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Measuring the World City Network: New Results and Developments

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Lists, Rankings, Hierarchies and Cities

We live in an age of 'list-mania'; there is so much information available that ordering selected topics has become popular entertainment. And so it is with cities, there are numerous rankings of cities available in both the commercial and academic spheres. People are interested in where their city ranks and this can be fun. Some years ago my city, Newcastle, was ranked above Rio as a 'world party city'; it made headlines in the local press. But beyond boosterism there has been a genuine concern for cities as business centres in a rapidly globalizing world economy. GaWC, with its measures of network connectivity, has contributed to this situation with its rankings of the importance of cities in the world city network. In fact, it appears that it is these rankings that most people want from GaWC. But there is a basic sense in which concern for city rankings operates against *the spirit of the GaWC project* (Taylor 2004).

City rankings fit into the approach to inter-city relations that emphasizes competition between cities. This is in keeping with the long-term, conventional theoretical approach to inter-city relations that described 'national urban systems' in each of which exists a 'national city hierarchy' broadly conforming to classical central place theory. The intellectual power of this theoretical framework can be appreciated through the fact that 'city hierarchies' appear almost natural (Taylor 2009) – how else would cities relate to each other except through hierarchies? From this position ambitious cities are expected to 'climb the hierarchy' at the expense of rival cities. But there is an alternative position. I think that inter-city relations are inherently cooperative; *cities exist in city networks and networks can only exist through collective complementarities* (Powell 1990; Thompson 2003). Cities need one another, they grow through relations with one another not by eliminating one another in a world of city competition. Thus one of GaWC's aims has been to reposition research on inter-city relations from the easy seduction of hierarchies to the complex subtleties of networks.

Of course, in practice, inter-city relations are both cooperative and competitive; it is a matter of where to begin. At GaWC we start with network so that we measure a 'world city network with hierarchical tendencies' (Taylor 2004). We treat *network relations as generic to cities and hierarchical relations as contingent*: city competitiveness varies in space and time with competitive relations being stronger locally and in cyclical downturns. Returning to theory,

our starting point is the specification of a world city network to replace hierarchical theory in its various forms (Taylor et al 2010).

The Interlocking Network Model

Networks are relatively easy to understand. They usually consist of two layers, the net level and the node level. For instance, in a social network analysis of a gang, members are nodes, the gang is the net level and relations between the nodes (members) define the nature of the network. Formal city government associations work in this way with the cities (members) as nodes, the city association represents the net level, and the formal relations between members within the association define the network. Such networks can be an important component of global governance but this is not how cities operate as key components of the global economy. In the latter, it is advanced producer service firms that are the network makers; they create the world city network through their everyday practices linking offices across the world. This defines a different type of network, an *interlocking network* (Knoke and Kuklinski 1982).

An interlocking network is unusual in having three layers. In the case of the world city network there is the net level of the global economy, the node level of cities, and an additional *sub-nodal level of service firms*. The latter are not just an additional level, they define the critical level: this is where the agents of network formation are found. In the global economy, it is firms who are the network makers not the cities themselves. Thus for studying the world city network it is service firms that are investigated in order to understand the city network as the outcome. In other words, it is through studying the locational strategies of firms that it is possible to describe and analyse the world city network: *firms are the object of the research, cities are the subject of the research.*

Why focus on these service firms? In the 1970s two separate industries, computers and communications, merged their technologies to enable work to be coordinated worldwide based upon simultaneous connections. Early on Sassen (1994) spotted two contrasting economic geography effects: first, a dispersal of production to cheaper labour locales, and second, a contrary trend towards concentration of management and business service industries. The latter were required to organize the new worldwide production and were concentrated in cities. As Sassen (1991) originally argued, it is this concentration of management alongside financial, professional and creative services that characterises contemporary ‘global cities'. Of course, service firms have always clustered in cities to provide such services to their clients but *under conditions of contemporary globalization those specialised services became worldwide with fundamental implications for work practices*. Firms need a multiple office policy across many cities to provide a seamless service to protect global brand integrity by keeping all work in-house.

This is how it came to be that from the 1980s onwards there have been hundreds of large service firms with trans-national office networks, many of them global in scope. Each firm had its own locational strategy – which cities to have offices in, what size and functions those offices will be, and how the offices will be organised. *It is the work done in these offices that ‘interlock' various cities* in projects that require multiple office inputs. Thus the inter-city relations in these servicing practices are numerous electronic communications – information, instruction, advice, planning, interpretation, strategy, knowledge, etc., some tele-conferencing as required, and probably travel for face-to-face meetings at a minimum for the beginning and end of a given project. These are the *working flows* that combined across numerous projects in many firms to constitute the *world city network* (Taylor 2001, 2004).

So we have to study service firms to describe and analyse the world city network but, unfortunately, there is no feasible way that data could be collected from firms on these working flows. As well as the obvious confidentiality issues with competing private firms, there is also a feasibility issue: the degree of research collaboration that would be needed from a large number of firms makes such a data collection exercise beyond reasonable social science research logistics. However, this is not a particularly rare situation in measurement practices: where direct measures cannot be obtained, there is the fall back position of carrying out *indirect measurement*. This requires access to more easily available data plus credible assumptions about how the firms operate.

As mentioned previously, service firms offer a seamless service across their office networks. This means that the geographical distribution of their offices, and their scope and range, are important selling points in attracting new clients. Hence such information is commonly available on service firms' web sites. This has been the main source of data for measuring the world city network: for each firm, offices are assessed individually by asking what is the importance of this office in this city within the firm's overall office network? Answers to this question are termed the *service value of a city to a firm*. These values are coded and become the quantitative input into the study: the coding ranges from 0 (a firm having no office in a city) to 5 (a city housing the headquarters of a firm); standard or typical offices of a firm score 2, minor and major offices 1 and 3, respectively, leaving 4 for scoring cities housing exceptionally important offices such as regional headquarters. The credible assumption that is made is that the more important an office the more working flows it will generate. Therefore two important offices will generate a much higher level of flow between their respective cities than two minor offices between their respective cities. These data and this assumption are combined to generate estimates of inter-office working flow levels between cities for each firm; they are not actual working flows, but *potential working flows, indirect measures derived from the data and the model assumptions*. Aggregating all potential working flows for all firms located in a city generates estimates of its working flow relations with other cities; when this is done for all cities it constitutes the world city network.

Network connectivity is the main measure of importance of a city in this model (Taylor 2001). It is computed from the products of service values for the city with each other city for all firms. Thus assuming m advanced producer service firms and n cities we can define a service value for firm j in city i as v_{ij}. The *basic relational unit of measurement* is given by

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

which defines the relation between cities a and b in terms of firm j. This is an *elemental interlock* between two cities for one firm. The aggregate *cities interlock* between the cities is then given by

$$r_{ab} = \sum_{j} r_{ab,j} \quad (2)$$

For each city there are n -1 such interlocks and the *network connectivity for a city* is given by

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

where *Ca* is the *network connectivity of city a*. This relates city *a* to all other cities within the network through its firms and *measures the degree of integration of the city into the world city network.*

This data collection and analysis exercise was carried out in 2000 utilizing 100 office networks of 'global service firms' in accountancy, advertising, banking/finance, insurance, law, and management consultancy (Taylor et al 2002). Such firms were defined by having offices in 15 different cities or more including at least one office in each of the three main globalization arenas – northern America (USA plus Canada), western Europe, and Asia Pacific. Otherwise the firms were chosen pragmatically in terms of the quality of information on their websites, an important consideration given our research resources. Offices were traced across 315 cities worldwide. The result was a *315 cities x 100 firms matrix of 31,500 service values*. Each column represents the locational strategy of a firm; each row represents the service mix of a city.

This exercise was repeated in 2004 (Taylor and Aranya 2008). However, because of corporate reorganizations and other changes, direct comparisons could only be made with 80 of the original 100 firms. The resulting 315 x 80 matrix of 25,200 service values was still deemed large enough to produce credible results. But this attrition of the original "GaWC 100" firms by a fifth made continuation of this approach problematic. Thus a revision in firm selection for the 2008 data collection was instituted.

The Revised, Improved 2008 Data Collection

Collaboration between the Global Urban Competitiveness Project (GUCP) at the Chinese Academy of Social Sciences (CASS) and GaWC researchers at Loughborough and Ghent Universities made possible a much larger and complete data collection of advanced producer service firms. In order to put the data collection on a sustainable future trajectory, firms were simply chosen by their size not where there offices are located or the quality of their websites. For four of the previously studied services – accountancy, advertising, law and management consultancy – we included the top 25 firms. We combined banking/finance with insurance to define a financial services category and included the top 75 firms. Thus the number of firms was increased from 100/80 to 175. More important, this number will be retained in future data collection. Thus any future change recorded will be the result of both changes by individual firms and by firms entering and leaving the top 25/75 of the service sectors.

In addition we carried out a thorough review of cities and added many new cities from emerging markets to create a list of 525. The coding remained the same: CASS carried out the major data collection exercise between January and May 2008; the data were checked at Ghent University. The end result is a *525 cities x 175 firms matrix of 91,875 service values*. These are the data used to produce the new results reported below.

A Digression: Return of Alpha, Beta, Gamma World Cities

When we first embarked on the GaWC project, we carried out a study of how London was connected to other world cities through its advanced producer service firms. As a starting point we needed a roster of 'other world cities' to begin our measurements of London's links. For this exercise we used a basic Adansonian taxonomy approach that eschews theoretical presumptions and just aggregates available empirical evidence, in this case presence of advanced producer service firms in cities (Beaverstock et al 1999). *Simply summing city*

attributes allowed us to define world cities and categorise them into three levels: alpha, beta and gamma. To our continuing embarrassment, this very early work remains by far our most cited and quoted research output. That there was a demand for a roster of world cities in this research and policy community there can be no doubt, but this simple piece of crude empiricism was most certainly not the answer required.

It was only subsequent to this initial work that we specified the world city network as an interlocking network and derived measures of network connectivity to measure how well a city was integrated into the network through its service firms. The resulting *city connectivities are relational measures*, the correct way of measuring the importance of cities in a network.

However, try as we may to forget or at least ignore our most cited paper, a decade later requests and queries continue to come in about alpha, beta and gamma world cities. We have decided to go with the flow and *return to these categories but to treat them as levels of integration within the world city network.* This means using the network connectivity results and recasting them as general categories. One advantage of this is that it eschews the individual ranking of cities and provides only ordinal classes. This is more in keeping with our 'network with hierarchical tendencies' position and is probably more in keeping with the degree of robustness in our aggregative measurements.

Results: Alpha Cities in the World City Network, 2008

Not wanting to over-burden you with too many cities, I will keep the reporting of results to just the alpha cities. In addition I will compare the 2008 results with those for 2000 and 2004. Although the basis of firm selection has changed, I think comparing the results remains interesting and reflects genuine changes in the world city network.

Table 1 lists all alpha level cities identified in 2000, 2004 and 2008. The following empirical points are noteworthy:

- *London* and *New York* define a duopoly that constitutes a case apart – 'NYLON' is the *global cities dyad par excellence*.
- *Hong Kong* is consistently number 3 (NOT Tokyo) and is definitely gaining in importance and approaching the alpha++ level – if current trends continue, it is likely that the world city network will be dominated by a *global cities triad* - NYLOHK - in the very near future
- The alpha ++/+ levels are *over-represented by western Pacific Rim cities* (50% in 2000 & 2004), a pattern strongly accentuated in 2008 by the rapid elevation of *Sydney*, *Shanghai* and *Beijing* (THIS IS THE KEY FINDING OF 2008)
- Excepting New York, *US cities are very distinctive* in their positioning in the world city network: possibly under-represented with only 6 alpha world cities in 2000, *Miami* and *Atlanta* drop out in 2004, and *San Francisco* is missing from the 2008 list. This leaves the US with just three alpha world cities, *New York* plus *Chicago* and *Los Angeles*, the latter hanging on as a lowly alpha-city. I will return to this surprising result below.
- The rise of *cities from 'emerging markets'* is very clear – in the plain alpha category they were represented only by *Sao Paulo* in 2000 and 2004 but despite this level reducing in number of cities, *Seoul*, *Moscow*, *Mumbai*, *Buenos Aires* and *Kuala Lumpur* have joined to constitute the majority of plain alpha cities in 2008.

- The emerging cities' rise from 2004 to 2008 is largely at the *expense of leading western European cities*: *Amsterdam*, *Frankfurt* and *Zurich* move down to alpha- level. However, *Madrid* and *Brussels* consolidate their alpha level status, and *Milan* rises to alpha+
- In the *ex-COMECON countries of eastern Europe* whose economic privatizations in the 1990s led to their services-led integration into the world economy, *Warsaw* appears to be leading city by 2008; *Berlin* through its absence from the lists confirms the failure of its bid to become a major world city (see Krätke 2000)
- Finally, the cities with relatively stable trajectories not mentioned so far should not be ignored: *Paris* and *Singapore* stay alpha+, *Toronto* remains alpha, and *Mexico City*, *Taipei*, *Jakarta*, *Stockholm*, *Bangkok*, and *Dublin* are alpha-cities in all three lists.

To aid in interpreting these results, I have provided average network connectivity scores in Table 2 for the different alpha levels. The connectivities are computed as proportions of the highest city connectivity (i.e. London's). The important point to make about this table is that 2008 averages are higher for all four levels. Thus, even though the alpha+ level is increased by four cities, this does not dilute the average; rather the new cities bolster the average. This indicates that globalization of services has been a dynamic process of growing bigger offices in many cities while extending office networks to new cities. The result has been an expanding and increasing integrated world city network. In these circumstances, cities with long established service offices in western Europe and the USA will decline relatively (standing still) while the rest of the world catches up.

But the USA is a special case with its cities being reported as under-represented in the world city network in 2000 (Taylor 2004; Taylor and Lang 2004) and 2004 (Taylor and Aranya 2008). The 2008 results continue and perhaps accentuate this trend (Derudder et al 2010). This appears to be a result of the US home market for advanced producer services being far greater than for any other country. This has two key effects. First, foreign firms find it hard to penetrate the market and often choose to represent clients through just a New York office. Second, US service firms have less reason to gamble on global expansion – compare a Chicago management consultancy company with an Amsterdam company, the former can make better profits through domestic expansion, the former can only expand in a big way through new cross-border work. Both effects lead to a tendency for US cities other than New York being less integrated in the world city network than might be expected.

Finally the all-important caveat: the GaWC method of measuring the world city network produces theoretically informed, empirically robust assessments of cities in globalization. But it measures just one process in city development: the servicing of global capital. As shown, London and New York are the supreme archetypal cities in this regard. But, as we have also seen, the failure of Berlin has shown that the world city network can never be a collection of mini-Londons and little New Yorks. All world cities will have mixtures of cutting edge economic functions but these need not just be advanced producer services. The key is to find economic niches but without being vulnerable to economic specialization (Turok 2009). Milan and its design portfolio, Singapore and its logistics portfolio, Los Angeles and its entertainment portfolio and, outside the alpha cities, Houston and its energy portfolio, are each important examples of world cities despite their contrasting positions in the world city network (Taylor 2005). However, whatever the niches, cities WILL need to have *a sufficiency of advanced producer services* so as not to make it too overtly dependent on London, New York and their rare ilk. Thus within the world city network as conceptualised by GaWC, there will be ‘global cities' in the original sense of Sassen (1991) focusing on advanced producer

services, as well as numerous other cities with varying sufficiency in advanced producer services. GaWC network connectivities and the resulting levels of integration into the world city network represent just one process, albeit especially global in scope, among many that constitute contemporary cities in globalization.

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NOTES

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