country will come from the cultural sector. Spain has a very important asset in its cultural heritage. And we know how to manage this Spanish heritage very well. It generates excellent employment. It generates appealing activities for tourists who can enjoy it. It enriches the economic fabric around us. And it's important that politicians and society know this and value it as well.

The crisis undresses a country. The crisis leaves you naked. When you take away all the accessories, all the jewels, what it will leave Spain with is the nucleus for the future, the strength of what it has. And no doubt, one of the great things this country has is its cultural heritage. I think that once we come out of this crisis, that everything that has to do with culture in Spain could generate almost 6 percent of GDP rather than the 4 percent it does now. That should be the objective.

If you knew in 2004 the economic crisis was coming, would you have said to architect Rafael Moneo, "No, let's not build the new wing?"

No, I wouldn't. The Prado needed this extension to better present its collections to appeal to the needs of the visitors. As a matter of fact, the Prado's extension has not been a capricious expansion in any way. It was very much needed. What we could have done, had we known, is perhaps stop building unnecessary projects such as airports in Spain that have no airplanes or museums that have no contents.

The idea of investing time and labor to perfect craft into art seems not modern.

That's almost like an occasional defect of the way artists are trained nowadays. Baudelaire used to say of Manet that he was a genius amongst the decrepitude of painting. He spoke of Manet as if saying he was the last one. And the craftsmanship of painting and drawing is dying. It's dying every day as we speak. And it's interesting that at the same time that we're seeing the death of this craftsmanship, it's when society is demonstrating its greatest need to see great art.

What does quality of life mean to you in a city?

For me, quality of life has a lot to do with efficient, good management of the public services, where you have good alternatives for education, for health, good opportunities to relate with art and culture, within a secure environment. On top of that, it's an ideal city if you have a good climate, and the society is fun and not lazy, and people want to reinvent themselves and be

The Clothed Maja and *The Naked Maja* by Francisco de Goya at Museo Nacional del Prado.

dynamic. Small Spanish cities have actually developed rather well this idea of quality of life.

It has been said "you are like a great orchestra director who knows how to talk with everyone, the politicians, the administrators, the curators, the educators. Miguel Zugaza gets the best out of all of them, and he gets what he wants, too." What is the secret?

I think a director has to be a good connector. He connects a good sponsor with a good project that a curator is developing, for example; or the museum itself with different sensibilities, for instance, amongst politicians. I feel comfortable doing this. But then somebody once told me having the product I have makes it all that much easier.

It's a beautiful museum. It's very intimate.

There is this human scale to it, yes. That's one of the most flattering comments we've had.

The *Third of May 1808* by Francisco de Goya commemorates Madrid's resistance to Napoleon's army. "Understanding of [Spain's] history, not just the history of its art but also its history in full context," is among the Prado's many rewards, explains Miguel Zugaza. Courtesy of Museo Nacional del Prado.

Learn more

A full-length print version of the entire discussion is available at www.pwc.com/cities.

The Prado had largely ignored the city. It was a museum for the tourists. And what we worked on diligently from the beginning was to actually nourish a relationship with the visitor who is closest to us, from Madrid itself.

Demographics and livability

Two new variables rejigger the order within the top 10

This indicator benefits from two new data variables taken directly from the PwC survey of 15,000 of its global staff (an average of 20 percent of personnel in each city of opportunity) that supplements this year's report. The traffic congestion variable in our previous report has now been supplemented by ease of commute; in addition, we've added a sixth variable, relocation attractiveness, which quantifies the responses to our survey question, "Of the other 29 cities in *Cities of Opportunity*, which are the top three in which you'd most like to work?" Finally, we've further normalized the measure of working-age population in order to even out some discrepancies in the relevant statistics (see "Key to the variables," starting on page 66, for further details).

The results are both substantively different and consistent with the past. In other words, while the cities in the top 10 are almost all the same—the only difference being New York's addition to the group (tying for #10)—the exact rankings have altered significantly.

Sydney now finishes first. Former #1 Paris drops to seventh. London is now #2, just behind Sydney, while San Francisco just beats out Berlin for third place. In the end, Germany's capital climbs three places, Toronto drops four, and Singapore, Stockholm, and Chicago stay where they were (although the Windy City now ties with New York).

The fact is that fundamental results *throughout* this indicator (whether in the upper, middle, or lower ranks) remain almost precisely the same. Given the nature of the indicator, however—and most of its variables (cultural vibrancy, quality of living, ease of commute, perceptions of attractiveness)—it would have been odd if the top cities changed radically from one report to the next. This indicator is about "livability" after all, and as we stated in our last report, there seems to be a global consensus, if not on what makes a "livable" city, at least on which particular cities are more livable than others.

The distinctive results in the current report are those that quantify global attractiveness. London finishing #1 and New York #2 certainly aided those two cities' rise in the rankings this year (as Paris's fifth-place finish contributed to its overall drop). Of course, PwC's survey polled a staff with characteristics specific to a professional services firm. Nonetheless, PwC is a prominent global network of firms with 184,000 people in hundreds of cities in almost 160 countries. The women and men of PwC reflect the highly skilled, globally mobile services sector whose personal investment of themselves and their family is so critical to the ongoing progress of urban communities worldwide. Consequently, when these individuals say they'd prefer to live in some cities as opposed to others, both the selected cities and those not chosen need to listen carefully as to why that is.

	Cultural vibrancy[1]	Quality of living	Working age population
30 Sydney	24	29	5
29 London	29	17	18
28 San Francisco	23	19	26
27 Berlin	27	25	13
26 Hong Kong	21	24	25
26 Singapore	15	19	23
24 Paris	28	27	17
23 Stockholm	17	28	6
22 Toronto	18	30	16
21 Chicago	20	23	11
21 New York	30	16	8
19 Dubai	6	11	29
18 Madrid	11	21	3
17 Los Angeles	26	22	12
16 Tokyo	25	26	4
15 Milan	19	20	1
14 Shanghai	7	9	28
13 Kuala Lumpur	6	10	21
12 Johannesburg	9	8	19
11 Moscow	14	13	24
10 Beijing	4	12	30
9 Seoul	9	15	10
8 Buenos Aires	11	14	2
8 Rio de Janeiro	14	8	9
6 Nairobi	2	1	22
5 Mexico City	17	5	27
4 Istanbul	14	4	14
4 São Paulo	22	8	15
2 Jakarta	3	2	20
1 Mumbai	1	3	7

Each city's score (here 142 to 25) is the sum of its rankings across variables. The city order from 30 to 1 is based on these scores. See maps on pages 14–15 for an overall indicator comparison.

1 Weighted combination of city rankings based on: the quality and variety of restaurants, theatrical and musical performances, and cinemas within each city; which cities recently have defined the "zeitgeist" or the spirit of the times; and the number of museums with online presence within each city. The zeitgeist rankings take into account cultural, social, and economic considerations.

Traffic congestion	Ease of commute[2]**	Relocation attractiveness[3]**	Score
29	27	28	142
26	21	30	141
13	28	27	136
23	29	18	135
15	25	23	133
30	22	24	133
17	13	26	128
29	30	16	126
18	19	22	123
19	26	20	119
13	23	29	119
23	24	15	108
25	20	21	101
9	4	25	98
13	9	19	96
16	18	17	91
13	16	12	85
23	12	8	80
27	7	9	79
7	15	4	77
6	11	7	70
6	17	10	67
24	1	13	65
15	5	14	65
23	14	2	64
1	8	5	63
6	10	11	59
2	6	6	59
6	3	1	35
9	2	3	25

High
Medium
Low

Highest rank in each variable

***PwC Employee Survey 2013.*

2 PwC employees in each of the 30 city offices were asked "On a scale from 1 to 10, where 1 is difficult and 10 is easy, please rate your commute to work?"

3 PwC employees in each of the 30 city offices were asked "Of the other 29 cities in *Cities of Opportunity*, please rank the top three cities that you would like to work in most."

Sydney

From Mumbai to Manhattan to the favelas of Brazil

…Suketu Mehta writes the story of modern cities

Born in Calcutta and raised in Bombay (now Mumbai), Suketu Mehta lives in Manhattan and teaches at New York University. He has also lived in London and Paris. His prize-winning book, *Maximum City: Bombay Lost and Found*, was hailed by Salman Rushdie as "the best book yet written about that great, ruined metropolis." Mehta, now working on a book about New York, once wrote: "I live in cities by choice, and I'm pretty sure I will die in a city." Here, he discusses why humans are so powerfully drawn to cities and what makes a city great. As the technological revolution continues, how is it affecting the economy and employment?

In *Maximum City*, you write, "Bombay is the future of urban civilization on the planet, God help us." How does it represent the future, and why should that scare us?

The planet is divided broadly into two groups of cities. One group consists of the established cities of richer countries—places like New York, Paris, and London. The other consists of these teeming megacities of the developing countries—places like Bombay, Lagos, and São Paulo—whose growth is primarily due to migrants coming from the impoverished countryside. By some estimates, Bombay adds a million people every year. But it has no coherent, practical, or achievable plan for managing even the number of people it has already. Still, people continue to flood into these megacities, in spite of extremely adverse living conditions. In Bombay, about 60 percent of the population lives in a slum. They give up the clean air and open spaces of the countryside to live in shacks without running water or toilets and to endure tremendous insecurity. I set to wondering: Why would they do that?

Greenwich Village. "The beauty of New York is in its chaos."

Moving to a city can dramatically improve your economic situation in the long run. But migrants are also drawn by the metropolitan allure of the city. A young person in an Indian village moves to Bombay not just to make more money but because the city signifies freedom.

Are they driven primarily by financial opportunity?

Moving to a city can dramatically improve your economic situation in the long run. But migrants are also drawn by the metropolitan allure of the city. A young person in an Indian village moves to Bombay not just to make more money but because the city signifies freedom. It's also a place where your caste doesn't matter as much. And for many migrants, Bombay is where their dream lives occur. The majority of Indian films still come from Bombay. So when a migrant walks on the promenade in Bombay, he's already been there in his dream life, because he's seen the actor Shahrukh Khan dance on that same promenade in the movies.

You depict Mumbai's slums not just as places of "perpetual misery," as we might expect. What don't we understand about slum life?

We tend to think of a slum as an excrescence. But in a Bombay slum, there's a vast range of habitations. Many are awful, but some are pretty well-built and have the latest appliances and satellite dishes. It's nearly impossible to obtain rental housing in Bombay at a reasonable price, so most migrants go into slums. There's a huge range of people living in these informal structures: You have the absolutely destitute but also doctors, lawyers, computer scientists. And these are places of incredible entrepreneurial energy. Slums all around the world are an anarchist's dream, because the state doesn't provide them with many services. Everything from transport to sanitation to water to cable television is provided by people in the slum, often very efficiently. If you want electricity, the local electrician illegally taps the municipal electrical line and snakes it through the rooftops to your shack. Bombay's slums also have very strong community networks, which is why they don't erupt—and why most of us would be extremely safe walking there.

How are the slums, or *favelas*, different in Brazilian cities like Rio and São Paulo?

The difference is that their slums have indoor toilets and running water. Physically, they're much better. But they also have drugs and guns, which we don't yet have in large numbers in Bombay's slums. Some Brazilian *favelas* are among the most violent places on Earth. One big question for city governments in places like this is: How much of the state do you introduce? The biggest battle is in security, because many people in slums distrust the state.

How can a megacity like Mumbai deal with overcrowding?

If you look at it from the air, you see that there's no reason for this overcrowding. The problem is the uneven distribution of people and the lack of a functioning transport system. Every morning, millions wake up in the north and commute to the south on some of the planet's most crowded trains and buses. It's an incredibly inefficient way of transferring huge numbers of people. There are all kinds of innovative solutions available, like the bus rapid transit system, which provides dedicated bus lanes. But in cities like Bombay, it's not enough to think

of the ideal urban plan. It's about what's politically feasible, given that it's a democracy with very well-mobilized interest groups. Also, the city is ruled by the state government. Bombay needs to be allowed to control its own destiny.

All over the world, there's a stampede to cities. Because there's something about cities, no matter how awful they are, which speaks to something in us as human beings—this need to live in clusters, this metropolitan excitement, this sense that you won't starve as you might in the countryside.

How has New York City changed since you moved there in 1977?

When I arrived, it was a mess. It had narrowly escaped bankruptcy. Mobs were looting stores and homes. I was mugged twice. There was garbage everywhere. The subways were awful. Now, it's never been a more attractive place to live. It's America's safest large city. It's clean. The subways run well. It's this glamorous place, where people flock from around the world. Two out of three people in New York are immigrants or their children. And the miraculous thing is that there's almost no ethnic conflict. The great secret of New York is that nobody is excluded. It's not that you'll get invited to every party. But, somewhere in the city, there's a party to which you are invited. The city is working in most ways, except one: It's dramatically unequal. The top 1 percent make more money in a day than the bottom 44 percent make in a year.

You've written that Paris is beautiful partly because the poor—particularly immigrants—are shunted into the outskirts. How problematic is this lack of inclusiveness?

Paris is a museum city. The buildings have a pleasing uniformity. Very little new development is possible. By contrast, the beauty of New York is in its chaos: There's this eruption of buildings here. And the beauty of Bombay is in the chaotic energy of its streets and its hospitality—the fact that people can come from all over the country and live there. You can't do that in Paris. It's very tightly controlled. Paris continues to have problems with tolerating difference. Its immigrants largely live beyond the municipal limits; they periodically come into the city and burn cars or riot. Unless Paris finds a way to make them feel included—or, at least, not excluded from the celebration of the city—this is going to happen with increasing frequency.

Do you see diversity as an asset for cities?

Yes. Cities all over the world are trying to attract a new creative class, a rich global elite working in areas like technology, biomedicine, and banking. This is a fantastically mobile class that grew up learning different languages, and they regard diversity as an essential component of a great city. Cities have to realize that these people really want a choice of diverse cuisines and entertainment. They don't mind seeing lots of different faces from different cultures on the subway. They don't want to live in a beautiful, monocultural place. So there's actually an economic value in difference.

Mumbai rush hour

"New York is the best city in the world to walk in. The most beautiful cities I've seen are Rio, Istanbul, and Hong Kong; the most culturally vibrant is São Paulo; the most dynamic and entrepreneurial is Bombay."

Is London's strength its openness to difference?

London is very open culturally. But it's increasingly less open economically. The question is: How long, if you're poor or middle class, can you afford to live close to the center of London? It doesn't matter how welcoming the city is if you can't find an apartment there for a reasonable price, because you won't be part of the city at all. That's dangerous to the city's well-being. You need the great middle class—good people who will keep faith in the city during a downturn. In the next downturn, the foreign billionaires will just go to the next hot spot—Dubai, Shanghai, or Mumbai. So you need people with roots, with local engagement, with family.

Is it becoming too difficult financially for families to live in major cities?

The emergence of cities without children is a disturbing trend. In richer cities all over the world, you're finding this phenomenon of singletons, of people choosing not to get married or have children. And in places like San Francisco, Seattle, and Berlin, families are deserting the city. As cities become more expensive and apartments smaller, the suburbs start looking better. That's terrible because a city without children is like a forest without songbirds. That's also why good public education is so crucial in cities. This is something cities will have to figure out: What can they do to retain people with kids?

What's your favorite city?

I really can't say I have a favorite. I grew up in Bombay and New York. I've lived in Paris and London and, for stretches of time, São Paulo. Each has something magnificent about it. I think New York is the best city in the world to walk in. The most beautiful cities I've seen are Rio, Istanbul, and Hong Kong; the most culturally vibrant is São Paulo; the most dynamic and entrepreneurial is Bombay.

One quality you prize in New York and Mumbai is their chaotic dynamism. Why?

To me, a messy heterogeneity is the defining mark of a great city. That's what keeps cities from going sterile. It's a city where you can't quite predict what's going to happen. It shouldn't be a completely unmanageable place where a marauding militia can come in and loot and rape. But it should be somewhat unmanageable.

Are humans ultimately urban creatures despite our complaints about the difficulties of city life?

Cities are the purest expression of who we are. They're our great mark on the planet. We've despoiled the planet, so it's for better and for worse. But it's who we are, if you look at what's quintessentially human, what we've done, how we've chosen to live. All over the world, there's a stampede to cities. Because there's something about cities, no matter how awful they are, which speaks to something in us as human beings—this need to live in clusters, this metropolitan excitement, this sense that you won't starve as you might in the countryside. Whether they're working cities like New York or dysfunctional cities like Kinshasa, people are stampeding in to live in these overcrowded places. This is where the action is.

Learn more

A full-length print version of this condensed discussion is available at www.pwc.com/cities.

Economics

Toronto

Paying the way for progress: Clout, cost and ease of business

The last section of this year's report focuses on the indicators that assess and describe three separate dimensions of urban economies and, in so doing, demonstrate the several ways in which cities can implement effective strategies for economic growth. The indicators here also point to the synergies required if this growth is going to lead ultimately to permanent economic potency and, above all, depth.

It is precisely this sense of depth that is measured by our first indicator, economic clout, which almost perfectly reflects the economic history of the urban world. That is why it is hardly accidental that the top-ranked city in this indicator is London and that it is followed by Beijing, New York, Paris, and Shanghai. These are all legendary cities, three of them seats of former empires, with tremendous political, commercial, financial, and cultural sway. The empires might have all now disappeared, but the cities once at their core remain global centers of economic might.

What is most notable about our second indicator, cost, is that not one city in the top five is in the top five in economic clout. What is even more interesting is that the three cities in the top 10 in this indicator and in economic clout are also in the top 10 in our third indicator, ease of doing business—the only three cities scoring this economic trifecta. A number of conclusions can be drawn therefrom.

The first is that New York, San Francisco, and Toronto—the cities that make up the successful triad—know from experience that "clout" is not a product of brute force but of perpetual management, development, and, especially, resourcefulness. Second, the cities in the top 10 in cost also explode the myth of the inability of mature cities to compete in this indicator, as five of them are from North America and one (Berlin) is even from Europe. And of the four cities from the emerging economies, two of them, Seoul and Dubai, are generally recognized as being on the verge of passing over into the category of fully "emerged" (if they haven't done so already).

There is also a significant correspondence between economic clout and ease of doing business. This, of course, seems obvious and even intuitive: A place in which it is easy to do business will actually do business and, therefore, develop economic muscle. Our data confirm that expectation: Six of the cities in the top 10 in economic clout are also in the top 10 in ease of doing business. The four cities that fall out of the top 10 in moving from economic clout to ease of doing business are Beijing, Paris, Shanghai, and Tokyo; even more interestingly, all four cities fall into the bottom 10 in cost.

What is certain in and about today's global environment is that being competitive in cost and ease of business might very well lead to economic clout. Once achieved, however, there's no guarantee that economic clout can be maintained. On that score, Erik Brynjolfsson, director of the MIT Center for Digital Business, talks with us about the rise of robots and the race to keep our jobs in the second machine age (see pages 58–61).

Economic clout

London ascends to the summit, but the top five remain remarkably consistent

The changes in this indicator this year are minimal but, again, as with other indicators, they've been made in order to sharpen the accuracy of the ensuing results. We've collapsed our two previous foreign direct investment (FDI) variables (measuring number of new job-creating projects and total capital investment), which were essentially redundant categories, into one variable, which now aggregates total investment. We've also enhanced the definition of GDP growth in order to reduce year-to-year volatility. We now average it out over three years rather than giving a single year's rate.

Still, this indicator arguably remains the one out of our 10 with the heaviest burden to bear—or, more accurately, the most challenging name to live up to. In the *realpolitik* of today's world, after all, what greater gauge of sheer muscle is there—short of a military arsenal—than economic power? And since cities don't have to worry about raising standing armies or building aircraft carriers, their economic resiliency and performance *historically* says even more about their future viability than it does about their past success.

The key term here is "historically." It explains not only the consistency of the top performers but also the occasional "surprises"—which, once they're examined a bit more carefully, turn out to be anything but. In a previous report, summarizing this indicator, we wrote that "economic strength doesn't come easily; it has to be earned over time." In a subsequent one, we reiterated that "economic clout has a great deal to do with staying power." The top 10 cities here—and certainly those in the top half of the rankings—have been around for a while. The "newest" among them (invariably in the New World) were founded, in most cases, in the 18th century. Only Chicago is less than two centuries old.

Even among emerging economies, Beijing and Shanghai maintain their extraordinary economic and cultural duopoly in the face of extremely dynamic competitors such as Shenzhen, whose economic development goes back only to 1979; in Brazil, São Paulo and Rio de Janeiro (founded in 1554 and 1565, respectively) remain Brazil's urban powerhouses, as opposed to the capital Brasília (founded in 1960). And Brasília's experience is not unique. The most successful capitals in the world (London, Paris, Beijing, Moscow) have organically led (or, at least, been part of) the historic growth of their countries, as opposed to places such as Washington, DC, Ottawa, or Canberra that were designated as capitals—that is, *administrative* centers—while the economic work was done in other, much more vigorous and forceful cities integrated into a national or the global economy.

It is precisely this reality of a vital city, one of unflagging energy and openness to the world, that most thoroughly describes the top ranks in this indicator. As we wrote in our last report, a city's "clout" is measured, above all, by its "ability to translate urban strength into a global economic presence." The cities that do best in this indicator might be national capitals or they might not be. None of them, however, is a mere administrative center. They are all global hubs of commerce, investment, and production (a city itself might not have a significant manufacturing sector but can contain international headquarters of corporations that manage enormous manufacturing capacity worldwide). In the end, the cities that do best here are so familiar because they've been doing what they've been doing, creating wealth for their citizens and the world, for a very long time.

London certainly has been doing that for hundreds of years, so its #1 ranking here is as expected as anything can be in the global economy. And yet, due credit must be given to the British capital, not only for overtaking Beijing for first place (and jumping over Paris in doing so) since our last report but for accomplishing that feat during a time of unusually painful economic conditions. Paris's drop from #2—a rank it held over several reports—to #4 this year is proof of just how difficult the economic environment has been for most cities in the developed world, but it also demonstrates the city's resiliency and long-lived strength.

In any case, although they've mostly changed places, the cities that were ranked in the top five in our last report remain in the top five in this one—further proof that economic clout is not a flash in the pan but the result of many years of planning and building and of refusing to take past success for granted. Indeed, as a whole, the cities in the top 10 haven't changed very much—except for one very impressive leap up the rankings. In our last report, San Francisco finished #16 out of 27 cities and tied with Madrid. Currently, it ranks #7 out of 30 cities—helped by our adjustment of the FDI variable—while the Spanish capital is now tied for #17. San Francisco thus joins Paris and Toronto as another example of a smaller city with outsized economic influence globally.

Each city's score (here 118 to 36) is the sum of its rankings across variables. The city order from 30 to 1 is based on these scores. See maps on pages 14–15 for an overall indicator comparison.

1 Combined variable ranking of the number of greenfield (new job-creating) projects, plus the total US$ value of greenfield capital investment activities in a city that are funded by foreign direct investment (FDI).

2 Productivity is calculated by dividing the gross domestic product (GDP) in 2013 US dollars by employment in the city.

3 GDP annual growth rate from 2012–2014 in real terms expressed in 2013 US$.

Robots are coming to a city near you…and they want your job!

…Erik Brynjolfsson of MIT explains how to stay a step ahead of technological unemployment

Erik Brynjolfsson is a professor at the MIT Sloan School of Management and the director of the MIT Center for Digital Business. In 2003, *Businessweek* declared: "If e-business had an oracle, Erik Brynjolfsson would be the anointed." Since then, he has sealed his reputation as one of the world's leading experts on the economic effects of technological innovation. He is the co-author with Andrew McAfee of a new book, *The Second Machine Age: Work, Progress, and Prosperity in a Time of Brilliant Technologies*. Here, he shares his vision of the future and discusses how cities can ride this wave of technological change.

As the technological revolution continues, how is it affecting the economy and employment?

There's a great paradox right now. The US has hit a new record for net wealth. There are more millionaires than ever before. Productivity and GDP are at all-time highs. But the median income is lower than in 1997; the portion of the population that's working is falling; jobs are disappearing. So the economy is working well in making the pie bigger, but a lot of people aren't sharing in that. And there's no economic law that says everyone has to benefit from technological progress. With every technology, some people are made worse off. Recently, it's gotten to be a bigger and bigger section of the population, because the new technologies are so powerful and affect so many more tasks than earlier technologies. We're at a fundamental inflection point: You're seeing cars that can drive themselves; you can talk to your phone and have it carry out your instructions; there are problem-solving machines that can now make medical diagnoses. In each case, technology is pushing

Erik Brynjolfsson at MIT.

Technological change is going to accelerate. But our organizations and institutions aren't keeping up. And if they don't keep up, more people will be out of work, more people will fall into poverty, and we'll have even more social and economic disruption.

back the frontiers of things that, previously, only humans could do. As a result, we've seen a great decoupling of productivity from median income and employment. That's a real change. We're in a different era now.

Despite this economic dislocation, you describe yourself as a digital optimist. Why?

Technology is having an enormous effect on our ability to produce wealth, but it's also a substitute for many kinds of labor. That's part of the concern—that people won't have jobs if machines can do them more cheaply and efficiently. But in the long run, I'm optimistic, because there's no inevitability to any particular technology trajectory. I don't think we should try to slow down technology. However, I do think we should speed up the rate of re-skilling people and improving the way they work with machines. That way, we can create not just a bigger pie, which is almost inevitable with the improvements in technology, but also shared prosperity, with more people participating in it. The key, though, is that it's going to happen only if we make conscious efforts to guide our society in those directions. We need to make choices that improve those outcomes.

Such as?

We can do a much better job with education. We're just beginning to use digital technologies like massive, online, open courseware. Technologies like these can allow us to bring the best educational methods and the best teachers to a much broader set of people. These technologies will also allow us to understand what's working, since digital processes are inherently more measurable. So education is one category where we can improve. There are also other areas like boosting entrepreneurship—not because everyone is going to become an entrepreneur but because entrepreneurs are the ones who create jobs.

In *The Second Machine Age*, you argue that everyone from lawyers to truck drivers will be upended by technological change. What should individuals—and cities—do to prosper in this new era?

A lot of routine information-processing work is being automated. This is increasingly happening with routine physical work as well. But a number of areas will be in more demand. One is creative work. The second is interpersonal interactions. And those are areas where cities can excel. They can stoke creativity by bringing people together. You need to attract a creative class of professionals who work together. They're attracted partly by the culture, partly by proximity to other creative people. These people will be even more in demand in the next 10 years, and the successful cities will be the ones that cultivate and attract them.

How important is immigration as a means of driving innovation and creativity?

The data I've seen suggest that a disproportionate share of the startups in Silicon Valley were founded by people born outside the US. One of the country's great strengths is the ability to attract creative people from all over the world to help not just with startups but scientific breakthroughs and contributions to the arts and other fields. It's been wonderful for America to bring these people together.

We're at a fundamental inflection point: You're seeing cars that can drive themselves; you can talk to your phone and have it carry out your instructions; there are problem-solving machines that can now make medical diagnoses. In each case, technology is pushing back the frontiers of things that, previously, only humans could do.

It's also good for the world, because many of those people are more productive in this milieu where they're near each other. Urban environments tend to facilitate that because creative workers can be close to other creative workers, and the speed of idea transmission is much greater that way. Wonderful as email and other digital technologies are for sharing ideas, there are still a lot of things that can be done much better face to face. So, by bringing people together from all over the world who have ideas in particular areas, you can speed up idea creation.

So the density of cities really fuels innovation?

Absolutely. The reason I love being at MIT is because of all the amazing people I bump into here. When I work at home, I can be very efficient in tackling certain kinds of tasks, but I lose that unexpected benefit of bumping into people. The same thing is true for cities: By getting people to be near each other, you get what economists call "externalities" from these idea-sharing events. That's one of the great virtues of a university and of a city. Unfortunately, it's not something technology can easily replace—at least, not in our generation.

Do you see similar trends of technological change and disruption outside the US?

Yes. The same forces apply in China, India, Europe, Latin America. I'd say that workers in low-wage countries are even more in the bull's-eye of automation than those in America. If you look at manufacturing, for instance, much of the routine work has left the US for lower-wage locations, but that's exactly the kind of work that robots can do best. So, if countries like China or Vietnam are relying mainly on low wages to protect themselves from automation, that's going to be a losing battle. In fact, we'll see robots taking more and more of those simple routine tasks away from humans in every country.

What happens if cities stick with their old ways, hoping these technological and economic changes will pass, instead of adapting to this new era?

There are certainly some temporary phenomena going on—like the Great Recession and the business cycle. But the roots of this disruption we're seeing in the labor markets and elsewhere are much deeper and have to do with fundamental technology changes that are only going to accelerate. Those technological improvements—whether it's self-driving cars or being able to speak to our machines—are just the tip of an even bigger tidal wave of changes that we'll see in the next 10 years. Technological change is going to accelerate. But our organizations and institutions aren't keeping up. And if they don't keep up, more people will be out of work, more people will fall into poverty, and we'll have even more social and economic disruption. So ignoring those technology changes isn't an option. The best option is to speed up our adaptation to the technology, and that's going to require much more effort in thinking about urban planning, organizational studies, and economics, both at the national and individual levels. All those things are going to require much more attention than we've given them so far.

Boston, which is just across the river from you at MIT, is a rich, developed city. But is there anything about it that you'd want to improve?

The physical infrastructure could use a lot of improving. In part, it's a matter of investing in transportation. New technologies and congestion pricing could also help the traffic flow more smoothly. There are also things we can do in terms of education that would continue to make Boston a magnet for creative and intellectual leaders. The data I've seen suggest that if we invested more in education at the K-12 level, that would have huge payoffs. And it would be a wise societal choice to boost the pay of teachers so we start attracting more of the best and brightest into that area. When we underinvest in education, both in terms of technology and direct resources, we are shortchanging our future.

Learn more

Video of this condensed conversation is available at www.pwc.com/cities, as is a full-length print version of the interview.

A robot arm collaborates with VW worker in Germany.

Ease of doing business

After a while, competitiveness is bred in the bone of the most successful cities

Although both intellectual capital and ease of doing business lost one variable each in this report, they both still contain the most of any other indicator, in this case eight. This indicator has lost flexibility of visa travel, which we've now deleted because the ability to stay three months in a city is, practically speaking, much less important than actual access to it in order to do business. The concrete effects of this minor change are minimal in the end, however, notwithstanding a couple of exceptions within the top 10 finishers.

What is immediately striking about these results is the sheer consistency of the cities at the summit of the rankings over the last several years. Simply put, there was no change at all in the top three. Top-ranked Singapore, second-ranked Hong Kong, and third-ranked New York finished in the same order in *Cities of Opportunity 5*. The same cities also finished in the top three in *Cities of Opportunity 4*, with the only variation being that Hong Kong and Singapore were #1 and #2, respectively. Indeed, eight of the top 10 cities in this indicator this year have been in the top 10 in our last three reports, while Stockholm has joined the group in the last two.

This is remarkable consistency. And what is even more remarkable is the consistency across the board of first-place Singapore—and its considerable margin of difference with #2 Hong Kong. It ranks at the very top in three of the eight variables, finishes second in two, is in the top five in two others, and only falls out of the top 10 in one variable—and hardly a critical one (foreign embassies or consulates). This is a dominating performance. And it shows a city that, despite all its previous success in the global marketplace, is anything but complacent.

But, then again, hardly any of the cities in the top 10 can be accused of resting on their laurels. As already mentioned, most have been here for the last few years and clearly intend to stay here. Nonetheless, two Asian cities, Tokyo and Kuala Lumpur, that were in the top 10 in our last report have fallen out of it in this one.

There are three other, broadly geographical, issues that seem to indicate a possible long-term persistence. The first one affects all the US cities, which do extremely well over most variables in this indicator with the exception of ease of entry, as federal visa regulations put them at a distinct disadvantage to their global competitors.

	Ease of starting a business[1]***	Resolving insolvency***	Employee regulations[2]***
30 Singapore	28	29	26
29 Hong Kong	27	21	24
28 New York	26	25	30
27 Toronto	29	28	15
26 London	22	27	1
25 Los Angeles	23	25	29
24 Chicago	25	25	28
24 San Francisco	25	25	27
22 Seoul	20	26	17
21 Stockholm	16	17	11
20 Kuala Lumpur	16	13	21
19 Tokyo	10	30	13
18 Sydney	30	20	14
17 Paris	19	14	6
16 Berlin	11	19	9
15 Mexico City	18	16	25
14 Madrid	6	18	16
13 Johannesburg	17	9	13
12 Dubai	21	6	23
11 Milan	13	15	3
10 Beijing	5	11	19
9 Istanbul	14	4	7
9 São Paulo	9	3	5
7 Moscow	12	12	10
6 Shanghai	5	11	19
5 Rio de Janeiro	9	3	5
4 Jakarta	2	1	20
3 Mumbai	1	5	22
2 Nairobi	7	7	9
1 Buenos Aires	3	8	2

A second seemingly enduring issue is European. In this report, just as in our last one, Stockholm is the only continental European city in the top 10. Paris and Berlin bring up the bottom of the upper half in this indicator, while Madrid and Milan fall into the lower half. What is disconcerting about this outcome is that after another two years of systemic economic crisis in Europe, in which the major impetus behind most of the reforms undertaken by the European Union was to "restore" European global competitiveness, our rankings, under the best of interpretations, show results no better than in our last report.

Finally, our current report shows the continuing fragility of the competitive position of developing cities. Seoul is the only emerging city to reach the top 10 in this indicator, with Kuala Lumpur the only other emerging city in the top half of the rankings, at #11. Every other emerging city finds itself in the bottom half. This is certainly a sobering conclusion. And, once again, it points to the tenacity with which mature cities defend the competitive advantages they've accumulated over the years, not to say decades.

Ease of entry: Number of countries with visa waiver*	Foreign embassies or consulates[3]	Level of shareholder protection[4]***	Operational risk climate*	Workforce management risk	Score
30	17	30	30	29	219
29	13	29	29	25	197
9	24	26	24	30	194
14	14	28	26	28	182
26	29	22	19	27	173
9	10	26	24	26	172
9	6	26	24	24	167
9	8	26	24	23	167
27	21	18	15	16	160
21	23	19	29	22	158
28	20	28	16	14	156
15	28	20	18	17	151
10	12	13	27	20	146
19	30	11	24	19	142
19	25	8	25	18	134
17	15	18	11	6	126
22	22	8	17	15	124
25	1	22	12	9	108
11	2	1	15	21	100
17	8	18	13	11	98
3	28	8	10	13	97
21	11	13	6	3	79
24	9	11	8	10	79
5	26	3	4	5	77
3	4	8	10	12	72
24	3	11	8	8	71
4	18	18	3	4	70
3	5	18	5	7	66
12	16	8	2	1	62
13	19	3	1	2	51

Each city's score (here 219 to 51) is the sum of its rankings across variables. The city order from 30 to 1 is based on these scores. See maps on pages 14–15 for an overall indicator comparison.

High
Medium
Low

Highest rank in each variable

*Country-level data.

***Data based on countries' most populous city except in the case of employee regulations and ease of starting a business, which have been differentiated for US cities.

1 These data are based on regulations relevant to the life cycle of a small- to medium-sized domestic business. It is assumed that the minimum time required for each procedure is one day. Although procedures may take place simultaneously, they cannot start on the same day.

2 Sum of three assessment scores from the World Bank's *Doing Business 2013* study, including: ratio of minimum wage to average value added per worker; notice period for redundancy dismissal (for a worker with 10 years of tenure, in salary weeks); and paid annual leave for a worker with 20 years of tenure (in working days).

3 Includes embassy offices, consulate and honorary consulate offices. Figures include States with Embassies or Consulate offices.

4 The Strength of Investor Protection Index is the average of indices that measure transparency of transactions, liability for self-dealing and shareholders' ability to sue officers and directors for misconduct.

Cost

Mature cities' (higher) wages can successfully compete against emerging cities' (lower) prices

This indicator has undergone a number of changes since our last report. There are now five variables instead of six, and the only two that remain unaltered are total corporate tax rate and cost of business occupancy, which are both basic factors, not only in business costs but in the decision-making process that leads to investment.

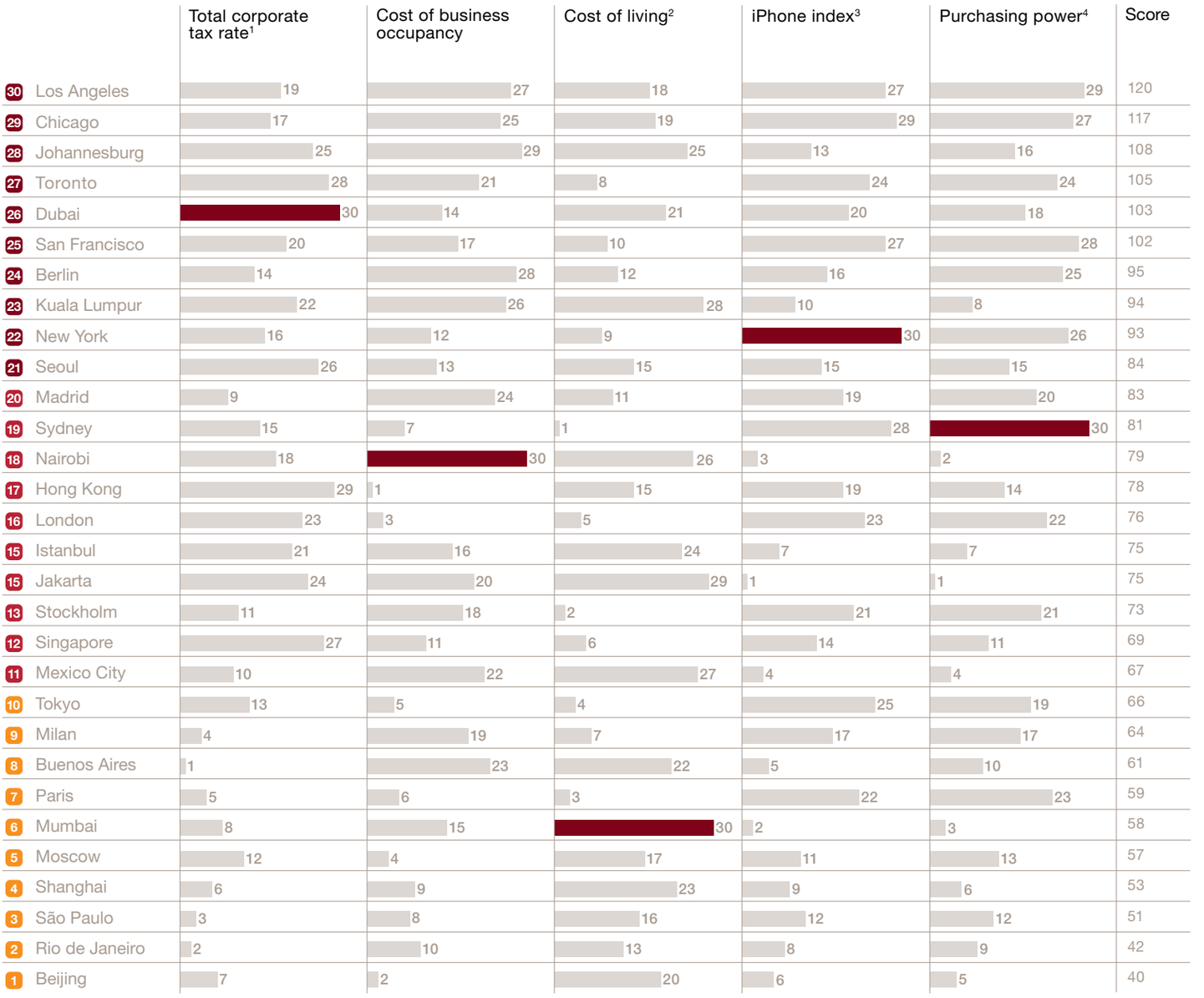
Cost of living has now replaced cost of rent and of the Internet. In order to dig even deeper into actual, and *practical*, costs of living, however, we have also included two variables, iPhone index and purchasing power.

The iPhone index replaces the previous iPod index and thus only represents an updating of the previous variable with a more recent, and more widely used and disseminated, technological tool. To confirm the results of the iPhone index, however, we've added a more general—but also much more detailed—variable that measures purchasing power over a wide range of goods, as opposed to just one consumer item. Both variables measure purchasing power, but each acts as a methodological control of the other, which is also why they track closely—and in the two cases they don't (Tokyo and, especially, Berlin), the deviations themselves allow us to deduce some interesting facts, or at least working hypotheses, about the respective cities.

Los Angeles

Given the extensive nature of the changes to the indicator, the considerable reordering of the rankings, both generally and in the top 10, is no surprise. But what is noteworthy is that the reordering is nowhere near as wide-ranging as one would expect. Six of the top 10 cities in our last report remain in the top 10 in this one, while five of the bottom 10 previously stay there (albeit in a different order within both top and bottom). This indicator has always been challenging, not because of the data gathering, which is relatively easy and straightforward, but because of the subsequent assessment of the data. How does one measure cost, after all? Is cheapest best? Or is it a matter of determining which business environment combines wages and prices in the most efficient, and *productive*, manner possible, both for business in general and for each business in particular?

Clearly, the results in this indicator tend to lead toward the latter conclusion. Los Angeles ranks first here, closely trailed by Chicago in second place. Indeed, among the top 10, there are six mature cities, five of them from North America. Among developing cities, Johannesburg does best by far, at #3, followed by Dubai in fifth place, Kuala Lumpur in eighth place, and Seoul at #10. What distinguishes the North American cities, however, is their excellent results in purchasing power. None of the US cities, in particular, falls below fifth place in either variable gauging that performance. For that matter, regardless of where they finish in the final rankings, most mature cities generally do very well in purchasing power. For that matter, regardless of where they finish in the final rankings, most mature cities generally do very well in purchasing power.



Each city's score (here 120 to 40) is the sum of its rankings across variables. The city order from 30 to 1 is based on these scores. See maps on pages 14–15 for an overall indicator comparison.

High
Medium
Low
Highest rank in each variable

1 There has been a methodology change for fuel tax in *Paying Taxes 2014*. Fuel taxes are no longer being included in the Total Tax Rate calculation because of the difficulty of computing these taxes in a consistent way across all economies covered. The *Paying Taxes 2014* report can be found at http://www.pwc.com/gx/en/paying-taxes/.

2 A relative measure of the price of consumer goods by location, including groceries, restaurants, transportation, and utilities. The relative Consumer Price Index measure does not include accommodation expenses such as rent or mortgage.

3 Working hours required to buy an iPhone 4S 16GB. Price of the product divided by the weighted net hourly wage in 15 professions.

4 Domestic purchasing power is measured by an index of net hourly wages, excluding rent prices. Net hourly wages divided by the cost of the entire basket of goods and services, excluding rent. The basket of goods relates to 122 goods and services.

Key to the variables

Air pollution
Combination of measures of PM10 (particulate matter 10 micrometers) outdoor air pollution levels from the World Health Organization (WHO) and the Numbeo Pollution Index of overall pollution in each city. The WHO's Public Health and Environment database provides annual mean concentrations of PM10 in diameters or less that reflect the degree to which urban populations are exposed to this fine matter. The Numbeo Pollution Index is generated via survey-based data. Numbeo attributes the biggest weight to air pollution, then to water pollution/accessibility as the two main pollution factors. A small weight is given to other pollution types.

Airport to CBD access
A measure of the ease of using public transit to travel between a city's central business district (CBD) and the international terminal of its busiest airport in terms of international passenger traffic. Cities are separated into categories according to whether a direct rail link exists, if so the number of transfers required, and if not whether there is a public express bus route to the airport. Cities with direct rail links are preferred to those with express bus service. Cities with rail links with the fewest transfers are ranked higher than those with more. Within categories, cities are ranked against one another according to the cost of a single one-way, adult weekday trip and the length of the trip, with each factor weighted equally.

Attracting FDI
Combined variable ranking of the number of greenfield (new job-creating) projects, plus the total US$ value of greenfield capital investment activities in a city that are funded by foreign direct investment (FDI). Data cover the period from January 2003 through December 2012 provided by fDi Intelligence.

Broadband quality
Based on millions of recent test results from Pingtest.net, this global broadband index from Ookla compares and ranks consumer broadband connection quality around the globe. Quality is reported in R-factor, an industry-standard measurement for connection quality (crucial for applications that require a steady connection such as VOIP and online gaming). The value is the mean R-factor over the past 30 days. Only tests taken within 300 miles of the server are eligible for inclusion in the index.

Cost of business occupancy
Annual gross rent divided by square feet of Class A office space. Gross rent includes lease rates, property taxes, maintenance and management costs. Data produced by CBRE Global Office Rents in US$.

Cost of living
A relative measure of the price of consumer goods by location, including groceries, restaurants, transportation, and utilities. The relative Consumer Price Index measure does not include accommodation expenses such as rent or mortgage. Figures provided by Numbeo.

Cost of public transport
Cost of the longest mass transit rail trip within a city's boundaries to the CBD. The cost of a bus trip is used in the cities where there are no rail systems.

Crime
Weighted combination of Mercer Quality of Living 2013 reports crime score (50 percent); Intentional homicide rate per 100,000 of the city population (30 percent); and the Numbeo Crime Index, which is an estimation of the overall crime level in each city based on how safe citizens feel (20 percent).

Cultural vibrancy
Weighted combination of city rankings based on: the quality and variety of restaurants, theatrical and musical performances, and cinemas within each city; which cities recently have defined the "zeitgeist" or the spirit of the times; and the number of museums with online presence within each city. The zeitgeist rankings take into account cultural, social, and economic considerations.

*Digital economy**
Economist Intelligence *Unit Digital Economy Rankings 2010—Beyond E-readiness* report provides an assessment of the quality of a country's information and communications technology (ICT) infrastructure and the ability of its consumers, businesses, and governments to use ICT to their benefit. When a country uses ICT to conduct more of its activities, the economy can become more transparent and efficient.

*Ease of commute***
PwC employees in each of the 30 city offices were asked, "On a scale from 1 to 10, where 1 is difficult and 10 is easy, please rate your commute to work." Data provided by *PwC Employee Survey*.

*Ease of entry: Number of countries with visa waiver**
Number of nationalities able to enter the country for a tourist or business visit without a visa. Excludes those nationalities for whom only those with biometric, diplomatic, or official passports may enter without a visa.

*Ease of starting a business****
Assessment of the bureaucratic and legal hurdles an entrepreneur must overcome to incorporate and register a new firm. Accounts for the number of procedures required to register a firm; the amount of time in days required to register a firm; the cost (as a percentage of per capita income) of official fees and fees for legally mandated legal or professional services; and the minimum amount of capital (as a percentage of per capita income) that an entrepreneur must deposit in a bank or with a notary before registration and up to three months following incorporation. Assessment scores gathered from *Doing Business 2013*, The World Bank Group. US cities were differentiated from each other using the *United States Small Business Friendliness 2013 Small Business Survey* by Thumbtack.com in partnership with Kauffman Foundation.

*Employee regulations****
Sum of three assessment scores from the World Bank's *Doing Business 2013* study, including: ratio of minimum wage to average value added per worker; notice period for redundancy dismissal (for a worker with 10 years of tenure, in salary weeks); and paid annual leave for a worker with 20 years of tenure (in working days).

*End-of-life care**
Ranking of countries according to their provision of end-of-life care. The Quality of Death Index by the EIU scores countries across four

categories: basic end-of-life healthcare environment; availability of end-of-life care; cost of end-of-life care; and quality of end-of-life care. These indicator categories are composed of 27 variables, including quantitative, qualitative and "status" (whether or not something is the case) data. The indicator data are aggregated, normalized, and weighted to create the total index score.

*Entrepreneurial environment**

Measurement of the entrepreneurial attitudes, entrepreneurial activity, and entrepreneurial aspirations in a country. The Global Entrepreneurship Index (GEINDEX) integrates 31 variables, including quantitative and qualitative measures and individual-level data.

Financial and business services employment

The number of jobs in financial and business services activity as a share of total employment in the city. Financial services includes banking and finance, insurance and pension funding, and activities auxiliary to financial intermediation. Business services includes a mix of activities across the following subsectors: real estate and renting activities, IT and computer related, R&D, architectural, engineering and other technical activities, legal, accounting, bookkeeping and auditing activities, tax, and consultancy, advertising, and professional scientific and technical services and business services where not elsewhere classified. Data sourced by Oxford Economics.

Foreign embassies or consulates

Number of countries that are represented by an embassy or consulate in each city. Figures sourced from GoAbroad.com.

*Relocation attractiveness***

PwC employees in each of the 30 city offices were asked, "Of the other 29 cities in *Cities of Opportunity*, please rank the top three cities that you would like to work in most" Data provided by *PwC Employee Survey*.

*Health system performance**

Measurement of a country's health system performance made by comparing healthy life expectancy with healthcare expenditures per capita in that country, adjusted for average years of education (years of education are strongly associated with the health of populations in both mature and emerging countries). The PwC Global Healthcare team adapted methodology from the 2001 report: "Comparative efficiency of national health systems: cross-national econometric analysis."

Hospitals and health employment

Combination of scores for: the ratio of all hospitals within each city accessible to international visitors for every 100,000 members of the total population; and the ratio of employment in the health sector per 100,000 of the population (as provided by Oxford Economics).

Hotel rooms

Count of all hotel rooms within each city.

Housing

Measure of availability, diversity, cost and quality of housing, household appliances, and furniture, as well as household maintenance and repair. This measure is based on the Mercer Quality of Living 2013 reports. US cities were differentiated from each other by their annual rise in house prices.

Incoming/outgoing passenger flows

Total number of incoming and outgoing passengers, including originating, terminating, transfer, and transit passengers in each of the major airports servicing a city. Transfer and transit passengers are counted twice. Transit passengers are defined as air travelers coming from different ports of departure who stay at the airport for brief periods, usually one hour, with the intention of proceeding to their first port of destination (includes sea, air, and other transport hubs).

Innovation Cities Index

The 2thinknow Innovation Cities™ index is composed of 331 cities selected from 1,540 cities based on basic factors of health, wealth, population, and geography. The selected cities had data extracted from a city benchmarking data program on 162 indicators. Each of the benchmarking data was scored by analysts using best available qualitative analysis and quantitative statistics. (Where data were unavailable, national or state estimates were used). Data were then trend balanced against 21 global trends. The final index had a zeitgeist (analyst confidence) factor added and the score reduced to a three-factor score for cultural assets, human infrastructure, and networked markets. For city classification, these scores were competitively graded into five bands (Nexus, Hub, Node, Influencer, Upstart). The top 33 percent of Nexus and Hub (and selected Node cities of future interest) final graded scores were ranked by analysts based on trends over two to five years. A Node ranking is considered globally competitive.

International tourists

Annual international tourist arrivals for 100 cities collected by Euromonitor International. Euromonitor's figures include travelers who pass through a city, as well as actual visitors to the city.

*Intellectual property protection**

Leading business executives' responses to the question in the World Economic Forum's *Executive Opinion Survey 2012* that asks, "How would you rate intellectual property protection, including anti-counterfeiting measures, in your country? (1=very weak; 7=very strong)." The survey covers a random sample of large and small companies in the agricultural, manufacturing, non-manufacturing, and service sectors.

*Internet access in schools**

Leading business executives' responses to the question in the World Economic Forum's *Executive Opinion Survey 2012* that asks, "How would you rate the level of access to the Internet in schools in your country? (1=very limited; 7=extensive)." The survey covers a random sample of large and small companies in the agriculture, manufacturing, non-manufacturing, and service sectors.

iPhone index

Working hours required to buy an iPhone 4S 16GB. Data sourced from *UBS Prices and Earnings 2012*.

*Level of shareholder protection****

Measurement of the strength of minority shareholder protection against misuse of corporate assets by directors for their personal gain. The Strength of the Investor Protection Index is the average of indices that measure transparency of transactions, liability for self-dealing, and shareholders'

ability to sue officers and directors for misconduct. Assessment scores gathered from *Doing Business 2013*, The World Bank Group.

Libraries with public access
Number of libraries within each city that are open to the public divided by the total population and then multiplied by 100,000.

Licensed taxis
Number of officially licensed taxis in each city divided by the total population and then multiplied by 1,000.

*Literacy and enrollment**
Measurement of a country's ability to generate, adopt ,and diffuse knowledge. The World Bank's Knowledge Economic Index is derived by averaging a country's normalized performance scores on variables in three categories—education and human resources, the innovation system, and information and communications technology. The variables that compose education and human resources are adult literacy rate, secondary education enrollment, and tertiary education enrollment. Adult literacy rate, per UNESCO, refers to the percentage of people aged 15 and above who can, with understanding, read and write a short, simple statement on their everyday life.

Major construction activity
The count of "planned" and "under construction" buildings in the Emporis database for each city as of November 21, 2013. This includes structures such as high rise, skyscrapers, low rise, halls and stadia.

Mass transit coverage
Ratio of kilometers of mass transit track to every 100 square kilometers of the developed and developable portions of a city's land area. A city's developable land area is derived by subtracting green space and governmentally protected natural areas from total land area.

*Math/science skills attainment**
Top performers' combined mean scores on the math and science components of the Program for International Student Assessment (PISA), an Organisation for Economic Co-operation and Development (OECD) assessment of 15-year-olds' academic preparedness. Top performers are defined as those students who achieved in the top two proficiency levels (Level 5 and Level 6) on the math and science portions of the test. Comparable examinations are used wherever possible to place cities not included in the OECD assessment.

Natural disaster risk
Risk of natural disasters occurring in or near a city. Counted hazards include hurricanes, droughts, earthquakes, floods, landslides, and volcanic eruptions.

Number of Global 500 headquarters
Number of Global 500 headquarters located in each city, as per the CNN Money Fortune Global 500 list.

Number of international association meetings
Number of international association meetings per city per year that take place on a regular basis and rotate between a minimum of three countries. Figures provided by members of the International Congress and Convention Association.

On-time flight departures
Average percentage of flights that departed on time from each city over three months (May–July 2013).

*Operational risk climate**
Quantitative assessment of the risks to business profitability in each of the countries. Assessment accounts for present conditions and expectations for the coming two years. The operational risk model considers 10 separate risk criteria: security, political stability, government effectiveness, legal and regulatory environment, macroeconomic risks, foreign trade and payment issues, labor markets, financial risks, tax policy, and standard of local infrastructure. The model uses 66 variables, of which about one-third are quantitative. Data produced by Economist Intelligence Unit's Risk Briefing.

Percent of population with higher education
Number of people who have completed at least a university-level education divided by the total population. A university-level education is set equivalent to a bachelor's degree or higher from a US undergraduate institution.

Political environment
Measure of a nation's relationship with foreign countries, internal stability, law enforcement, limitations on personal freedom, and media censorship. Data are from the Mercer Quality of Living 2013 reports.

Productivity
Productivity is calculated by dividing the gross domestic product (GDP) in 2013 US$ by employment in the city. Data provided by Oxford Economics.

Public park space
Proportion of a city's land area designated as public recreational and green spaces to the total land area. Excludes undeveloped rugged terrain or wilderness that is either not easily accessible or not conducive to use as public open space.

Public transport systems
Reflects the efficiency, reliability and safety of public transport networks as defined and rated by the Mercer Quality of Living 2013 reports. Cities also received additional points for each multi-modal transport system available to the public including: subway, bus/bus rapid transit, taxi, light rail, tram/trolley/streetcar, commuter rail and bike share systems. Each city received a tenth of a point for the modes of transport available within the city to differentiate between the 1–10 scores awarded by Mercer. Cities that had a fully operational Bus Rapid Transit (BRT) system received 0.05 points (in addition to the tenth of a point for a public bus system). Ferry systems were excluded to not penalize land-locked cities for their absence.

Purchasing power

Domestic purchasing power is measured by an index of net hourly wages (where New York=100) excluding rent prices. Net hourly wages divided by the cost of the entire basket of goods and services, excluding rent. The basket of goods relates to 122 goods and services. Data sourced from *UBS Prices and Earnings 2012*.

Quality of living

Score based on more than 30 factors across five categories: sociopolitical stability, healthcare, culture and natural environment, education, and infrastructure. Each city receives a rating of either acceptable, tolerable, uncomfortable, undesirable, or intolerable for each variable. For qualitative indicators, ratings are awarded based on the Economic Intelligence Unit analysts' and city contributors' judgments. For quantitative indicators, ratings are calculated based on cities' relative performances on a number of external data points. Data produced by The Economist Intelligence Unit Liveability ranking.

Rate of real GDP growth

2012–2014 gross domestic product percentage growth rate in real terms expressed in 2013 US$. Data provided by Oxford Economics.

Recycled waste

Percentage of municipal solid waste diverted from landfill.

*Resolving insolvency****

This topic identifies weaknesses in existing bankruptcy law and the main procedural and administrative bottlenecks in the bankruptcy process. Assessment scores gathered from *Doing Business 2013*, The World Bank Group.

Software development and multimedia design

Combination of scores for each city from fDi Benchmark's Software Development Centre and Multimedia Design Centres profiles and The World Bank Knowledge Economy Index (KEI). Both fDi Benchmark indices weight a city's performance 70 percent based on the quality of the location and 30 percent based on the cost of the location. The Software index is based on an assessment of 120 quality competitiveness indicators. These indicators include availability and track record in ICT, availability of specialized-skills professionals such as scientists and engineers, access to venture capital, R&D capabilities, software experts, quality of ICT infrastructure, and specialization in software development. The Multimedia Design Centre rankings are based on an assessment of 120 quality competitiveness indicators, including the size of the location's leisure and entertainment sector, its specialization and track record, information technology infrastructure, quality of life, and skills availability. The World Bank KEI is noted as the simple average of normalized scores of three key variables: telephone, computer, and Internet penetrations (per 1,000 people).

Thermal comfort

A thermal comfort score was created for each city by calculating the average deviation from optimal room temperature (72 degrees Fahrenheit). January, April, July, and October heat indices were calculated for each city using an online tool that integrates average high temperature and corresponding relative evening humidity during each month. A final thermal comfort score was derived by first taking the difference between a city's heat index for each month and optimal room temperature and then averaging the absolute values of these differences.

Top 100 airports

Each city receives a score based on the ranking of that city's top airport in the World's Top 100 Airports ranking, compiled by Skytrax.

Total corporate tax rate

The total tax rate measures the amount of taxes and mandatory contributions payable by the business in the second year of operation, expressed as a share of commercial profits. The total tax rate is designed to provide a comprehensive measure of the cost of all the taxes a business bears. Data provided by PwC UK from *Paying Taxes 2014*, taxes are accurate for year ended 31 December 2012. Some cities which were not included in the *Paying Taxes 2014* study were calculated separately by our PwC local office using the TTC methodology. The *Paying Taxes 2014* report can be found at http://www.pwc.com/gx/en/paying-taxes/.

Traffic congestion

Measure of traffic congestion and congestion policies for each city scored on the level of congestion, as well as the modernity, reliability, and efficiency of public transport. Assessment based on Mercer Quality of Living 2013 reports and adjusted using IBM Commuter Pain Index.

Workforce management risk

Ranking based on staffing risk in each city associated with recruitment, employment, restructuring, retirement, and retrenchment. Risk was assessed based on 30 factors grouped into five indicator areas: demographic risks associated with labor supply, the economy, and the society; risks related to governmental policies that help or hinder the management of people; education risk factors associated with finding qualified professionals in a given city; talent development risk factors related to the quality and availability of recruiting and training resources; and risks associated with employment practices. A lower score indicates a lower degree of overall staffing risk. Rank scores sourced from the *2013 People Risk Index* produced by Aon Hewitt.

Working age population

Proportion of a city's population aged 15–64 to the total population of the city.

World university rankings

The Times Higher Education World University Rankings 2013-2014 powered by Thomson Reuters are the only global university performance tables to judge world-class universities across all of their core missions—teaching, research, knowledge transfer, and international outlook. The top university rankings employ 13 carefully calibrated performance indicators to provide the most comprehensive and balanced comparisons available, which are trusted by students, academics, university leaders, industry, and governments.

* Country-level data

** Data based on PwC Employee Survey 2013.

*** Data based on countries' most populous city except in the case of employee regulations and ease of starting a business, which have been differentiated for US cities.

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Center for Urban Science and Progress: All CUSP photos

Zack Zhao, PwC, Shanghai: Wang Lin and Ron van Oers

Lyndon Mechielsen/newspix: Miguel Zugaza

Frank Tophoven/Laif/Redux: *The Clothed Maja* and *The Naked Maja* by Francisco de Goya at Museo Nacional del Prado

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