# U.S. Cities in the 'World City Network'

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*"The rise of transnational interactions has produced a new economic globalization in which cities and their regions are the prime nodes."*

## Findings

An examination of economic connections among cities' global advanced service firms finds that:

- **While New York, Chicago, and Los Angeles are the U.S. leaders in global connectivity, San Francisco, Miami, Atlanta, and Washington are also important nodes in the world city network.** A mixture of regional capitals—such as Boston and Seattle—and specialist cities—such as Houston, the world's energy capital—are found in the next tier. Somewhat surprisingly, dynamic and growing Phoenix and San Jose have relatively low connectivities.

- **U.S. cities overall—and particularly non-coastal cities—are generally less globally connected than their European Union and Pacific Asian counterparts.** Sixteen EU cities and 11 Pacific Asian cities rank among the top 50 most globally-connected cities, while only seven U.S. cities make the cut. Chicago is the only high ranking U.S. city not located in a coastal state.

- **While important service connections exist among certain U.S. cities and particular global regions, U.S. cities are more strongly linked to other U.S. cities than to cities around the globe.** New York is the only U.S. city with more non-U.S. cities than U.S. cities in its top ten list of strongest global connections. Only three non-U.S. cities make Miami's top 10 list, for example, while Pittsburgh's list contains none.

- **Even the most globally-connected U.S. cities are more locally oriented than cities in the EU.** New York and Miami are the least locally oriented of U.S. cities, but even they are far more U.S.-centric in their connections than most European cities are EU-centric. A much larger number of EU cities boast strong connections to Latin America and Pacific Asia than cities in the U.S.

- **Beyond localism, functional linkages among firms are more important determinants of connectedness than geography alone.** While Europe has no American Pacific Coast city linkages, for example, it has many international financial centers with strong connections to the rising banking and finance hubs of Pacific Asia. Many of these cities, as well as New York, are much more oriented to the Pacific Rim than San Francisco, Seattle, or even Los Angeles.

As cities aim to position themselves better economically, they must remember that they operate in a global marketplace. Cities able to grow and attract globally-connected, high-value service firms can access, and benefit from, a worldwide array of customers, workers, and contracted services, ultimately boosting quality growth at home.

## Introduction

Just about anyone with even a casual interest in the geography of the global economy could guess that New York, Los Angeles, and Chicago are major world cities, with strong ties to other cities and regions worldwide. But what about other U.S. cities? How do places like Houston and Detroit—or even Portland and Cincinnati—connect to the rest of the world? What is their place in the "world city network?" And why does it matter?

Until recently there were no real answers to these questions. Most studies on the connections between global entities use nations—not cities—as their unit of analysis, and/or tend to focus on political, as opposed to economic, relationships. Those that have focused on world cities have failed to provide adequate measures of inter-city relations. By contrast, this paper introduces a new approach to network analysis that allows us to better understand the relative connectivity of cities in the world economy. Using this method, we track the global distribution of 100 leading advanced services firms to determine one important aspect of cities' economic connectedness to other world cities and the patterns of these linkages across the globe.

The importance of these relationships is becoming increasingly apparent. The conditions of contemporary globalization have, in fact, spurred a renaissance of major cities across the world, and a new economic configuration is emerging based upon cities.[2] This is not to say that states are no longer significant in their international relations, but the rise of transnational interactions has produced a new economic globalization in which cities and their regions are the prime nodes of a nascent network society. In this new context U.S. domination can no longer be taken for granted. Yes, New York can claim to be "capital city of the world," but in reality it shares its economic dominance with other global cities, notably London and possibly Tokyo and Paris. And other "global" U.S. cities are still far more locally oriented than their European counterparts. Put simply, the clear supremacy of the U.S. in international relations and military power does not translate into a similar position for American world cities within the world city network.

The findings from this report highlight these shifting dynamics, and suggest multiple implications for elected officials, policymakers, urban planners, and others who are concerned with regional development and competitiveness. How a city plugs into the world economy of advanced producer services could impact local growth patterns, for example, and offer opportunity for development of its downtown. It could influence a city's economic prospects by determining how many high-paying service jobs are locally created. And it could help shape what types of households a city attracts and retains. In short, global connectivity has become another urban barometer—a new statistic that helps reveal the health and strength of cities and regions.

## Background

This study treats world cities as the global service centers of the world economy. As such, the network of flows between cities described here provides a skeletal spatial organization of contemporary globalization. This approach is an extension of the usual understanding of world cities and therefore requires some exposition.

However, there are many ways cities are connected globally that are beyond the scope of this paper. Bentonville, AR, headquarters to Wal-Mart and its vast supply chain, certainly is very globally connected, as may be a large agribusiness in Iowa. Additionally, cities with large concentrations of immigrants can have strong global connections due to the ebb and flow of both people and money back to countries of origin.

This paper focuses on one type of economic connection—those between advanced producer services firms—important because of the high value they provide to places. This approach is an extension of the usual understanding of world cities and therefore requires some exposition.

***Cities, hierarchies, and networks***

World cities studies suffer from a theoretical legacy that assumes all inter-city relations are necessarily hierarchical.[3] A product of the national urban systems school of research that flourished in the 1960s and 1970s, this theory of inter-city hierarchical relations views cities as rivals, struggling against each other to "reach the top."[4] With the advent of globalization, the competition is now thought to be even more cut-throat, and a large "cities competition" urban policy literature has emerged as a result.[5] These studies of worldwide inter-city relations offer little or no interrogation of how cities actually relate to one another in a global space-economy, however. And so we ask: Must cities always form a hierarchy?

In a rare exception to the near-ubiquitous hierarchical premise, Jane Jacobs, in her classic *Cities and the Wealth of Nations,* developed an economic growth theory based upon "dynamic cities" whose relations with other cities are primarily mutual rather than competitive.[6] Cities generate local economic growth by replacing imports from other cities in a process that, rather than being a zero-sum game, stimulates new growth in the city losing the exports. A hypothetical example might be cities losing a particular manufacturing production (e.g. cotton textiles) compensating by providing the machine tools (e.g. machinery for producing cotton textiles) for the new production in the new cities. The result is a complex and interdependent network of cities rather than a simple hierarchical structure, with cities cooperating in economic development, not just competing for a share of the spoils.

This project adopts the Jacobs model of synergistic inter-city relations. In our interpretation, we adhere to the theoretical distinction between hierarchical/competitive processes and network/cooperative processes but understand that in practice the "real world" is somewhat messier, and "hybrid processes" are the norm.[7] But while we recognize that a world city network can include hierarchical tendencies, we believe the latter are to be searched for empirically within a network model.[8]

Our theoretical position leads to two separate but related issues: What is the agency that creates the city network, and how is the network formed by this agency?

***Globalization, cities, and agency***

Globalization is constituted by a myriad of transnational processes—economic, political, and cultural—that drive much contemporary social change. Economic globalization converts an "international economy" into a "global economy"—with transnational financial markets commonly cited as evidence for this change. Cities are central to these processes, initially as headquarters locales for multinational corporations;[9] and later as advanced producer service centers.[10] In this project we follow Saskia Sassen's lead by considering key financial and business services as the hallmarks of contemporary world cities.[11]

One of Sassen's major contributions to economic globalization theory has been her linking of the literature on the growth of the service sector to urban change. Service growth relative to manufacturing has led to an important economic shift in the second half of the twentieth century, and some services—those providing advanced knowledge products to multinational corporations—have become a cutting-edge industry in the new globalizing economy. A key feature of firms providing these services is their concentration in major cities, especially their downtowns.[12] Advanced producer service firms utilize the knowledge-rich environs of these cities while themselves contributing to downtown development through their business practices.

For Sassen, major service cities thus become "global cities," the "strategic places" of economic globalization. As the locales for production, development, and marketing of advanced services, global cities are contemporary manifestations of Jacobs' dynamic cities. This means that their success is not a matter of separate city development, rather they function as nodes in a worldwide network of cities.

Cities are not themselves the prime agents of world city network formation, however; it is advanced producer service firms that have been largely responsible for creating and maintaining the network. These firms have offices in important cities across all world regions, and personnel, information, knowledge, intelligence, ideas, plans, instructions, and advice flow freely among them. As such, these global service firms "interlock" the cities in which they have a presence. Viewed this way, the world city network can be measured.

## Methodology

There has been a continuous invention of phrases to describe inter-city relations in the world cities literature, including: "world city hierarchy";[13] "world system of cities";[14] "global network of cities";[15] "world system of metropolises";[16] "transnational urban system";[17] "new global urban hierarchy";[18] "functional world city system";[19] and "global urban network."[20] The variety of phrases suggests a literature struggling to understand this new scale of inter-city relations, confirmed by the fact that none of the above examples are in any sense formally specified. Thus we cannot be sure that these labels are trying to describe the same phenomenon or whether they are suggesting different types of relations. In contrast, we treat the world city network as a formally specified, empirically-based model that measures the interlocking network of global advanced service firms.[21]

***Data production***

The increasing relevance of a city-based perspective on worldwide developments has not yet led to an increased availability of data to monitor this process. In contrast to comparisons between countries, worldwide statistics for evaluating cities are not generally available beyond simple attribute measures such as population sizes.

A study of inter-city relations thus requires the creation of new data, customized for describing a new geography. Devising ways to meet this need has been the principal task of the Globalization and World Cities (GaWC) virtual research program centered at Loughborough University and the Metropolitan Institute at Virginia Tech (MI).[22] We introduce the GaWC/MI data approach here as a necessary base for beginning to understand the ways in which U.S. world cities relate to other world cities, within and outside of the U.S.

In 2000, we collected data on a large number of global service firms across a large number of cities covering all regions of the world.[23] We focused on firms from six key producer service sectors—accounting, advertising, banking/finance, insurance, law, and management consulting—choosing only those with offices in 15 or more cities, including at least one city in each of North America, Western Europe, and Pacific Asia. In total, we identified 100 such firms—18 in accounting, 15 in advertising, 23 in banking/finance, 11 in insurance, 16 in law, and 17 in management consulting—across 315 cities worldwide.

We defined cities broadly as "city-regions" or metropolitan areas, but in practice the service offices considered were largely concentrated in the central city, especially in downtowns (hence the use of the term "city"—as opposed to "metropolitan area" or "region"— throughout this report). Using information mainly gathered from firms' websites, we were able to determine each firm's distribution of offices and code each city in terms of its importance, or "service value," in the firm's office network. To compute this value, we employed two types of information about individual city offices: the size of the office as a service provided (e.g. the number of partners based in a law firm's office), and the extra-locational functions of a city office (e.g., a regional headquarters).[24]

Using this data, we developed an interlocking model consisting of a simple matrix arraying world cities against global service firms. Each matrix cell indicates the importance of a given city within the office network of a given firm. The end result of this exercise was a service values matrix measuring 100 firms times 315 cities depicted as an array of service values (codes) ranging from 0 to 5 (i.e., from no presence to headquarter location). The interpretation of this matrix is quite straightforward. Each column describes a firm's global office strategy across 315 cities, where it is strong and where it is weak. Each row describes the particular global service mix of a city, in which firms and sectors it is strong and in which firms and sectors it is weak.

In total, the matrix contains 31,500 pieces of information. This large quantity is significant. The measures we derive from the data are aggregations of different office networks of many firms. Each path to becoming a global service firm is distinctive in the mix of processes that create an office network, so that country of origin, initial expansion strategies, take-over opportunities taken, etc. each produce particular results. By combining 100 such globalization paths, we created a generalized world city network that is not dominated by just a few specific processes. Thus measurements based on these data are reasonable reflections of the broad new geography that is economic globalization.

***Measuring connectivity***

Using our matrix, we then set out to measure the connectivity of the 315 cities within the world city network. We based this measure upon the assumption that the more important an office is within a firm's network, the more flows—of information, knowledge, ideas, plans, etc.—it will generate. In other words, we expect greater connection between two cities with important offices of a firm than between another pair of cities that both house more modest offices. Thus we treat products of service values for pairs of cities as indicating connection potentials. Summing all such products for a given city for all firms across all other cities defines the city's global network connectivity (GNC). Computing these connectivities creates very large sums, however, so to make comparison easier, we converted them into relative measures of GNC, reporting them as proportions of the highest GNC score that is computed from this data, that for London.

Our measure of global network connectivity has three important properties that should be kept in mind when interpreting results. First, connectivity is measured irrespective of international boundaries. For instance, consider a New York law firm with offices in, say, Atlanta and Caracas that are both given service values of 2. In computing New York's global network connectivity the Atlanta-New York link and Caracas-New York link are identical: they each contribute 10 (2 x 5, remember 5 is scored for headquarters) to New York's overall connectivity. Second, cities with a large number of global service firm offices will, obviously, tend to be more connected than cities with less such offices. Thus it is no surprise that London and New York turn out to have by far the largest global network connectivity measures in our results. Third and countering the latter tendency, cities housing offices of firms with the very large office networks (i.e., found in very many cities) will be more globally connected than cities housing offices of firms with mainly small networks. Thus global network connectivity does not simply reflect the number of global service firms in a city—one city can have many more global service offices than another but if the latter's offices are concentrated among firms with the greatest networks, it may well have the higher global network connectivity.

***Defining "hinterworlds"***

In traditional urban studies it was common to depict towns and cities as service centers, each with its own "service area" (or hinterland) that it provisioned. In these global urban analyses, we also treat cities as service centers, but the area they service through their global service firms is worldwide. Thus a new term is required for the new geographical scope of advanced producer servicing: city hinterworlds. Unlike hinterlands, hinterworlds have no boundaries separating the areas provisioned between neighboring cities. However, they are like hinterlands in that they have a geographic basis or a spatial variation in the intensity of provisioning. Thus to map a city's hinterworld will show where it is strongly connected and where it is weakly connected across the world.

The computation involved for mapping the hinterworlds of cities is quite complex and is outlined in detail in the appendix.[25] We applied the method one city at a time to define its particular hinterworld. This consists of an array of the other cities, for each of which there are values indicating their degree of connection with the initial city. The values straddle zero: positive values show a city is strongly connected to the initial city, negative values indicate a weak connection. The methodology is as follows: first, we computed the link between a given city and each other city for all firms they share (i.e., both have offices of the firm); second, we summed them across firms to provide a provisional measure of links to the other cities; third, we made each link relative to the maximum service value that could have been provided; fourth, the list of such links for a given city to all other cities was compared to the latter's global network connectivities using a simple regression model; and finally, we used residuals from this regression to determine the other cities to which the given city is strongly connected (positive residual) or weakly connected (negative residual). In other words, hinterworlds are defined relative to global network connectivity because a positive residual indicates that the given city has a higher than expected connection to another city than the latter's global network connectivity would suggest, with the opposite implied by negative residuals.

As explained in the appendix, we carried out this exercise using just 123 out of the 315 cities in the original data.[26] This means that hinterworlds were computed for each of 123 cities; every hinterworld consists of measures of strong and weak connections to the other 122 cities. These have been mapped and are depicted in the *Atlas of Hinterworlds*.[27] For this report we use these measures in two ways. First, we constructed tables showing the 10 most strongly connected (positive residuals) cities and 10 most weakly connected (negative residuals) cities to show the nature of selected city hinterworlds. Second, we aggregated city hinterworlds by major regions to show the general geographical biases within hinterworlds—this shows which cities are strongly connected to Pacific Asian cities, for instance. We derived the regional score for a city by simply summing residuals for all cities in a given region (details are given in the appendix).

## Findings

***A. While New York, Chicago, and Los Angeles are the U.S. leaders in global connectivity, San Francisco, Miami, Atlanta, and Washington are also important nodes in the world city network.***

Table 1 shows the gross and relative GNC scores for U.S. cities, presented in order by size of the GNC, and grouped into 10 strata based on their connectivity levels. Alone in Strata I, New York is clearly the American global city *par excellence*. In fact, with connectivities more than a quarter above all other cities, New York together with London form a sort of global city duplex.

New York is not the only important U.S. world city, however: Chicago and Los Angeles constitute a clear, second strata in Table 1.[28] Globally, these two cities are ranked in the top ten connected cities with the likes of Paris and Singapore.

To be sure, the dominance of these three U.S. cities comes as little surprise. Our analysis does reveal some unanticipated, results, however.

Strata III includes Miami, which gives the city an elevated position compared to how it is perceived within a U.S. domestic urban hierarchy. However, as "capital of Latin America," it fully warrants its relatively high status in the world city network.[29] The other cities in the strata are less surprising but no less interesting: San Francisco, Atlanta, and Washington round out this third tier, due by and large to their roles as western gateway/financial center, media center and unchallenged "capital" of the large and fast growing South, and nation's capital, respectively.[30]

A mixture of regional capitals and specialist cities attracting services for their distinctive businesses is found in other tiers, with the size and economic importance of region or specialty determining the strata location of a city. Thus in strata IV, regional capitals in New England and the Pacific Northwest (Boston and Seattle) are joined by the two Texan world cities, one as regional center (Dallas) and the other as the world's energy capital (Houston).

Similarly, in strata V, leading cities of smaller and less important regions are combined with Detroit as the global auto center. Other strata combine sub-regional centers such as Charlotte and Portland with reviving industrial cities like Cleveland and Pittsburgh. There are surprises in both types of metropolitan area, with relatively low connectivities for the likes of "old and reviving" Baltimore and "new and dynamic" Phoenix.[31]

The final city of the series, Wilmington, forms the bottom strata on its own. This is no splendid isolation like New York in strata I: Wilmington was included in the data as a relatively low-level U.S. city to see how its GNC compared and because, despite its small size, the city is the center of the U.S. credit card industry. Clearly separate from the other selected cities, Wilmington as strata X represents the many other "ordinary" U.S. cities that do not appear in our data, mainly capitals of smaller states and industrial cities that never formed major metropolitan areas.

However, Wilmington's GNC score does remind us that globalization is not just the preserve of leading cities, but that all cities participate in globalization. In terms of financial and business services the provision in these less important cities is not large but neither is it zero. Still, while there are no "unlinked" U.S. cities in globalization, only a relatively few can realistically aspire to global service-led economic development.

## Table 1. Global Network Connectivities of U.S. Cities

| City | GNC score | Relative GNC | STRATA |
|---|---|---|---|
| New York | 61895 | 0.976 | I |
| Chicago | 39025 | 0.616 | II |
| Los Angeles | 38009 | 0.600 | II |
| San Francisco | 32178 | 0.508 | III |
| Miami | 29341 | 0.463 | III |
| Atlanta | 27052 | 0.427 | III |
| Washington, D.C. | 26522 | 0.418 | III |
| Boston | 22249 | 0.351 | IV |
| Dallas | 21796 | 0.344 | IV |
| Houston | 21424 | 0.338 | IV |
| Seattle | 19252 | 0.304 | IV |
| Denver | 17368 | 0.274 | V |
| Philadelphia | 17006 | 0.268 | V |
| Minneapolis | 16914 | 0.267 | V |
| St. Louis | 16124 | 0.254 | V |
| Detroit | 15818 | 0.250 | V |
| San Diego | 14585 | 0.230 | VI |
| Portland | 14113 | 0.223 | VI |
| Charlotte | 13556 | 0.214 | VI |
| Cleveland | 13442 | 0.212 | VI |
| Indianapolis | 13347 | 0.211 | VI |
| Kansas City | 12772 | 0.201 | VI |
| Pittsburgh | 12707 | 0.200 | VI |
| Baltimore | 11309 | 0.178 | VII |
| Phoenix | 11025 | 0.174 | VII |
| Cincinnati | 10603 | 0.167 | VII |
| Tampa | 10532 | 0.166 | VII |
| Columbus | 9974 | 0.157 | VII |
| San Jose | 9843 | 0.155 | VII |
| Rochester | 9731 | 0.153 | VII |
| Palo Alto | 9078 | 0.143 | VIII |
| Hartford | 9007 | 0.142 | VIII |
| Richmond | 8845 | 0.140 | VIII |
| Buffalo | 8798 | 0.139 | VIII |
| Honolulu | 8656 | 0.137 | VIII |
| Las Vegas | 7911 | 0.125 | IX |
| New Orleans | 7089 | 0.112 | IX |
| Sacramento | 6870 | 0.108 | IX |
| Omaha | 6564 | 0.104 | IX |
| Wilmington | 3740 | 0.059 | X |
| + other cities | - | - | X |

*Source: Authors' calculations*

***B. U.S. cities overall—and particularly non-coastal cities—are generally less globally connected than their European Union and Pacific Asian counterparts.***

In Table 2 we compare the connectivity of U.S. cities to those in the EU and Pacific Asia.[32] The 23 U.S. cities listed are part of the roster of 123 cities from across the world that have at least one fifth of London's GNC. There are 28 cities in European Union countries that similarly qualify but only 13 Pacific Asian cities. The key point this table makes, however, is not that there are slightly more EU cities and less Pacific Asian cities, but rather that the latter two sets of cities are generally ranked higher globally relative to equivalent U.S. cities.

The capitals of the EU and the U.S. encapsulate this situation: both rank 7th in their respective local economic areas but Brussels ranks 15th globally compared to Washington's 37th world ranking. This pattern is consistent throughout the table: Barcelona and Houston ranked 10th locally, but 32nd and 62nd respectively globally; Luxembourg City and Cleveland are both 20th locally, but 63rd and 112th globally. The situation with Pacific Asian cities is similar at the top end of the global ranking—whereas only 7 U.S. cities are in the world top 50, 11 Pacific Asian cities make the cut. This region has just 2 other world cities, however, reflecting a particular concentration of services in capital cities (excepting several cities in China).

However this tendency of major European and Pacific Asian cities to rank higher than those in the U.S. is not completely regular: there does appear to be a "middle gap" in the U.S. listing (between strata III and IV in Table 1) that is balanced by a cluster of lowly ranked cities (strata VI in Table 1); neither feature is found in the EU listing. This appears to be reflected, at least partially, in a geographical dimension. Whereas Europe's heartland is city-rich in connectivities (notably in Germany), the American heartland has fewer cities and with lower connectivities, Chicago being the exception. After Chicago, the next U.S. city from a non-coastal state is Denver, ranked 73rd globally.

**Table 2. Global Network Connectivity Rankings: U.S., EU, and Pacific Asian Cities**

| U.S. cities | EU cities | Pacific Asian cities |
|---|---|---|
| New York – 2 | London – 1 | Hong Kong – 3 |
| Chicago – 7 | Paris – 4 | Tokyo – 5 |
| Los Angeles – 9 | Milan – 8 | Singapore – 6 |
| San Francisco – 17 | Madrid – 11 | Taipei – 20 |
| Miami – 25 | Amsterdam – 12 | Jakarta – 22 |
| Atlanta – 33 | Frankfurt – 14 | Kuala Lumpur – 26 |
| Washington, D.C. – 37 | Brussels – 15 | Bangkok – 28 |
| Boston – 60 | Stockholm – 27 | Shanghai – 31 |
| Dallas – 61 | Dublin – 30 | Beijing – 36 |
| Houston – 62 | Barcelona – 32 | Seoul – 41 |
| Seattle – 68 | Vienna – 39 | Manila – 46 |
| Denver – 73 | Lisbon – 42 | Ho Chi Minh – 88 |
| Philadelphia – 76 | Copenhagen – 44 | Guangzhou - 109 |
| Minneapolis –77 | Hamburg – 48 | |
| St. Louis – 81 | Munich – 49 | |
| Detroit – 85 | Düsseldorf – 50 | |
| San Diego – 98 | Berlin – 51 | |
| Portland – 105 | Rome – 53 | |
| Charlotte – 108 | Athens – 56 | |
| Cleveland – 112 | Luxembourg – 63 | |
| Indianapolis – 114 | Helsinki – 70 | |
| Kansas City – 119 | Stuttgart – 74 | |
| Pittsburgh – 120 | Rotterdam – 75 | |
| | Cologne – 92 | |
| | Lyon – 93 | |
| | Antwerp – 96 | |
| | Manchester – 101 | |
| | Birmingham – 106 | |

*Source: Authors' calculations*

***C. While important service connections exist among certain U.S. cities and particular global regions, U.S. cities are more strongly linked to other U.S. cities than to cities around the globe.***

We focused here upon the hinterworlds of three pairs of U.S. cities, selected to show a variety of U.S. city hinterworlds. First, we contrasted the country's definitive global city (New York) to the U.S. city with the lowest connectivity in Table 2 (Pittsburgh). Second, we compared two cities with well-known regional proclivities (Los Angeles-Pacific Rim and Miami-Latin America). Finally, we considered two important U.S. cities surprisingly located in relatively low-level strata in Table 2 (Houston and Seattle). In each case we highlight the top 30 cities in each of the six hinterworlds (Table 3). In doing so, the "localness" of these cities' hinterworlds becomes apparent.

*New York and Pittsburgh.* As expected, the hinterworlds of these two cities show quite opposite patterns (Table 3). The Pittsburgh hinterworld is extremely U.S.-focused, with all of the top 20 cities in its hinterworld located in the U.S. In contrast, New York's hinterworld shows only three U.S. cities among the top ten—Boston, Chicago, and Washington. London also appears among the top ten well-connected cities to New York and the remaining majority are found in Pacific Asia. In short, whereas Pittsburgh's hinterworld is very "local," New York's is global, with specific strengths in the three leading globalization regions: the U.S. itself, Pacific Asia, and Europe.

*Los Angeles and Miami.* The hinterworlds of these two cities show the expected regional biases beyond the U.S.: Los Angeles is well-connected to Pacific Rim cities in both Asia and Australia, and Miami is well-connected to Latin American cities (Table 3). However, it is also the case that both these cities are, in general, most strongly linked to other U.S. cities than those elsewhere around the world. For Los Angeles, nine of the top 10 well-connected cities are U.S. cities, the exception being Tokyo. For Miami, a majority of top 10 well-connected cities are in the U.S., and only one is found in Latin America (Rio de Janeiro).

It is interesting that despite having a Spanish origin and a large Hispanic population, Los Angeles is not as well-connected to Latin America as is Miami. We speculate that this may have something to do with the immigration patterns to both respective places. Many Hispanics in Miami's business community are political refugees from Cuba. When Castro came to power over forty years ago, much of Cuba's middle class fled to southern Florida. This affluent and educated expatriate community quickly reestablished a business network to Latin America. By contrast, most Hispanic immigrants to Los Angeles have been poor. The contacts to Latin America in Los Angeles are therefore more cultural and are less likely to result in the establishment of business contacts in the advanced producer services industry.

*Houston and Seattle.* The hinterworlds of these two important U.S. cities are strikingly similar despite

## Table 3. The Top 30 Cities in the Hinterworlds of Six U.S. Cities

| Rank | New York | Pittsburgh | Los Angeles | Miami | Houston | Seattle |
|---|---|---|---|---|---|---|
| 1 | Washington, D.C. | Washington, D.C. | Washington, D.C. | Dallas | San Francisco | Dallas |
| 2 | Tokyo | Cleveland | Boston | Philadelphia | Dallas | Washington, D.C. |
| 3 | Boston | Dallas | Chicago | Washington, D.C. | Washington, D.C. | Portland |
| 4 | Chicago | Philadelphia | San Francisco | Melbourne | Chicago | Los Angeles |
| 5 | Hong Kong | St. Louis | Dallas | Rio de Janeiro | Boston | Denver |
| 6 | Guangzhou | Charlotte | Philadelphia | Cleveland | Philadelphia | Boston |
| 7 | London | Boston | San Diego | Detroit | Los Angeles | Minneapolis |
| 8 | Singapore | Minneapolis | Tokyo | Frankfurt | Minneapolis | Philadelphia |
| 9 | Ho Chi Min City | Indianapolis | Minneapolis | San Diego | Montreal | St. Louis |
| 10 | Beijing | Kansas City | Denver | St. Louis | Seattle | Montreal |
| 11 | Pittsburgh | Denver | New York | Caracas | Denver | Barcelona |
| 12 | San Diego | Atlanta | Cleveland | Bogota | Toronto | Vancouver |
| 13 | Cleveland | Seattle | Pittsburgh | New York | Pittsburgh | Houston |
| 14 | Frankfurt | Detroit | Houston | San Francisco | Rio de Janeiro | Detroit |
| 15 | Bangkok | New York | Calgary | Boston | Calgary | Chicago |
| 16 | Minneapolis | Chicago | Seoul | Buenos Aires | San Diego | San Diego |
| 17 | Calgary | Los Angeles | Singapore | Kansas City | Vancouver | Pittsburgh |
| 18 | Los Angeles | San Francisco | Guangzhou | Vancouver | Melbourne | Indianapolis |
| 19 | Denver | San Diego | Sydney | Panama City | Kansas City | Miami |
| 20 | Dallas | Portland | Atlanta | Adelaide | Charlotte | San Francisco |
| 21 | Bratislava | Rotterdam | Charlotte | Chicago | Portland | Chennai |
| 22 | Shanghai | Houston | Hong Kong | Los Angeles | Zurich | Toronto |
| 23 | San Francisco | Stockholm | Vancouver | Charlotte | Birmingham(UK) | Kansas City |
| 24 | Nassau | Brisbane | Hamilton (Ber.) | San Diego | Rotterdam | Bogota |
| 25 | Philadelphia | Riyadh | Seattle | Copenhagen | Manama | Karachi |
| 26 | Cologne | Perth | Detroit | Mexico City | St. Louis | Cleveland |
| 27 | Kiev | Vancouver | Shanghai | Sao Paulo | Sydney | Rio de Janeiro |
| 28 | Sofia | Rio de Janeiro | St. Louis | Port Louis | Sao Paulo | Melbourne |
| 29 | Rotterdam | Miami | Manama | Cape Town | Indianapolis | Atlanta |
| 30 | Zurich | Adelaide | Kansas City | Barcelona | Nassau | New Delhi |

*Non-U.S. cities are shown in italics*

*Source: Authors' calculations*

their being from very different parts of the U.S. (Table 3). Like Los Angeles, both have nine of their top 10 well-connected cities in the U.S., and in both cases the other top 10 city is still North American (Montreal). Thus these cities are very U.S.-oriented in their connections and, unlike Los Angeles and Miami, they have no distinctive extra-U.S. regional pattern of well-connected cities. In Seattle, for example, this can be explained by the fact that, while it has a big port, it does not have a large producer service economy relative to such places as Los Angeles and San Francisco. In general, neither of Seattle nor Houston has a hinterworld very different from that of Pittsburgh.

***D. Even the most globally-connected U.S. cities are more locally oriented than cities in the EU.***

The above examples suggest a degree of local parochialism in U.S. city linkages.[33] Such localism can be easily measured as a particular orientation within a hinterworld, allowing us to both generalize to more U.S. cities and to make comparisons again with cities in Europe.

In Table 4 we report the results from using the U.S. and EU as "local regions" for their respective cities. The findings for U.S. cities are quite stark.

The considerable localism of U.S. cities is confirmed by the fact that three cities, including Pittsburgh, actually score the maximum in local focus. It is obvious from this list that Pittsburgh, rather than New York, typifies U.S. world cities in terms of their inter-city relations. All but two U.S. cities—Miami and New York—have a local orientation above 0.8 (and there

## Table 4. Local Orientations of U.S. and EU City Hinterworlds

| U.S. city | U.S.-ness (local orientation) | EU city | EU-ness (local orientation) |
|---|---|---|---|
| Denver | 1.000 | Cologne | 0.703 |
| Indianapolis | 1.000 | Munich | 0.656 |
| Pittsburgh | 1.000 | Stuttgart | 0.640 |
| Cleveland | 0.981 | Antwerp | 0.625 |
| San Diego | 0.981 | Hamburg | 0.609 |
| St. Louis | 0.981 | Lyon | 0.578 |
| Boston | 0.963 | Barcelona | 0.531 |
| Minneapolis | 0.963 | Berlin | 0.531 |
| Philadelphia | 0.963 | Rome | 0.500 |
| Portland | 0.963 | Copenhagen | 0.375 |
| Kansas City | 0.944 | Milan | 0.360 |
| Seattle | 0.944 | Rotterdam | 0.360 |
| Charlotte | 0.926 | Lisbon | 0.344 |
| Dallas | 0.926 | Luxembourg City | 0.250 |
| Los Angeles | 0.926 | Vienna | 0.250 |
| Washington, D.C. | 0.926 | Dusseldorf | 0.219 |
| Detroit | 0.907 | Birmingham | 0.203 |
| Houston | 0.889 | Madrid | 0.203 |
| San Francisco | 0.851 | Amsterdam | 0.188 |
| Atlanta | 0.833 | Paris | 0.172 |
| Chicago | 0.815 | Dublin | 0.156 |
| Miami | 0.741 | Frankfurt | 0.156 |
| New York | 0.481 | Stockholm | 0.141 |
| | | Manchester | 0.109 |
| | | Athens | 0.000 |
| | | Brussels | -0.016 |
| | | Helsinki | -0.045 |
| | | London | -0.078 |

*Source: Authors' calculations*

are no values of orientation this high found in tables 5, 6, or 7).

New York's low level of local orientation is distinctly un-notable in comparison with EU cities, however. In general, EU cities are locally-orientated but to a much lesser degree than U.S. cities. Some major EU cities have low or even negative local orientation (e.g., London and Brussels) and the same is true of some peripherally-located EU cities (e.g., Helsinki and Athens). This comparison highlights the extreme nature of the national parochialism of U.S. cities: Even at the global city level New York turns out to be much more American than London is European.

European cities generally have stronger regional connections across the board than cities in the U.S. This is even true of inter-city links to Latin America, as shown in Table 5. As we would expect, Miami has the highest Latin American orientation among both U.S. and EU cities—but this is where U.S. preeminence ends. U.S. cities turn out to be weakly connected to Latin American cities, while EU cities have a balance of strong and weak connections. This is due largely to the fact that several medium-sized EU cities are relatively well-connected to Latin American cities, including historically linked Lisbon and Madrid. Note that both New York and London have appreciably negative orientations to Latin America, as their non-local linkage biases are both directed elsewhere.

To further U.S.-EU comparisons, we examined cities' orientation to Eastern Europe. We defined this region by examining cities that were in COMECON during the Soviet era. In the 1990s they constituted centers for massive privatizations that fuelled globalization of advanced producer services, especially in banking/finance and law. In short, this was the "global opportunity region" of the 1990s and it is clearly EU cities that took advantage (Table 6). Amongst U.S. cities, only New York has a positive orientation, with a level on par with Antwerp, which ranks 21st among EU cities. The EU-Eastern European linkages are how we expect a "backyard relationship" to look; it is precisely not how the U.S.-Latin American linkages appear once Miami is allowed for.

***E. Beyond localism, functional linkages among firms are more important determinants of connectedness than geography alone.***

Our examination of hinterwords (Table 3), revealed an interesting contrast between New York and the two Pacific cities (Los Angeles and Seattle). Specifically, while we were able to show a regional bias towards the Pacific Rim for Los Angeles, we could discern no such pattern for Seattle. And yet the Atlantic Coast city of New York is very well connected to Pacific Asian cities, seemingly much more so than even Los Angeles. This might be explained by New York's premier role in global finance. In general, what these contrasts indicate is that the relative network locations of Pacific Asian cities (specifically in banking/finance) are much more important than their absolute geographical location (Pacific Rim) in

## Table 5. Latin American Orientations of U.S. and EU Cities

| U.S. city | Latin American orientation | EU city | Latin American orientation |
|---|---|---|---|
| Miami | 0.563 | Athens | 0.469 |
| Cleveland | 0.125 | Copenhagen | 0.469 |
| St. Louis | 0.094 | Helsinki | 0.406 |
| San Diego | 0.063 | Rome | 0.313 |
| | | Dublin | 0.281 |
| Atlanta | 0.000 | Lisbon | 0.188 |
| Boston | 0.000 | Hamburg | 0.094 |
| Dallas | 0.000 | Stockholm | 0.094 |
| | | Madrid | 0.063 |
| Chicago | -0.031 | Milan | 0.063 |
| Denver | -0.031 | Vienna | 0.063 |
| Kansas City | -0.031 | | |
| Minneapolis | -0.031 | Amsterdam | 0.000 |
| Philadelphia | -0.031 | Luxembourg City | 0.000 |
| Charlotte | -0.063 | | |
| Detroit | -0.063 | Cologne | -0.031 |
| San Francisco | -0.094 | Manchester | -0.031 |
| Houston | -0.156 | Birmingham | -0.063 |
| Portland | -0.156 | Dusseldorf | -0.125 |
| Seattle | -0.188 | Munich | -0.125 |
| Indianapolis | -0.281 | Barcelona | -0.156 |
| Los Angeles | -0.313 | Brussels | -0.156 |
| New York | -0.313 | Antwerp | -0.219 |
| Pittsburgh | -0.344 | Stuttgart | -0.219 |
| Washington, D.C. | -0.344 | Frankfurt | -0.250 |
| | | Berlin | -0.281 |
| | | Paris | -0.281 |
| | | Rotterdam | -0.313 |
| | | Lyon | -0.344 |
| | | London | -0.375 |

*Source: Authors' calculations*

determining their inter-city links. This can be more definitively illustrated by considering the Pacific Asian orientations of U.S. and EU cities.

Table 7 lists these Pacific Asian orientations. This is, of course, the world region whose rise to economic prominence in the last quarter of the twentieth century helped popularize the concept of globalization, and led to the transcendence of the old North Atlantic-centered world economy. The orientations of cities to this key economic region are ordered as we might expect: the top six include four Pacific Coast cities plus the two dominant U.S. international financial centers, New York and Chicago. Of course, Europe has no Pacific Coast cities, but it does have many international financial centers; thus for financial and business services, EU cities are generally better connected to Pacific Asian cities than are those in the U.S. Clearly, Table 7 confirms what we gleaned from Table 3: It is the financial functions of Pacific Asian cities in the world city network, not mere geography, driving the formation of city hinterworlds.

**What do these findings mean for U.S. cities and their economies?**
This paper has been largely a descriptive exercise. We are working in a research area—worldwide inter-city relations—where there is little empirical work, so we need to provide original findings to depict the new global geography. At the same time, we must be cognizant of the limits of the results we have produced. In the myriad connections that constitute Manuel Castells' contemporary "space of flows," the inter-city relations we have described are but a miniscule part.[34] But they are a very important part, as they describe a cutting edge economic sector in the world economy—advanced services—that has been crucially instrumental for economic globalization. As such, our findings should not be dismissed for their narrow economic focus, even if the meaning of the findings still remains to be ascertained. We do know that, at worst, they cast doubt on the continuing viability of U.S. cities in the world economy. In other words, while there are many positive things happening in U.S. cities today, we can't neglect the benefits of dense worldwide connections. Intra-city variety and complexity is not an alternative to inter-city variety and complexity, but rather, as Jacobs taught us long ago, they complement each other.[35]

To probe the findings further, we need to consider several key questions: How relevant is the relative underconnectedness and parochialism of leading U.S. cities to the future prosperity and development of their metropolitan areas? Why haven't U.S. cities made a greater mark on the world city network? What are the processes or mechanisms operating in the world economy that are producing this inter-city outcome? Does the degree and nature of connectedness in the world city network translate into

**Table 6. East European Orientations of U.S. and EU Cities**

| U.S. city | East European orientation | EU city | East European orientation |
|---|---|---|---|
| New York | 0.111 | Vienna | 0.741 |
| | | Brussels | 0.630 |
| | | Hamburg | 0.593 |
| Detroit | -0.148 | Helsinki | 0.556 |
| Washington, D.C. | -0.185 | Athens | 0.519 |
| Los Angeles | -0.444 | Dublin | 0.519 |
| San Diego | -0.444 | Frankfurt | 0.482 |
| Miami | -0.482 | Milan | 0.444 |
| Atlanta | -0.519 | Amsterdam | 0.407 |
| San Francisco | -0.519 | Copenhagen | 0.407 |
| Cleveland | -0.593 | Luxembourg City | 0.407 |
| Portland | -0.593 | Stuttgart | 0.407 |
| Seattle | -0.593 | Dusseldorf | 0.304 |
| Boston | -0.630 | Berlin | 0.297 |
| Chicago | -0.630 | Paris | 0.297 |
| Philadelphia | -0.630 | Cologne | 0.259 |
| Denver | -0.667 | Madrid | 0.259 |
| Houston | -0.667 | London | 0.222 |
| Dallas | -0.704 | Munich | 0.222 |
| Kansas City | -0.704 | Lisbon | 0.186 |
| Pittsburgh | -0.704 | Antwerp | 0.111 |
| St. Louis | -0.704 | | |
| Indianapolis | -0.741 | | |
| Charlotte | -0.778 | Stockholm | -0.037 |
| Minneapolis | -0.815 | Rome | -0.111 |
| | | Rotterdam | -0.222 |
| | | Lyon | -0.444 |
| | | Barcelona | -0.556 |
| | | Birmingham | -0.593 |
| | | Manchester | -0.593 |

*Source: Authors' calculations*

immediate advantages in terms of economic growth? And what, ultimately, do the findings mean for political and business leaders?

We attempt to address some of these issues below.

***What might explain the localism of U.S. cities?***

Understanding the mechanisms through which U.S. city connections in the world city network have been created requires additional research on how agents of world city network formation—the global service firms—use the cities in which they are located. We can, nevertheless, provide some explanation of the processes behind U.S. cities' weak connectedness:

- ***The Shadow Effect:*** Non-U.S. service firms developing a global strategy must locate in New York (and perhaps Chicago and Los Angeles) but often decide on no further penetration of the U.S. domestic market. They need a U.S. presence for their non-U.S. clients but do not wish to invest in service within the U.S. market itself with its high cost thresholds. Hence, for global services delivered by non-U.S. firms, concentration in New York casts a 'shadow' with relatively few global services provided elsewhere.
- ***The Comfort Effect:*** Leading U.S. financial and business service firms may decide not to develop a global strategy and concentrate on expanding within the domestic market. Because this market is so large, such a strategy may be less risky, and it eliminates the need to cope with expensive "loss leader" foreign-city offices. Certainly there is much less of an incentive for U.S. financial and business service firms to embark on a transnational strategy than for firms in any other country. Alternatively, a firm in Switzerland with its limited domestic market must operate globally to survive.

These two effects must remain hypotheses for the time being but they are, we think, very plausible interpretations of the situation. If we accept them as prime reasons for U.S. city under-connectedness then it is difficult to see how this global deficiency of U.S. cities will alter any time in the near future. But does this matter?

***Are global connections essential for economic success?***

We can begin to answer this question with a simple comparison. Consider the world city status of Atlanta versus Phoenix. Both regions are Sunbelt boomtowns that expanded rapidly in the past several decades. The two metropolitan areas now rank among the top 15 regions in the country. But as "U.S. world cities," Atlanta—the "New York of the South"— places 6th, while Phoenix comes in at 25th (Table 1). Thus the question arises to whether Atlanta has a distinct advantage over Phoenix because of its superior global connectivity.

Cities and city networks are

## Table 7. Pacific Asian Orientations of U.S. and EU Cities

| U.S. city | Pacific Asian orientation | EU city | Pacific Asian orientation |
|---|---|---|---|
| New York | 0.472 | Amsterdam | 0.611 |
| Los Angeles | 0.306 | London | 0.528 |
| Portland | 0.306 | Dusseldorf | 0.472 |
| Chicago | 0.194 | Frankfurt | 0.444 |
| | | Paris | 0.444 |
| | | Brussels | 0.361 |
| San Francisco | -0.056 | Luxembourg City | 0.333 |
| Seattle | -0.111 | Athens | 0.250 |
| Houston | -0.306 | Hamburg | 0.083 |
| Philadelphia | -0.306 | Madrid | 0.028 |
| Dallas | -0.333 | | |
| Denver | -0.333 | | |
| San Diego | -0.333 | Dublin | -0.028 |
| Washington, D.C. | -0.361 | Lisbon | -0.083 |
| Detroit | -0.472 | Vienna | -0.083 |
| Pittsburgh | -0.472 | Milan | -0.139 |
| Charlotte | -0.500 | Berlin | -0.167 |
| Atlanta | -0.556 | Munich | -0.167 |
| Boston | -0.556 | Helsinki | -0.333 |
| Cleveland | -0.583 | Cologne | -0.361 |
| Minneapolis | -0.583 | Rotterdam | -0.444 |
| Kansas City | -0.611 | Barcelona | -0.472 |
| Miami | -0.611 | Stuttgart | -0.472 |
| St. Louis | -0.639 | Copenhagen | -0.611 |
| Indianapolis | -0.667 | Stockholm | -0.694 |
| | | Birmingham | -0.722 |
| | | Rome | -0.722 |
| | | Lyon | -0.750 |
| | | Manchester | -0.750 |
| | | Antwerp | -0.778 |

*Source: Authors' calculations*

immensely complex phenomenon. Certainly it would be naïve in the extreme to assume that more global connections automatically translate into more economic growth. It is, of course, a matter of what these connections contribute to a city's economic vibrancy. The only sure thing we can say about globalization is that it has made cities and their networks even more complex. The key point to note is that these enhanced transnational and worldwide inter-city relations are an addition: Economic transactions taking place at other geographical scales continue to operate. There is nothing within globalization processes that determine this particular scale to be the most important for cities. City businesses will enter markets at a variety of scales and will expand their activities at levels where they either make most profit or expect to make most profit. This may or may not be the global scale depending on a whole array of circumstances.

The advanced producer service firms we have studied have all established multiple global offices as part of their overall location strategy. But they remain a small minority of firms in all the sectors we cover. Most financial and business service firms are still based upon a local client base generated by building a reputation for their service provision.

Overall, in any city, there will be access to services operating at different levels. The fact that one city has more global connectivity therefore does not necessarily mean that it is the more important service center. In our previous discussion (Table 2), we noted that Luxembourg City is much more connected globally than Cleveland (63rd to 112th), however Cleveland is the larger service center overall. Luxembourg City has grown an important global niche as an international financial center but is weak in all other sectors and scopes, whereas Cleveland has important local, state, regional, and national connections in addition to its global connections.

Having put our analyses into economic-geographical perspective, we can begin to answer the question of the importance of our findings to the growth prospects of U.S. cities. The first point to make is that global connections are not necessary for success. Several studies have shown that medium-sized cities have been particularly prospering in recent years. At the global level, Jones Lang LaSalle's "Winning Cities" project has identified Dublin, Dubai, and Las Vegas as the outstanding growth centers. Only one of these cities has relatively strong GNC—Dublin's high rank (30th) in Table 2 is a "European surprise" in our analysis. Dubai has a moderate world rank (54th), but ranks as the most connected Middle Eastern city; and Las Vegas' GNC ranking is only a lowly 197th. Similarly, in a recent study focusing only on U.S. metropolitan areas, Jonathan Bowles and Joel Kotkin show how many smaller metropolitan areas are growing much faster than New York.[37] Taking such results at face value, it would seem that global connections are not just unnecessary for growth; they may even be an impediment.

However, the global level of economic activities cannot be dismissed so easily. Economic globalization is a reality, a critical result of the massive restructuring of economic activities over the last two or three decades. What it provides for cities is new connections, and thus new opportunities to reach larger supplier, producer, and consumer markets.[37] Taking opportunities from across a wider range of geographical scales means increased complexity and it is the latter that is crucial to city vibrancy and medium-term success. As business conditions change, it is the more complex cities that are best able to weather the economic storms. John Short has reported, for example, that a large and successful city like Phoenix appears to be like much less successful Third World cities in terms of its population/GNC relation. This is not to say that Phoenix is on a dead-end economic trajectory, but its relatively simple, localized economy does make it economically vulnerable.

So while economic globalization is not a panacea for cities, it does provide new potentials for city economies that adds to their complexity and therefore to their ultimate sustainability. Thus in the medium-term U.S. cities cannot afford to be globally under-connected and nationally parochial. Because the U.S. economy is the sum of its city economies, our findings point to a national economic vulnerability.

***What does this mean for local political and business leaders?***

The findings presented here have several key implications for world city political and business leaders. Because the world city network is such a new method and concept, it is hard to capture all of its meaning in this exploratory paper. But some obvious issues do arise. We believe that the greatest local impact that global connectivity will have on a city is in its central business district.

First, because much of the advanced producer service industry is located in central business districts, the growth of global networks could increase the demand for downtown Class A office space. A larger workforce can subsequently impact a host of related downtown industries, including retail, entertainment, arts, conventions, and perhaps even housing.

Second, expanding employment in fields like law, advertising, and media can help attract a highly educated, skilled, and "creative" work force to a world city. In fact, virtually all the jobs associated with global producer services falls under Richard Florida's definition of the "Creative Class." Phoenix and Las Vegas rank low in Florida's scheme despite their rapid growth because they are underrepresented in terms of the creative class. In contrast, many of the cities that are well-connected to the global producer service economy also maintain a large creative class.

Third, being a world city can help local boosters promote a place. Most places promote the idea that they are the world city of something—sometimes almost anything. Given the increasing buzz about the global economy, not being part of it means a city fails as a real player in business. Cities even bid on such high-profile but often losing ventures as World Fairs and Olympic Games—think Atlanta in 1996—just to lay claim to their lofty global status. Atlanta can also now lay claim to out-networking such Southern rivals as Dallas and Houston, and leaving its Sunbelt bookend Phoenix in the dust.

Finally, and perhaps most speculatively, being a well-connected world city may produce a more cosmopolitan view. Places with business links throughout the world may be less parochial in attitude and feel than peer cities that are not well-connected to global producer service economy. Does an Atlanta or Houston seem more outwardly focused than Phoenix? That is hard to say, but it is easy to imagine that such is the case given how isolated Phoenix is from the rest of the world. Of course, historically, isolation has not been beneficial for cities: All successful cities have been cosmopolitan.

## Methods Appendix

**Computing global network connectivity**

The world city network is constituted by $m$ global service firms with offices distributed across $n$ world cities. The level of service performed by firm $j$ in city $i$ is $v_{ij}$ which we call the service value. The array of service values defines an $m$ x $n$ service value matrix, $V$. The world city network is derived from this matrix using the plausible conjecture that the larger a firm's service value in a city, the greater the number of the firm's flows of information, knowledge, instruction, ideas, strategies, plans, etc. will emanate from that city to connect with offices in other cities. This assumption allows for relations between cities to be defined.

The initial relation between each pair of cities is given by:

$$r_{ab,j} = v_{aj} \cdot v_{bj} \qquad (1)$$

This defines relations between cities $a$ and $b$ in terms of firm $j$. This specifies an elemental interlock link between two cities. It is multiplicative because the potential quantity of flows between two cities rises geometrically with the quantity of service provided in each city. From equation (1) the aggregate city interlock link between two cities can be derived as:

$$r_{ab} = \sum_j r_{ab,j} \qquad (2)$$

For each city there is n-1 such links, one to every other city. These can be used to define the overall interlock connectivity of a city so that:

$$C_a = \sum_i r_{ai} \text{ where } a \neq i \quad (3)$$

This measure of connectivity picks up two features of a city's service values. First, and most obviously, cities where firms locate offices with higher service values are more connected. Second, and more subtly, if those high service offices are for firms with larger office networks then the city appears more connected. In other words, a city with several high service offices of firms that has only small office networks will not be that well connected as measured by interlock connectivity.

Interlock connectivity indicates the importance of a city in the world city network. Generally we refer to empirical measures of interlock connectivity as global network connectivity.

**Deriving city hinterworlds**

To compute a city's hinterworld we need to specify its external relations with other cities. For this exercise, we deal with just the top 123 cities in terms of global network connectivity. This is because the data matrix becomes sparser (more zero scores) with additional cities creating a particular problem when measuring connections for individual cities. Obviously with less firms represented in computing a measure, a result becomes that much less reliable. Thus the results reported below are derived from a reduced 100 x 123 data matrix.

A city's hinterworld consists of the levels of service it provides for doing business in each of the other 122 cities in the reduced data matrix. This is initially computed as follows. First, count the number of firms present in each city. For each city multiply this number by 5, the maximum service value. This constitutes the highest possible level of service that a city could expect in another city (i.e., the other city houses the headquarters of every single one of a city's global service firms). Thus, in the simple data set shown in Table A, highest levels of possible service are 20 for New York, 15 for Hamburg, and 10 for Bogotá. Now for each city, take other cities in turn and sum their service scores but only for firms present in the original city. For instance, starting with New York, the sums for Hamburg and Bogotá are 10 and 4 respectively; starting with Hamburg the sums for New York and Bogotá are 12 and 2; and starting with Bogotá the sums for New York and Hamburg are 10 and 2. The latter sums are expressed as proportions of the highest level of possible service. For instance, the proportions for New York are Hamburg 0.5 (= 10/20) and Bogotá 0.2 (= 4/20). All such computations are shown in Table A.

**Table A. Simple City/Firm Data Set**

(a) Service values

| | Firm A | Firm B | Firm C | Firm D |
|---|---|---|---|---|
| New York | 5 | 5 | 5 | 2 |
| Hamburg | 2 | 3 | 0 | 5 |
| Bogota | 2 | 0 | 2 | 0 |

(b) Levels of servicing derived from (a)

| | New York | Hamburg | Bogota |
|---|---|---|---|
| New York | - | 0.8 | 1.0 |
| Hamburg | 0.5 | - | 0.2 |
| Bogota | 0.2 | 0.13 | - |

The interpretation is relatively simple. The columns in this table define the level of service that can be expected in a city when visiting a global service firm in a row city. Thus, going into an office in New York to do business in Hamburg the service level is 0.5, but to do business in Bogotá the level falls to 0.2. Notice that from Bogotá, doing business in New York has a 1.0 service level showing that Bogotá's two service firms in Table 1 have their headquarters in New York. In contrast, the lowest level of service in this data is a paltry 0.13 for doing business from Hamburg in Bogotá. These columns represent the servicing linkages that form the basis for describing the hinterworld of a city.

However, there is a problem when comparing the hinterworlds of cities using results such as those in Table A. Notice that in this table New York appears with very high service levels for the other two cities and Bogotá provides low levels. This is obviously reflecting the network position of these cities in this small data set. Thus when this method is used for the 100 x 123 data set, we find that every city has its highest external provision in either London or New York. In general, we can note that external service provisions tend to closely follow the level of a city's global network connectivity. Thus mapping direct measures of connections to any city tends, to a large degree, merely to replicate the worldwide map of GNCs. Thus all hinterworlds, although not exactly the same, look very much alike. To overcome this comparative deficiency an extra step needs to be taken for describing hinterworlds.

We will term the external service provisioning results from Table A depictions of 'absolute' hinterworlds. Taking out the underlying general influence of global network connectivity from the absolute provisioning values for a city is a fairly simple task. Scatter diagrams of global network connectivity against a city's external provisioning levels shows a strong positive linear relationship in every case. Thus absolute provision in city $i$ for all other cities $j$ can be regressed against their GNCs using the simple equation:

$$H_j = \_ + \_ C_j + \_ \text{ where } i \neq j \qquad (4)$$

$H_j$ is the absolute provision values and $C$ is global network connectivity. The regression constants are _ and _, and _ is the error term or residual. Calibrating this equation for any city produces an estimate of the level of service provision given a city's connectivity. It is the difference between this estimate and the actual level of provision that is the residual. These residuals define a 'relative' hinterworld—in which other cities that are 'over-linked' to city *i* are identified (a positive residual) and also where city *i* is 'under-linked' (a negative residual) with respect to position in the world city network (i.e., its GNC).

Such mappings of hinterworlds have been analyzed and discussed for North African/West Asian cities,[40] for Dutch cities,[41] for British cities,[42] and for Belgium cities.[43] The hinterworlds of all 123 cities, including the 23 US cities, are depicted in the GaWC virtual Atlas of Hinterworlds.[44]

**Computing regional orientations within hinterworlds**

Geographical orientations within city hinterworlds, such as a propensity to be over-linked to neighboring cities or to a particular world region, can be measured by converting the hinterworld residual values into ordinal scores in the following way. First, for City i, the top ten over-linked cities are scored 3, the next top 20 are scored 2, and remaining over-linked cities score 1. Under-linked cities are similarly scored as negative values: -3, 2, and -1. Second, identify Region X which includes, say, 10 cities. Summing the values for just these 10 cities provides an aggregate measure of City i's geographical orientation to Region X. If the sum is 30 this means that Region X's cities actually constitute the top ten over-linked cities. This is a maximum score; in practice we might expect less extreme orientation. Third, we divide the sum by the maximum possible sum to measure the relative orientation to a region. In the case above the orientation of City i to Region X is 1.0 which one the limit of the scale, the other is -1.0 when maximum under-linkage is found. Producing a scale between plus and minus one in this way enables us to create comparable measures of the geographical orientations of cities across different world regions.

## Endnotes

1. Peter J. Taylor is associate director of the Metropolitan Institute at Virginia Tech and co-director of the Globalization and World Cities (GaWC) Study Group and Network at Loughborough University, UK. He is author of *World City Network: a Global Urban Analysis* 2003 (London: Routledge). Robert E. Lang is director of the Metropolitan Institute at Virginia Tech and an associate professor of urban affairs and planning. He is author of *Edgeless Cities: Exploring the Elusive Metropolis* (Washington: Brookings Institution, 2003).

2. See the argument in Susan E. Clarke and Gary L. Gaile, *The Work of Cities* (Minneapolis: University of Minnesota Press, 1998)

3. The two classic derivations of world city hierarchies are: J. Friedmann, "The World City Hypothesis," *Development and Change* 17 (1986): 69–83 and R.P. Camagni, "From City Hierarchy to City Network." In T. R. Lakshmanan and P. Nijkamp, eds., *Structure and Change in the Space Economy* (Berlin: Springer-Verlag, 1993).

4. The leading papers in this research school were brought together in L. S. Bourne and J. W. Simmons, eds., *Systems of Cities* (New York: Oxford University Press, 1978).

5. The city competition referred to here is that between major city regions, not cities as in incorporated administrative entities. The literature is reviewed and developed in a special issue of *Urban Studies,* see W. F. Lever and I. Turok, "Competitive Cities: Introduction to the Review," *Urban Studies,* 36 (1999): 1029–44.

6. Jane Jacobs, *Cities and the Wealth of Nations* (New York: Vintage, 1984).

7. A good discussion of this distinction can be found in W. W. Powell, "Neither Market Nor Hierarchy: Network Forms of Organization," *Research in Organizational Behavior* 12 (1990): 295–336. See also G. Thompson, *Between Hierarchies and Markets: The Logic and Limits of Network Forms of Organization* (Oxford University Press, 2003).

8. This position is presented in detail in Taylor, *World City Network.*

9. John Friedman, "The World City Hypothesis." This approach to defining the "world city system" has been recently operationalised in Arthur S. Alderson and Jason Beckfield, "Power and Position in the World City System," *American Journal of Sociology* 109 (2004): 811–51. For a comparison with the approach adopted here, see Peter J. Taylor, "Parallel Paths to Understanding Global Inter-city Relations," GaWC *Research Bulletin* 143 (www.lboro.ac.uk/gawc). This alternative approach has previously been applied to U.S. inter-city relations by Allan Pred, *City-Systems in Advanced Economies* (London: Hutchinson, 1977) and Christopher Ross, *The Urban System and Networks of Corporate Control* (Greenwich: JAI Press, 1992).

10. Saskia Sassen, *The Global City (Princeton University Press,* first edition 1991, second edition 2001).

11. For Sassen, the production and sale of advanced producer services are crucial elements of her global cities.

12. Lang, *Edgeless Cities.*

13. Friedmann, "The World City Hierarchy," *Development and Change* 17 (1986): 69–83.

14. D. R. Meyer, "The World System of Cities: Relations Between International Financial Metropolises and South American Cities," *Social Forces* 64 (1986): 553–581.

15. A. D. King, *Global Cities* (London: Routledge, 1990).

16. D. R. Meyer, "Change in the World System of Metropolises: The Role of Business Intermediaries," *Urban Geography* 12 (1991): 393–416.

17. S. Sassen, *Cities in a World Economy* (Thousand Oaks, CA: Pine Forge, 1994).

18. W. Wu, "Economic Competition and Resource Mobilization." In M. A. Cohen, B. A. Ruble, T. S. Tulchin and A. M. Garland, eds., *Preparing for the Urban Future* (Washington: Woodrow Wilson Center, 1996).

19. F-c. Lo and Y-m. Yeung, *Globalization and the World of Large Cities* (Tokyo: University of United Nations Press, 1998).

20. J. R. Short and Y. Kim, *Globalization and the City* (London: Longman, 1999).

21. For full details of the specification, see Taylor, "Specification." The methods appendix provides a summary of that argument highlighting aspects necessary for this paper.

22. See **www.lboro.ac.uk/gawc** and **www.mi.vt.edu**

23. This data collection effort was funded by the Economic and Social Research Council of the United Kingdom and is described in detail in Peter J. Taylor, Gilda Catalano and David Walker, "Measurement of the World City Network," *Urban Studies* 39 (2002): 2367–2376. The regional breakdown is: Europe 101, Northern America 50, Pacific Asia 37, Latin America 37, Sub-Saharan Africa 32, Middle East/North Africa 25, South Asia 13, Australasia 12, CIS 8.

24. *Op cit.*

25. The technique for measuring and mapping hinterworlds is described in detail in Peter Taylor and David Walker, "Hinterworlds Revisited," *Geography* 89 (2004): 145–51. The methods appendix provides a summary of this technique.

26. The United States contains 40 of the 315 cities in the global services/cities data, 23 of which are in the 123 cities used for defining hinterworlds.

27. See "Visualization" section at **www.lboro.ac.uk/gawc**

28. J. Abu-Lughod, *New York, Los Angeles, Chicago, America's Global Cities* (Minneapolis: University of Minnesota Press, 1999).

29. Ed Brown, Gilda Catalano and Peter Taylor, "Beyond World Cities," Area 34 (2002): 139–148.

30. Carl Abbot, *Political Terrain: Washington DC from Tidewater Town to Global Metropolis,* (Minneapolis: University of Minnesota Press, 1999). More generally, he promotes a historical approach to understanding U.S. world cities: Carl Abbott, "The International City Hypothesis: An Approach to the Recent History of U.S. Cities," *Journal of Urban History* 24: 28–52.

31. J. R. Short, "Black Holes and Loose Connections in the Global Urban Network'" *GaWC Research Bulletin* No. 76.

32. The European Union (EU) is chosen for comparison because it is an economic area roughly equivalent to the U.S. in economic size and wealth. Pacific Asia has no such institutional unity but it does constitute a key globalization arena and therefore provides a second valuable comparison.

33. Remember that it is only global firms included in the study; we do not consider national or local firms. Thus the 'national localism' recorded shows how global firms are using US cities.

34. Manual Castells, *The Rise of Network Society* (Oxford: Blackwell, 1996).

35. Jacobs op cit. Described in detail in Jane Jacobs, *The Economy of Cities* (New York: Random House, 1969). See also Jane Jacobs, *The Nature of Economies* (New York: Vintage, 2000), discussion of Los Angeles page 51.

36. See Jones Lang Lasalle at **www.joneslanglasalle.co.uk/**

37. Jonathan Bowles and Joel Kotkin, *Engine Failure* (New York: Center for an Urban Future, 2003).

38. Short, "Black Holes."

39. Richard Florida, *The Rise of the Creative Class: and How it's Transforming Work, Leisure, Community and Everyday Life* (New York: Basic Books, 2002).

40. Peter Taylor, "West Asian/North African Cities in the World City Network," *Arab World Geographer* 4 (2001): 146–159.

41. Peter Taylor, *Amsterdam in the World City Network* (Amsterdam: AME, 2002).

42. Taylor, "Hinterworlds Revisited."

43. Ben Derudder and Peter Taylor, "Brussels in the World City Network," *Belgeo* 4 (2004): 259–76.

44. See "Visualization" section at **www.lboro.ac.uk/gawc**

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