Research on world cities has been defined by a simple idea, that relations between cities are important for what occurs within them (e.g. Friedmann, 1986; Sassen, 2001; Knox and Taylor, 1995). Typically situated in relation to the discourse on globalization, this research seeks to address the widespread sense that what happens ‘here’ is increasingly related to, and even dependent upon, what happens ‘there’ in the new global economy, polity and culture. Moreover, globalization is held to be fundamentally restructuring the global urban hierarchy, and thus altering the ‘there’ with which ‘here’ is linked. In contrast to the comparatively glacial pace at which major cities rose and fell in earlier human history, scholars such as John Friedmann have characterized the present era as one in which ‘cities may rise into the ranks of world cities, they may drop from the order, and they may rise or fall in rank’ in short order (Friedmann, 1995, p. 26). Thus the rise of Dubai and the decline of Detroit, to note but two dramatic examples, signal the emergence of a novel hierarchy of cities, one that may cut across long-standing North/South and East/West divides in the world system.

Approaching the world city system as a network, what is the content of the relation that links cities together within it? Our reading of the literature suggests that the network of world cities is best conceptualized as multi-relational, formed by analytically distinct networks in various domains. Ideally, then, in studying the world city system, one would seek to collect data on a range of relevant economic, political, social and cultural linkages between cities. Unfortunately, such data are exceedingly rare. As Taylor (2007) has argued, one consequence of the overriding focus of the social sciences on the nation-state is that there simply are no intercity analogues of the large international data sets that can be employed to link nation-states together in international flows.

This state of affairs has begun to change, perhaps decisively. While it may remain the case that ‘unrelational’ research – research that proceeds in ignorance of the ‘connections, links, [and] flows’ between cities – ‘continues to dominate urban studies even within the world city literature’ (Taylor, 2004, p. 2), in the last two decades a number of scholars have begun the painstaking task of gathering data on relations between cities. These data have allowed researchers to address a range of fundamental questions about individual cities in the world system, and about the evolving global urban system itself. In this chapter, we review research on one of the more empirically tractable – and, arguably, central – networks suggested to define the world city system: corporate networks.

CORPORATE NETWORKS AND WORLD CITIES

As firms acquire branches and subsidiaries around the world, they knit cities into a network of ownership, hierarchy and control. If the location decisions of firms are subject to isomorphic pressures, such pressures will tend to produce a hierarchy of cities/
places that mirrors the internal hierarchy of the modal firm. High-level ‘command and control’ functions, for instance, will cluster in a few key locations and, by tracing out the ties emanating from such centers, one can array cities in a hierarchy in a fashion akin to drawing up a firm’s organizational chart, producing a formal representation of the structure of the city system and of the positions occupied, and roles played, by cities.

Developed in different ways by figures such as Cohen (1981) and Hymer (1972), this insight has sparked theory and empirical research on world cities. ‘World cities’ are typically defined as those that occupy a central position in corporate networks. Friedmann (1986, pp. 70–77), for instance, describes them as ‘basing points in the spatial organization of production and markets’. Similarly, Sassen (2001, pp. 3–4) characterizes ‘global cities’ as ‘concentrated command points in the organization of the world economy’. The isomorphic pressures on location decisions that generate such ‘peak’ cities (i.e. producing a clustering of headquarters in a limited number of cities, rather than a more uniform spatial distribution) are generally assumed to lie in agglomeration economies. This is perhaps given its most sustained theoretical treatment in Sassen’s *The Global City* (2001).

Sassen argues that the global control exercised by transnational firms depends critically on a wide array of producer and professional services. The global dispersion of production and distribution in the context of the ‘new’ new international division of labor – which spans multiple political, cultural, linguistic, jurisdictional, and so on boundaries – requires highly specialized and sophisticated external inputs. Because these inputs are subject to agglomeration economies, firms will locate their headquarters or seek to open branches where producer and professional services cluster, further catalyzing the geographic clustering of global control functions.

While there are a range of economies of agglomeration that may emerge from the spatial concentration of corporate headquarters in and of itself, research on corporate networks of world cities typically proceeds in close dialogue with research on producer service networks. As Derudder (2007) has noted, this has caused uncertainty regarding the conceptualization and operationalization of ‘world cities’ – sites of global command and control – as opposed to Sassen’s ‘global cities’ – sites of the production of the inputs integral to such control. As we detail below, it is best to view work on corporate networks as focused on *already realized* global control and, as such, addressing the world city, rather than global city, problematic.

**KEY QUESTIONS**

A set of questions common to the broader literature on world and global cities motivates research on corporate networks. First, such research identifies world cities, using various techniques to determine which cities sit atop the urban hierarchy. Second, it seeks to determine the extent to which globalization alters the global urban hierarchy. Third, it is concerned with the spatial distribution of command and control. A key – and distinctive – idea that emerges is that globalization has, in part at least, been a fundamentally implosive, rather than explosive, process. As Sassen describes it, ‘the more globalized the economy becomes, the higher the agglomeration of central functions in a relatively few sites’ (2001, p. 5). Fourth, research has sought to determine the extent to which the world city system is evolving in ways that cut across long-standing
North/South and East/West divides. In the foundational work of Friedmann and Sassen, there is a strong suggestion that globalization is generating a ‘new geography of centrality (and marginality)’ (Sassen, 1998, p. 393), raising questions about the nature and trajectory of contemporary global inequality. Finally, this research is concerned with identifying the general structural features of the world city system as a system, the positions and roles that are emerging within it, and the implications of these features for cities and their residents. Smith and Timberlake (1995, p. 293) emphasize placing the question of the ‘overall morphology’ of the world city system at ‘the centre of the analysis’, linking the development of the world city system to that of the Wallersteinian (1974) world-system.

DATA AND METHOD

Research in this area begins by defining a sample of firms, always through purposive rather than random sampling. In an early paper exemplary of this approach, Meyer (1986) uses Polk’s World Bank Directory to identify every city in South America with an international bank office and to link these cities to the ‘international financial metropoles’ of bank headquarters. Ren (forthcoming) also uses sector-specific data, employing a list of architectural firms identified by Building and Design magazine. In another early paper, Rozenblat and Pumain (1993) use a Dun and Bradstreet ranking to identify the 300 largest European firms and then survey these firms about their foreign subsidiaries, using the results to link the location of the largest European firms to the location of their European subsidiaries. In our own research (e.g. Alderson et al., 2010), we use rankings such as Fortune magazine’s Global 500 to identify the world’s 500 largest multinationals in various years and then use the Directory of Corporate Affiliations to identify the headquarters and branch locations of these firms. Carroll (2007) begins his examination of how firms tie cities together through interlocking directorates in a similar fashion, using Fortune’s Global 500.

Having identified a sample of firms and gathered information on location, researchers must decide how to 1) address internal corporate hierarchies; 2) generate a network of cities from information on firms; and 3) code the relations in the network. With notable exceptions (e.g. Rozenblat and Pumain, 2007; Wall, 2009), research in this area typically does not attempt to incorporate detailed information on within-firm hierarchies. As a result, a firm’s subsidiaries are treated as equivalent in their relation to each other and to the firm’s headquarters. Thus, in contrast to research of the GaWC group on advanced producer service networks, research on corporate networks usually proceeds by ‘flattening’ internal corporate hierarchies, focusing on headquarters–subsidiary relations. Regarding the transition from firms to cities, when it has been articulated (e.g. Beckfield and Alderson, 2006; see also Neal, 2008), it has been rooted in Simmel’s insight, formalized by Breiger (1974), regarding the ‘duality of persons and groups’. Just as ties between groups are persons and ties between persons are groups, in this work ties between cities are firms and ties between firms are cities. Thus given data on the network of firms linked by cities, one can readily derive the network of cities linked by firms. While research typically focuses on the latter, both have distinct structural properties worthy of analysis. For instance, using the GaWC data, Neal...
(2008) shows that there is greater inequality in the network of cities linked by advanced producer service (APS) firms than in the network of APS firms linked by cities, suggesting that ‘place matters’ in ways not entirely revealed by a simple summation of the service values of APS firms active in each city. Regarding coding, the central decisions concern whether or not to treat the data as directional – to distinguish between senders and receivers (e.g. headquarters and subsidiaries) – and valued – to allow multiple ties between two cities. Coding the location of the headquarters and subsidiaries of 446 of the Fortune Global 500 in 2000, Alderson and Beckfield (2004), for instance, construct a $3692 \times 3692$ matrix in which values above the main diagonal of the matrix represent the number of subsidiaries of firms headquartered in City A that are located in City B, and values below the main diagonal represent the number of subsidiaries of firms headquartered in City B that are located in City A. Data can also be coded as undirected. Ren (forthcoming) constructs a symmetric, valued $198 \times 198$ matrix in which cities are linked by architectural firms, coding the relation as undirected to reflect the idea that headquarters–subsidiary relations in such firms are ‘horizontal and collaborative’ rather than hierarchical.

An array of methods has been used to analyse such data. Given the interest in identifying world cities and ranking them, research on corporate networks typically devotes a good deal of attention to the centrality of cities. Early work attempted to assess the importance of different cities in terms of how many corporate headquarters they hosted. Meijer (1993), for example, traces the ‘growth and decline of European cities’ by examining the shifting spatial distribution of the headquarters of the 500 largest European firms from 1973–1988. More recent work links headquarters to subsidiaries and assesses the degree centrality of cities – the number of ties that a given city has with other cities in the network. Carroll (2007) and Ren (forthcoming) treat the relation between cities as symmetric. In Ren’s analysis, the most central cities are those with the largest number of offices (headquarters or branch) and Shanghai emerges as the most central city in the network of architectural firms. Others treat the relation between cities as asymmetric, distinguishing between outdegree (number of ties sent) and indegree (number of ties received). Rozenblat and Pumain (2007, p. 144) calculate the outdegree of European cities to ‘map out a system of control-dependence’ between cities that host headquarters and cities that host subsidiaries. Alderson and Beckfield (2004) and Wall (2009) calculate both the outdegree and indegree of the cities in their networks, distinguishing between network power (outdegree) and network prestige (indegree). In the wider literature on world cities, a number of additional measures of network centrality have been employed: betweenness (the probability that the paths linking cities $j$ and $k$ contain city $i$), closeness (the inverse average distance between city $i$ and all other cities) and Bonacich power centrality (where the centrality of a city is a function of the centrality of the cities it is connected to) (see Wasserman and Faust (1994) for formulae). Each highlights distinct senses of network centrality and power and can be employed to identify and rank world cities.

Examination of these centrality measures also figures prominently in attempts to address the questions of how much the global urban hierarchy is 1) being restructured in the context of globalization, and 2) being restructured in ways that concentrate global command and control functions. Comparing the world city system in 1981 and 2000, Alderson and Beckfield (2007) calculate the Spearman rank-order correlation among
centrality measures to assess the degree to which cities exchange ranks over the period under investigation and employ a standard measure of inequality – the coefficient of variation – to assess change in the distribution of centrality measures.

In the earliest work attempting to assess the extent to which the world city system is evolving in ways that cut across Global North and South (and East and West), scholars note, based on varied data, the rising importance of Southern and Eastern cities (and, correspondingly, the declining importance of cities in the North and West). Sassen (1998, p. 394), for instance, describes a new ‘transterritorial “centre”’ that includes cities such as New York, London and Tokyo, but also ‘cities such as São Paulo and Mexico City’. Similarly, in their taxonomic exercises, Friedmann (1995) and Beaverstock et al. (1999) note the appearance of cities such as Singapore, São Paulo, Beijing and Buenos Aires in their inventories of cities located at the apex of the world city system. The most recent attempt to address this question appears in Alderson et al. (2010). They assign cities in their network to the world region (e.g. Asia, Africa, Latin America) and the circa 1970s world-system position (i.e. core, periphery or semi-periphery) of the nations in which they are located. They then regress change in network centrality on these region and world-system position indicators, reasoning that network centrality should grow increasingly orthogonal to ‘old’, established divisions in the world city system over the 1981–2007 period as a ‘new geography of centrality and marginality’ evolves across the era of globalization. Wall (2009) proceeds similarly, using GIS (Geographic Information System) techniques to examine the ‘linkage distribution’ between cities, nations and regions.

Finally, a number of scholars have been interested in determining what sort of system the world city system is, and with identifying and characterizing the different positions and roles that are emerging within it. Wall (2009) uses Zipf regressions to establish that the corporate network of world cities is a scale-free network (i.e. has a degree distribution that follows a power law). This finding has important implications for our understanding of the world city system: scale-free networks, as a class of networks, are known to display small world and Pareto distributions, to prove robust to random interruption (while being at risk of cascading failure), and to exhibit ‘rich get richer’ and ‘winner take all’ features as they develop (e.g. Barabási, 2002). Smith and Timberlake (1995) pioneered the use of blockmodeling techniques in their research on airline networks. Very generally, blockmodeling abstracts from information on individual cities to identify ‘types’ of cities that are defined by their relation to other ‘types’ of cities in the system (i.e. positions and roles). Of the many decisions involved in the course of blockmodeling (see Lloyd et al., 2009), the most fundamental concerns the notion of equivalence employed to join cities into positions. Smith and Timberlake (2001) cluster cities in terms of structural equivalence: cities are assigned to sets composed of cities that share the same ties to all other cities. Strict structural equivalence is rarely observed in such data, so researchers, based on substantive and theoretical concerns, typically settle on an approximation of strict structural equivalence to join cities (Wasserman and Faust, 1994). Alderson et al. (2010) join cities in terms of regular equivalence. Regular equivalence relaxes the constraint that cities be joined when they have identical (or near-identical) relations with others, joining cities instead based on the degree to which they have relations with equivalent others (e.g. abstracting from concrete kinship relations to identify ‘fathers’, ‘daughters’, ‘cousins’, etc.). Having joined cities into equivalence sets, one can then seek to identify the roles
played by such cities in the network (see Alderson and Beckfield, 2004, especially Table 5 and Figure 3).

RESULTS

Research on corporate networks of world cities has contributed to debates over which cities sit atop the global urban hierarchy. For instance, it demonstrates the surprising (in light of earlier attribute-based rankings) structural power of Tokyo and Paris. In the case of Tokyo, although it is less prestigious than London and New York in that it receives fewer ties, we find in 2000, for instance, that it sends far more ties (3639) than either London (1955) or New York (2601). Also in terms of outdegree, Paris ranks between London and New York, at 2535 ties sent (Alderson and Beckfield, 2004). Wall’s (2009) analysis of the top 100 global firms in 2005 identifies Paris and Tokyo as 2nd and 3rd, respectively, in terms of outdegree. Surprises also appear further down the ranking of cities, as prominent cities such as Miami, Singapore, Mexico City, São Paulo and Sydney do not appear among the 50 most powerful cities in the corporate network. Drawing on a selection of *Fortune* Global 500 firms, but focusing instead on interlocking directorates, Carroll (2007, p. 2306) also shows the power of Paris-based firms, along with firms headquartered in Frankfurt and Montréal. Interestingly, although Tokyo exhibits a high degree of activity in the interlock network, directors of Tokyo-based firms are more likely to appear as isolates (p. 2304). This is partly due to the nationalized and regionalized structure of the interlock network (Carroll, 2007). In an investigation of corporate networks in the European region, Rozenblat and Pumain (1993) find that firms locate in cities in ways that reinforce the existing urban hierarchy.

In the corporate network, a city’s placement in the hierarchy is multidimensional, and varies according to which aspect of centrality is measured. As noted, Tokyo is more powerful than prestigious in that its outdegree far surpasses its indegree. In the case of Paris, it outranks all other cities on closeness and betweenness centrality, suggesting its strong strategic position in the corporate network. On indegree, cities commonly ranked high in attribute-based urban hierarchies, such as Barcelona, Miami, Vancouver, Johannesburg, Jakarta, Prague and Shanghai, appear as prestigious in that they host a great many subsidiaries, but they are not particularly powerful (Alderson and Beckfield, 2004). This suggests that attention to corporate networks may help to correct a tendency in the literature to mistake prestige for power (cf. Taylor, 2006; Beckfield and Alderson, 2006). Both prestige and power are regionalized in the corporate network of world cities. For instance, Wall (2009) finds that ‘North America, Europe and Pacific Asia together claim 98% of all outdegree relations and 82% of all indegree’ (p. 180). Tokyo and Paris both stand out as regionally powerful cities (Wall, 2009).

Evidence on change in the urban hierarchy in our research comes from a comparison of the corporate network in 1981 (the first year for which location data are available from the *Directory of Corporate Affiliations*) with the network in 2007 (Alderson et al., 2010). By all four measures of centrality, there is substantial evidence of change: cities’ ranks on these measures are only moderately correlated over the nearly 30-year period. Evidence
on the distribution of centrality in the corporate network reveals that this re-ordering of cities was not random: outdegree centrality became more unequally distributed, as did betweenness. Thus, from the early 1980s there is evidence of increasing concentration of command and control among a re-ordered hierarchy of cities.

Which cities change rank in the urban hierarchy? The evidence to date suggests that, rather than generating a new geography, the recent wave of globalization has reinforced existing divides in the world system (Alderson et al., 2010). These findings are in line with cross-sectional analysis of the corporate interlock network (Carroll, 2007), the European corporate network (Rozenblat and Pumain, 1993) and the top 100 Fortune multinationals (Wall, 2009). These inferences are reinforced by regional comparisons, which show that no region outside the Global North grew significantly more central during the 1981–2007 wave of globalization (Alderson et al., 2010), although Shanghai and Beijing have grown in power in the network of architecture firms (Ren, forthcoming). Likewise, analysis of the corporate network using regular-equivalence blockmodeling shows that when cities in the semiperiphery and periphery join the network, they do so as structural isolates, on the passive, dependent and internally disconnected fringes of the world city system. The same results hold for the regional comparisons: cities in Africa, Asia and Latin America are significantly more likely than Global North cities to join the system in a passive, dependent role, and significantly less likely than Global North cities to join the system in an active, primary role.

FUTURE

The collection of relational data on corporate networks is enabling inquiry into the hierarchy of world cities, change in the hierarchy, the concentration of command and control, the (de-)coupling of world city system structure from world-system structure, and the general form of inter-city relations. We see several promising directions for the future of this research. Below, we conclude this chapter by suggesting four unresolved issues that could guide further inquiry.

First, the role of industry and sector in the world city system has received too little empirical scrutiny. In our own work, we are building on sector-specific analysis by Meyer (1986), Ren (forthcoming) and Wall (2009) by disaggregating our multinational corporate network data so that sectoral city systems can be compared. Understanding how cities are embedded in networks that may differ by sector is potentially important for understanding the consequences of inter-city relations. One conjecture is that a city’s economic fate may be more closely bound to its position in a rapidly rising (or declining) sector-specific network than to its position in the corporate network as a whole.

Second, longitudinal data on city network formation can be used to address unresolved questions about the mechanisms of world city network formation. For instance, longitudinal data on the locations of producer-services firms in different sub-sectors could be used to examine processes of agglomeration. If such data were available on the locations of corporate subsidiaries and producer-services firms, then one could observe the formation of agglomerated economies in process, and potentially disentangle the sequencing of firm presence in established sub-sectors of producer services such as consulting, finance, real estate, insurance and advertising. Longitudinal data are also
necessary to evaluate hypotheses regarding the changing world city system structure. As noted above, many of the central world city hypotheses concern change in the hierarchy of cities and the possibility of new geographies.

Third, although corporate network scholarship attends to organizational structure in that it allows relations of command and control to knit together networks of cities, such research, with a few exceptions (e.g. Rozenblat and Pumain, 2007; Wall, 2009), downplays variation in organizational structure. For instance, information on the level of investment of a firm in its subsidiaries, along with internal corporate reporting relationships, would add considerable richness to depictions of corporate networks – as would attention to ‘governance without ownership’ through, for instance, global commodity chains (Vind and Fold, 2010). We are currently gathering data on internal organizational hierarchies to complement the location data of the *Fortune* Global 500 sample of firms.

Finally, research on corporate networks of cities should of course directly inform the question of whether and how inter-city relations impact social life in cities. Debates surround how world city-ness impacts various attributes of cities, including migration, employment, economic development and inequality (Wall, 2009). For instance, Timberlake (2006) uses data on U.S. cities to test the hypothesis that world city-ness drives up urban economic inequality, and finds little evidence for the hypothesis. Comparing Amsterdam and Rotterdam, van der Waal and Burgers (2009) reach a similar conclusion. Such work seems likely to drive new debates over the consequences of corporate networks of world cities for urban life.

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