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# **External relations of German cities through intra-firm networks – a global perspective**

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## **Abstract**

This paper adopts a global perspective to investigate external relations of German cities, both transnationally and on the national scale. At the centre of the analysis are the locational strategies of major advanced producer service firms that link the cities in which they operate through a multitude of flows. Using an interlocking network model and data on the organizational structure of leading business service firms, the paper measures and interprets the extent to which German cities were integrated in the world city network in 2008. The global positions and national network patterns of 14 major German cities are explored, as well as the sectoral strengths and geographical orientations of their external relations. The paper concludes with an assessment of the trajectory of German cities in the world city network between the turn of the 21st century and the onset of the current financial crisis. The analysis reveals a geography of advanced producer services that is polycentric in character but does not map directly onto the distribution of other metropolitan functions. In a longitudinal perspective, German cities experienced an absolute and relative decline in global network connectivity between 2000 and 2008, which raises questions about the changing strategic importance of German cities in the world city network.

## **Keywords**

Advanced producer services, cities, connectivity, Germany, globalization, intra-firm networks

## **Externe Beziehungen deutscher Städte durch innerbetriebliche Firmennetze – eine globale Perspektive**

### **Zusammenfassung**

Der Artikel untersucht grenzüberschreitende wie nationale Außenbeziehungen deutscher Städte aus globaler Perspektive. Im Mittelpunkt der Analyse stehen die Standortstrategien wissensbasierter Dienstleistungsunternehmen, welche die Städte, in denen sie tätig sind, auf vielfältige Weise vernetzen. Auf der Basis des Modells eines verschränkten Netzwerks und unter Verwendung von Daten über die Organisationsstrukturen führender Dienstleistungsunternehmen wird die weltweite Vernetzung deutscher Städte im Jahr 2008 gemessen und interpretiert. Globale Positionierung und nationale Netzwerkmuster von 14 deutschen Großstädten werden ebenso analysiert wie sektorale Stärken und räumliche Orientierungen ihrer Außenbeziehungen. Der Artikel schließt mit einer Bewertung der Integration deutscher Städte in das Weltstadtnetzwerk zwischen der Wende zum 21. Jahrhundert und dem Beginn der aktuellen Finanzkrise. Die Analyse identifiziert eine polyzentrische Geographie wissensbasierter Dienstleistungsunternehmen, die sich jedoch von der Verteilung anderer metropolitaner Funktionen unterscheidet. In langfristiger Perspektive zeigen deutsche Großstädte einen absoluten wie relativen Rückgang ihrer Netzwerk-Konnektivität zwischen 2000 und 2008, was als Hinweis auf die sich verändernde strategische Bedeutung deutscher Städte im Weltstadtnetzwerk gedeutet werden kann.

### **Schlüsselwörter**

Unternehmensbezogene Dienstleistungen, Städte, Konnektivität, Deutschland, Globalisierung, innerbetriebliche Netzwerke

## 1 Introduction

While there is a strong research tradition into the hierarchical spatial arrangement of settlements in Germany, following in the footsteps of Christaller's (1933) seminal study, the same cannot be said for the equally important geographies of non-local inter-city relations. This is partly a conceptual issue – there has been no equivalent 'central flow theory' to Christaller's 'central place theory' (Taylor/Hoyler/Verbruggen 2010) – but is also due to the lack of readily available data on material and immaterial flows of goods, people and ideas between cities. It is therefore not surprising that the majority of studies that consider metropolitan functions in the German urban system have relied on attribute data to assess the position and economic strength of its constituent cities. For example, research conducted by the Federal Office for Building and Regional Planning (Bundesamt für Bauwesen und Raumordnung BBR) used 24 indicators to identify command-and-control functions, capacity for innovation and competitiveness, and gateway roles in German cities (Adam/Göddecke-Stellmann/Heidbrink 2005; BBR 2005: 177 ff.).<sup>1</sup> This includes a variety of different variables such as the headquarters of the 20 biggest German banks, the number of students at universities, concerts by Bruce Springsteen and the Rolling Stones, and tons of cargo handled at ports (BBR 2005: 178). Blotevogel and Schulze (2009) more recently compiled a set of 50 variables associated with the same three categories of metropolitan functions as the basis for a principal components analysis to derive a series of metropolitan indices for all 439 German districts.

Despite the valuable insights provided by these studies, there are also theoretical and evidential problems associated with such an attributive approach (Taylor 1997; see also Blotevogel/Schulze 2009: 31 ff.). First, without a convincing theoretical foundation for the selection of individual indicators and the construction of composite indices, there is the danger of adding up measures that capture very different social, economic, cultural and political processes, casting doubt on the explanatory power of the results. Second, no conclusions can be drawn from such inventories about the hierarchical nature (or otherwise) of cities, if hierarchies are

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<sup>1</sup> This has been expanded in a European study to 38 indicators covering five areas of 'metropolitan functions': politics, economy, science, transport and culture (BBSR 2010).

understood to be more than mere ordered lists. In evidential terms, the presence of institutions, headquarters, specialised infrastructure etc. in a particular city (as measured by attribute data) provides no evidence about its relations with other cities, and hence no information about power relations between the objects studied (Taylor 1997: 325). If we take the old adage 'no city is an island' seriously, then today's role of cities as nodes in global networks requires more work on capturing the less tangible flows that are at the centre of inter-city relations in a globalised world.

These deficits have been widely recognised (e.g. Blotevogel/Schulze 2009), and a number of recent studies on the German urban system and of selected metropolitan regions have focused on questions of inter-city relations and cooperative linkages at regional, national and European scales, but only rarely beyond (e.g. Esser/Schamp 2001; Kujath/Dybe/Fichter et al. 2002; Kujath 2005; Heinelt/Kujath/Zimmermann 2007; Krätke 2010).

This paper adopts a global perspective to investigate external relations of German cities, both transnationally and on the national scale. It is primarily an empirical contribution that takes its cue from the literature on world cities, which has flourished in the past 20 years since the first publication of Saskia Sassen's influential book *The Global City* (1991). At the centre of the analysis are the locational strategies of major advanced producer service (APS) firms that link the cities in which they operate through a multitude of flows. This focus on business services lacks the broad coverage of studies attempting to measure 'metropolitan functions' more widely but has the clear advantage of a coherent theoretical basis. After a brief outline of this relational conceptual approach, the paper specifies the model and describes the data used in the empirical analysis. It then discusses the extent to which German cities were integrated in this world city network in 2008. What role do German cities play in the global strategies of transnational advanced producer service firms? The global positions and national network patterns of 14 German cities will be explored, as well as the sectoral strengths and geographical orientations of their external business service relations. The paper concludes with an assessment of the trajectory of German cities in the world city network 2000-

2008, between the turn of the 21st century and the onset of the current financial crisis.

## **2 World city network formation: a firm-based global perspective**

### **2.1 Cities in globalization**

The process at the centre of the empirical analysis presented here is world city network formation. The paper starts out from the assumption that in contemporary globalization all cities are to some degree integrated in the world economy. This view has gradually gained ground since the formative contributions of John Friedmann (1986) and Saskia Sassen (1991), who initially only considered a small number of cities perceived to be atop a global urban hierarchy. Friedmann (1986: 69) first established a framework for research that linked “urbanization processes to global economic forces” (see also Friedmann/Wolff 1982) by considering cities as command-and-control centres of transnational corporations in the new international division of labour. Sassen (1991: 3), with her concept of the ‘global city’, proclaimed a “new strategic role for major cities”, in which she emphasized the unique position of some cities in globalization, not only as command-and-control centres but also as key production centres and markets for finance and other advanced business services. The focus on a selective number of key cities in these seminal contributions has been subject to critique, and alternative terminologies, such as ‘globalizing cities’ (Marcuse/van Kempen 2000) or ‘cities in globalization’ (Taylor/Derudder/Saey et al. 2007) have been suggested to provide a more inclusionary perspective on the effects of globalization on cities across the world.<sup>2</sup>

Two approaches to the empirical study of world city network formation have been particularly influential in recent years: an ‘infrastructure’ approach and a ‘corporate organization’ approach (Derudder 2006: 2029). Whereas the infrastructure approach studies the enabling capacities of telecommunications (e.g. the Internet

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<sup>2</sup> This is, of course, only the most cursory treatment of the now flourishing global/world city literature. For a selection of some of the key contributions in the field, see Brenner/Keil (2006).

backbone) and physical transportation (e.g. airline networks) that underpin much of contemporary globalization, the corporate organization approach focuses on firms as economic agents and producers of inter-city relations. One major strand of work in this field is the study of transnational networks of multinational corporations (e.g. Alderson/Beckfield 2004; Wall 2009; Alderson/Beckfield/Sprague-Jones 2010). Other key work investigates the emerging global office networks of advanced producer service firms, characterised as high value, knowledge-intensive, professional and creative, and their capacity to link cities in the world economy (e.g. Taylor 2004). It is the latter approach, developed primarily by the Globalization and World Cities Research Network (GaWC)<sup>3</sup>, that will be employed in this paper.

## 2.2 Cities as global service centres

The starting point for analyses of the Globalization and World Cities Research Network is the conceptualization of cities as global service centres (Taylor 2004; Hoyler 2005). This approach builds on Sassen (1991), who interprets a selected number of key cities in the world economy as 'global cities' because of their strategic importance in contemporary globalization. These cities have developed into major centres for the production and consumption of highly specialized advanced producer services that attend to the needs of corporate clients operating in transnational markets. Whereas before the 1970s advanced producer service firms were very local in their operations, building their client base in specific cities through face-to-face interaction, they have increasingly become large corporations in their own right, following their globalizing corporate clients to new locations overseas. In order to provide a 'seamless' service, work is preferentially provided in-house rather than through association with local partners in different jurisdictions. This concern for the safeguarding of brand integrity, combined with a continuing need for geographical proximity to clients, has made many advanced producer service firms establish offices in locations worldwide. The complexity of major servicing projects usually requires cooperation between a number of offices to mobilize globally dispersed knowledge both within the firm and externally

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<sup>3</sup> See <http://www.lboro.ac.uk/gawc>.

(Malecki 2010: 1035). It can therefore be argued that the myriad of electronic and embodied flows (of information, ideas, people, etc.) generated in the daily operation of a firm's office network constitute part of Castells' (1996) 'space of flows' in a network society. It is the work done in multiple offices across the world that integrates various cities beyond Sassen's global cities in the world city network (Taylor 2004). As advanced producer service firms are only expanding their office networks when there is new business available, their intra-firm networks do tell a story beyond sector-specific strategies: Advanced producer service firms can be interpreted as an 'indicator sector' of economic vitality and change in cities (Taylor/Hoyler/Evans et al. 2010: 1287). As comprehensive and comparative data on flows between advanced producer service offices are generally not available, an indirect measure has been created in previous analyses by the Globalization and World Cities Research Network, based on the size and function of individual offices and specified as an interlocking network model.

### 3 Model specification and data

#### 3.1 Interlocking network model

The specification of the world city network as an interlocking network (Taylor 2001a) can be represented formally by a matrix  $V_{ij}$  defined by  $n$  cities  $\times$   $m$  firms, where  $v_{ij}$  is the 'service value' of city  $i$  to firm  $j$ . The service value indicates the importance of a city to a firm's office network based on an assessment of the size and function of a firm's office(s) in a city. For each pair of cities in the matrix, the basic relation  $r_{ab,j}$  is defined as an elemental interlock between city  $a$  and  $b$  in terms of firm  $j$ :

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

The global network connectivity (GNC) of city  $a$  is then defined as:

$$GNC_a = \sum_{i,j} v_{aj} \cdot v_{ij} \quad (a \neq i) \quad (2)$$



As the gross connectivity measured in this way varies with the size of the matrix, for reasons of comparability and ease of interpretation global network connectivities are usually expressed as proportions of the largest computed connectivity, which creates a scale from 0 (no connectivity) to 1 (highest connectivity in the network).

The overall global network connectivity of a city can be disaggregated in two ways to allow for a more detailed consideration of a city's external relations. First, sectoral network connectivities (SNC) can be produced by calculating this measure separately for firms in each sector (Hoyler/Freytag/Mager 2008; Hanssens/Derudder/Taylor et al. 2010). This shows the integration of each city into sector-specific networks and therefore provides some insight into sectoral specialization and strength.

Second, the global network connectivity of a city can be geographically disaggregated to reveal a city's 'hinterworld' (Taylor 2001b), i.e. the pattern of links to other cities in the network.<sup>4</sup> Rather than analysing all individual linkages to other cities, the geographical orientation of a city's external relations can usefully be summarized for selected cities or world regions. In this paper, for each of the cities included, the relative strength of its connections will be measured to (a) other German cities, (b) European cities, (c) the ten most connected cities globally, (d) New York – London (NYLON), the traditionally leading city dyad, and (e) Beijing – Hong Kong – Shanghai, the emerging new city triad in China. These hinterworld dimensions are calculated as shown in the following example for Frankfurt's connections to the New York – London dyad:

$$Frankfurt(NYLON) = \frac{\sum r_{Frankfurt - (NewYork - London)}}{GNC_{Frankfurt}} - \frac{\sum GNC_{NewYork - London}}{\sum GNC} \quad (3)$$

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<sup>4</sup> The concept of an 'urban hinterworld' was introduced by Taylor (2001b) as an addition to the traditional 'hinterland' concept with its focus on delimiting urban spheres of influence around cities. Taylor (2004: 102) defines a city's hinterworld as "the global distribution of service connections that lies behind its world city formation".

Positive values of this measure indicate a higher connection to NYLON than the average city in the network ('overlinkage'); negative values indicate a relative 'underlinkage'.

### 3.2 Data

The specification outlined above has been fundamental to two major data collections in the years 2000 and 2008 that have informed GaWC-analyses of the world city network (Taylor 2004; Taylor/Ni/Derudder et al. 2011). This paper makes use of both sets of data, although the focus of the analysis is on the 2008 collection date. For both data collection exercises, the corporate websites of major advanced producer service firms were the main source of information, complemented by available material from other sources (e.g. annual reports of firms). In order to enable comparison across firms, the available information for every firm was standardized for each of its office locations to categorize their importance in a firm's office network. Service values  $v_{ij}$  were allocated on a scale from 0 (no presence of a firm in a city) to 5 (global headquarters of a firm in a city). The criteria applied to assess and score offices relate primarily to office size and extra-locational functions of the office(s). For example, all cities where a firm was present initially scored 2 (a 'typical' office of the firm). Further information available was then used to lower or raise the service value, if appropriate (1 for a very minor office, 3 for a particularly large office, 4 for extra-city responsibilities, e.g. for world-regional headquarters).<sup>5</sup>

In 2000, service values were identified for 100 global advanced producer service firms from six sectors: accountancy (18), advertising (15), banking/finance (23), insurance (11), law (16) and management consultancy (17). Global advanced producer service firms were defined as firms with offices in at least 15 cities, including one or more in North America, Western Europe and Pacific Asia, the prime globalization arenas. The information was collected for 315 cities worldwide,

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<sup>5</sup> Note that a service value is the score assigned to a particular city for a particular firm. In some cases there will be multiple offices of a firm in one city, which may lead to the allocation of a higher score (3 or 4), depending on overall size and extra-territorial functions.

including most capitals and many other important cities. The result is a matrix of 100 firms x 315 cities with 31,500 service values.<sup>6</sup>

In 2008, the scale of the data collection exercise increased significantly, and information was gathered for 175 advanced producer service firms in 525 cities. Firms were selected for five sectors by their size or importance as indicated in high-profile rankings for the respective sectors in 2006 and 2007. The previously separate categories of banking/finance and insurance were combined into one finance sector (75 firms); and the top 25 firms were included for the other four sectors of accountancy, advertising, law and management consultancy.<sup>7</sup> The number of cities selected was reviewed and increased to 525.<sup>8</sup> The result is a matrix of 175 firms x 525 cities with 91,875 service values.

The 2008 service value matrix was used to calculate measurements of global network connectivity, sectoral network connectivities and hinterworld dimensions for each city, as well as dyad connectivities for pairs of cities. This paper reports on the findings for the 14 German cities with proportionate general network connectivities of at least 5% of London's global network connectivity, the globally highest ranking city in 2008. For the seven leading German cities, the relative connectivity change between 2000 and 2008 was also calculated to assess their recent trajectory in the world city network.

### 3.3 A global perspective – methodological notes

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<sup>6</sup> The data matrix is available as GaWC Data Set 11 at <http://www.lboro.ac.uk/gawc/datasets/da11.html>. For lists of all firms and cities in the 2000 analysis, see Taylor (2004: 215 ff.).

<sup>7</sup> Financial firms are those ranked highest in the Forbes composite index in the categories of banking, insurance and diversified finance (see <http://www.forbes.com>); accountancy and advertising firms are identified by revenue as ranked by World Accounting Intelligence (see <http://www.worldaccountingintelligence.com>) and Advertising Age (see <http://www.adage.com>); law firms are from the Chambers List of Corporate Law Firms (see <http://www.chambersandpartners.com>); and management consultancy firms are top firms by 'prestige' as identified in a large survey of professionals (see <http://www.vault.com>). Substitute firms were identified just below the top ranked firms in each sector to replace firms that had disappeared by the time of the data collection, for example through take-over. For a list of all firms in the 2008 analysis, see Taylor/Ni/Derudder et al. (2011: 396 ff.).

As outlined above, the paper uses two global data sets to evaluate the external advanced producer service relations of German cities. Such a ‘top-down’ approach has implications for the findings and their interpretation.

First, in contrast to other studies that use a ‘bottom up’ network approach, i.e. one that takes the (city-) regional or national scale as the starting point for data collection (e.g. Schmitt/Knapp 2006; Hoyler/Freytag/Mager 2008; Brandt/Hahn/Krätke et al. 2009; Krätke 2010; Lüthi/Thierstein/Goebel 2010), including several papers in this special issue (Grove/Blotevogel; Lüthi/Thierstein/Bentlage; Münter), the global approach reported here is based on a relatively small number of firms. Although these are generally the top-ranked firms in each sector and operate in a significant number of countries, they only provide a partial insight into the much more extensive linkages of any specific city, even within the sectors analysed here. Furthermore, for cities that are only weakly integrated in the world city network, scores are potentially vulnerable to the effect of being based on links from very few firms. Employing a simulation experiment, a recent assessment of global connectivity rankings derived from the 2008 GaWC-data confirms that these are generally robust for the top 130 cities (including the six highest ranked German cities), but that positions further down the list are more sensitive to alternative service values (Liu/Taylor 2010). Interpretation should therefore focus on strata of cities with similar connectivity values rather than on exact ranks, an approach followed in the comprehensive global urban analysis of the 2008 data (Taylor/Ni/Derudder et al. 2011).

Second, and related to the above point, cities rather than city-regions are at the centre of the analysis presented here. This is partly due to the pragmatic approach taken to office location in the data collection exercises (i.e. focus on the major 315/525 cities worldwide, and allocation of firm location in the wider city-region to the central city).<sup>9</sup> More important, however, is the finding that global advanced producer service functions are indeed mainly located in the core cities of

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<sup>8</sup> For a list of all 525 cities, see Taylor/Ni/Derudder et al. (2011: 400 ff.).

<sup>9</sup> For reasons of marketing, some firms also use the name of a central city on their corporate websites to describe their office location rather than that of a suburb or small adjacent town.

metropolitan regions, particularly in their 'first cities' (see Hall/Pain 2006; also Sassen 2001; Glückler 2007).

Third, one of the strengths of the global approach taken here is that it produces worldwide comparable measures. The paper makes use of this advantage, and selectively draws on the global results of the larger project to contextualise the findings for German cities.

## **4 German cities in the world city network**

### **4.1 Global network connectivities and national dyad connectivities in 2008**

The German urban system has long been characterized by polycentricity at the national scale (Blotevogel 2000: 179 ff.). Without a dominant primate city, key metropolitan functions, including those associated with advanced producer services, are distributed widely across a number of cities and city-regions (Krätke 2004: 146 ff.; Blotevogel/Schulze 2009: 30 ff.). This functional and sectoral specialization of German cities is also reflected by the degree to which they are integrated in the world city network.

Table 1 lists the overall global network connectivity for those German cities showing the highest level of integration. 14 cities score above 5 % of the value of London, the world's top ranked city with regard to global network connectivity. These are also the 14 largest German cities in terms of population size and include all cities with more than 500,000 inhabitants. The national ranking of global network connectivity values reflects Frankfurt's role as leading centre for finance and associated corporate services (cf. Grote 2004): The core city of the metropolitan region of Rhine-Main outperforms the much larger millionaire cities of Berlin, Hamburg and Munich by a considerable margin, confirming its particular strength as a networked international financial centre with half the connectivity of its major European competitive/cooperative counterpart, London (cf. Beaverstock/Hoyler/Pain et al. 2001). Düsseldorf as the principal advanced producer service centre in the Rhine-Ruhr region also punches above its

(population) weight, ahead of Stuttgart with its corporate servicing of South-West Germany (cf. Strambach 2002). These six cities achieve roughly one third or more of London's connectivity value and rank among the top 100 leading global service centres. More traditional measures of non-primacy in the German urban system are confirmed by this new network measure of global integration: With six cities positioned between ranks 32 and 91 in the world, Germany lacks global advanced producer service beacons like London or Paris but achieves a much more balanced integration of its cities into global flows than the UK (London 1, Manchester 113) or France (Paris 4, Lyon 145). The key German hubs for internationally operating business services are also geographically spread across the national territory rather than spatially concentrated, not least because of the longstanding complementary division of labour between cities in other sectors of the economy and the federal political organization of the German state. This requires many advanced producer service firms to locate in a number of strategically important cities in the country rather than in a single gateway, although Frankfurt takes on this role for some leading firms that are only located in one city in the country (cf. Hoyler/Freytag/Mager 2008).

All other cities listed in Table 1, including Cologne, are far less linked to global circuits of advanced corporate servicing, with 15 % or less of London's global network connectivity. This indicates a limit to the number of cities in Germany that can achieve critical importance as hubs for global servicing, partly due to a 'shadow effect' of nearby more important centres, e.g. Düsseldorf vs. Cologne, Essen and Dortmund; Berlin vs. Leipzig and Dresden; Hamburg vs. Bremen and Hannover; Munich vs. Nuremberg.

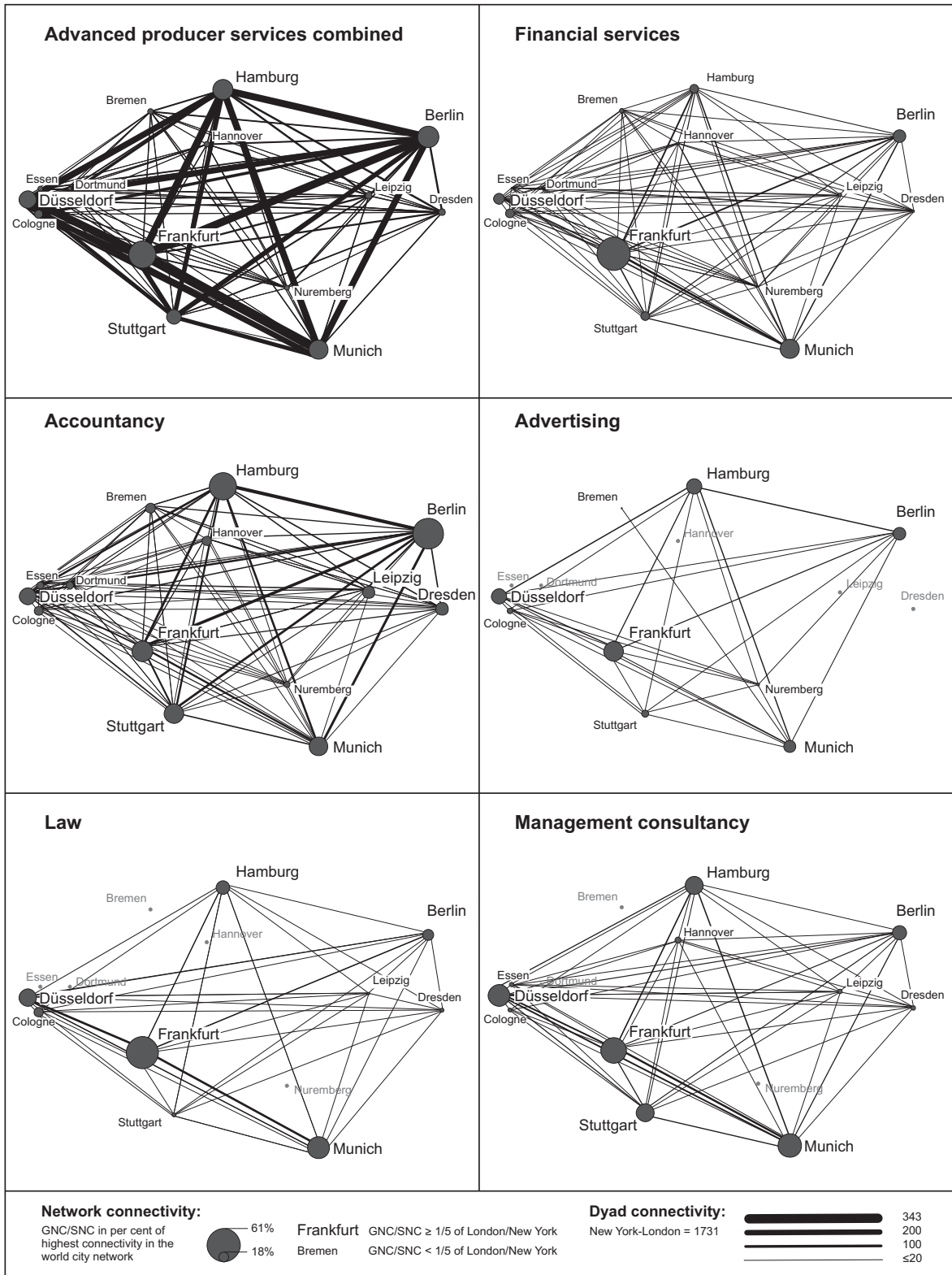
Table 1: Overall global network connectivity of German cities, 2008

City	Gross connectivity	Proportionate connectivity (London = 1.00)	Global rank
Frankfurt (F)	48165	0.50	32
Berlin (B)	37825	0.39	55
Hamburg (HH)	35574	0.37	60
Munich (M)	33482	0.35	67
Düsseldorf (D)	30575	0.32	76
Stuttgart (S)	26295	0.27	91
Cologne (K)	14499	0.15	166
Leipzig (L)	11762	0.12	197
Dresden (DD)	11628	0.12	199
Bremen (HB)	9916	0.10	233
Hannover (H)	9390	0.10	239
Essen (E)	8634	0.09	259
Nuremberg (N)	8034	0.08	275
Dortmund (DO)	6856	0.07	302

Figure 1 (top left) maps the detailed national inter-city connections between the 14 cities in Table 1, with nodal size indicating overall global network connectivity. These dyad connectivities represent the German space economy as practised by leading advanced producer service firms in 2008. The ‘horizontal’ nature of the urban system and the balanced geographical distribution of inter-city links are clearly visible.<sup>10</sup> The four strongest dyads all involve Frankfurt (Table 3), but the other five top-ranked cities in Table 1 are also highly interconnected. This reflects the locational strategies of major advanced producer service firms which often use more than one office location to serve their clients in Germany but tend to cluster in the major cities in each region. This leads to the geographical shadow effect indicated above, although evidence of regional bias in the dyad connections is relatively small (e.g. Leipzig’s highest and Dresden’s second highest links are with Berlin).

<sup>10</sup> Compare, for example, to the map of advanced producer service dyad connections of UK cities dominated by London in Taylor/Evans/Hoyler et al. (2009: 707); see also Taylor/Hoyler/Evans et al. (2010: 1292).

Figure 1: The German space economy as practised by advanced producer service firms





## 4.2 Sectoral network connectivities and dyad connectivities in 2008

Table 2 presents a more detailed analysis of the connectivity of each of the 14 cities. Disaggregating the overall global network connectivity by the advanced producer service sector shows strengths and weaknesses in terms of the integration of major German cities in sector-specific global networks. This provides new insights into how transnational advanced producer service firms use German cities in their locational strategies (see also Fig. 1). As there is considerable variation, reflecting specific conditions in different knowledge-intensive business services, each sector will be discussed in turn.

Table 2: Sectoral network connectivity of German cities, 2008<sup>a</sup>

City	Finance		Accountancy		Advertising		Law		Management consultancy	
	SNC	Rank	SNC	Rank	SNC	Rank	SNC	Rank	SNC	Rank
Frankfurt	0.61	16↑	0.38	81↓	0.36	64↓	0.59	4↑	0.47	19↑
Berlin	0.23	66↓	0.56	25↑	0.23	98↓	0.20	34↑	0.26	72↓
Hamburg	0.16	102↓	0.50	44↑	0.28	88↓	0.25	27↑	0.33	51↑
Munich	0.35	58↑	0.34	101↓	0.22	105↓	0.40	13↑	0.43	25↑
Düsseldorf	0.20	77↓	0.31	112↓	0.28	87↓	0.32	19↑	0.40	33↑
Stuttgart	0.16	100↓	0.36	88↑	0.13	125↓	0.07	68↑	0.33	53↑
Cologne	0.16	105↑	0.16	239↓	0.10	151↓	0.17	39↑	0.07	282↓
Leipzig	0.06	229↓	0.22	176↑	0.00	-↓	0.04	116↑	0.08	234↓
Dresden	0.04	295↓	0.23	164↑	0.00	-↓	0.07	70↑	0.08	212↓
Bremen	0.08	185↑	0.18	209↑	0.02	247↓	0.00	-↓	0.00	-↓
Hannover	0.04	296↓	0.17	221↑	0.00	-↓	0.00	-↓	0.11	149↑
Essen	0.13	278↓	0.13	278↓	0.00	-↓	0.00	-↓	0.08	213↑
Nuremberg	0.11	297↓	0.11	297↓	0.05	193↑	0.00	-↓	0.00	-↓
Dortmund	0.14	269↑	0.14	269↑	0.00	-↓	0.00	-↓	0.00	-↓

<sup>a</sup> Cities are listed by their overall global network connectivity (see Table 1); arrows indicate a rise (↑) or fall (↓) in global rank compared to overall global network connectivity

In financial services, four German cities – Frankfurt, Munich, Berlin and Düsseldorf – are placed among the top 100 most connected global financial centres in 2008 with at least a fifth of London’s sectoral network connectivity. Frankfurt in particular rises to 16 on this measure as one of the highest ranked European financial cities (behind London 1, Paris 6, Madrid 10, Milan 11, Moscow 15, and just ahead of Zurich 17 and Brussels 19; Taylor 2011: 26). Figure 1 (top right) highlights Frankfurt’s predominance as Germany’s leading financial centre and shows national inter-city links through finance networks: all 14 cities are integrated to

some degree, with Frankfurt – Munich being the strongest dyad (Table 3) (see also Klagge/Peter in this issue).

Table 3: Top 10 city-dyads by sector<sup>a</sup>

Rank	Finance		Accountancy		Advertising		Law		Management Consultancy		APS combined	
	City 1	City 2	City 1	City 2	City 1	City 2	City 1	City 2	City 1	City 2	City 1	City 2
1	Frankfurt-Munich	81	Berlin-Hamburg	127	Düsseldorf-Hamburg	46	Düsseldorf-Frankfurt	83	Frankfurt-Munich	75	Frankfurt-Munich	343
2	Berlin-Frankfurt	59	Berlin-Frankfurt	108	Berlin-Hamburg	45	Frankfurt-Munich	82	Düsseldorf-Munich	60	Düsseldorf-Frankfurt	292
3	Frankfurt-Hamburg	59	Berlin-Munich	90	Düsseldorf-Frankfurt	44	Berlin-Frankfurt	44	Düsseldorf-Frankfurt	58	Berlin-Frankfurt	285
4	Düsseldorf-Frankfurt	52	Frankfurt-Hamburg	87	Hamburg-Munich	44	Düsseldorf-Munich	42	Hamburg-Munich	48	Frankfurt-Hamburg	271
5	Hamburg-Munich	49	Berlin-Stuttgart	85	Frankfurt-Hamburg	40	Frankfurt-Hamburg	39	Frankfurt-Hamburg	46	Berlin-Hamburg	254
6	Berlin-Munich	47	Hamburg-Munich	78	Berlin-Frankfurt	38	Berlin-Düsseldorf	36	Munich-Stuttgart	42	Hamburg-Munich	245
7	Frankfurt-Stuttgart	47	Düsseldorf-Hamburg	77	Berlin-Munich	32	Düsseldorf-Hamburg	32	Düsseldorf-Hamburg	40	Berlin-Munich	234
8	Munich-Stuttgart	41	Berlin-Düsseldorf	75	Düsseldorf-Munich	32	Cologne-Frankfurt	26	Düsseldorf-Stuttgart	40	Düsseldorf-Hamburg	225
9	Cologne-Frankfurt	40	Frankfurt-Munich	73	Frankfurt-Munich	32	Berlin-Munich	26	Frankfurt-Stuttgart	40	Berlin-Düsseldorf	207
10	Berlin-Stuttgart	38	Hamburg-Stuttgart	73	Berlin-Düsseldorf	24	Hamburg-Munich	22	Berlin-Munich	39	Düsseldorf-Munich	205

<sup>a</sup> Values represent dyad connectivity, calculated as the sum of the products of service values for firms in each sector in each pair of cities.

Accountancy firms show the most highly connected national network of any of the sectors analysed here (see Fig. 1 centre left): This is generally the sector with the largest global office networks and near ubiquity in office location (Taylor 2004: 79 ff.). Here it is the Berlin – Hamburg dyad, connecting the leading population centres, which comes out strongest, followed by Berlin’s links to Frankfurt and Munich. Although eight German cities score at least a fifth of London’s leading sectoral network connectivity for this sector, only four achieve a place among the global top 100: Berlin, Hamburg, Frankfurt and Stuttgart. This is the only advanced producer service sector in which Berlin is ranked above all other cities.

Advertising is one of the two advanced producer service sectors led globally by New York rather than London. Five German cities score at least a fifth of New York’s sectoral network connectivity for the sector in this archetypal US industry (Faulconbridge/Beaverstock/Nativel et al. 2011: 49), with again four ranked in the global top 100: Frankfurt, Düsseldorf, Hamburg and Berlin. Frankfurt and

Düsseldorf as the traditional national headquarter locations of international advertising networks (Thiel 2005: 568) are ranked ahead of Hamburg, Berlin and Munich, the more recent creative advertising hubs in Germany. However, all German cities with a presence of major advertising firms lose in global rank compared to their general network connectivities (Table 2). The national network of leading advertising firms (Fig. 1, centre right) is also far less dense than the networks in finance and accountancy, and more focused on the major German cities. Five out of the 14 cities show no presence of any of the major advertising firms included in this study.

Legal services are similarly focused on a restricted number of major German cities (Fig. 1, bottom left), but in contrast to advertising, they do perform remarkably well in this sector. Five German cities score at least a fifth of London's connectivity for corporate law, and eight are ranked among the global top 100. All German cities with a presence of a major law firm in this study gain substantially in their global ranking for this sector. Frankfurt in particular ranks exceptionally high with a global rank 4 (behind London, New York and Paris), reflecting the close nexus between finance and corporate law, but Munich and Düsseldorf also achieve positions in the global top 20. This follows a period of rapid internationalization of major German corporate law firms since the 1990s, after the abolishment of legal restrictions that prevented the creation of "supra-local partnerships" (Morgan/Quack 2005: 1772).

Management consultancy is the other archetypal US advanced producer service sector, with New York leading globally ahead of London. Six German cities score at least a fifth of New York's sectoral network connectivity for this sector and rank in the global top 100 (see Table 2). With the exception of Berlin, all of these rank higher than for general network connectivity, making this business service the second most successful in German cities, after law. Geographically, the firms considered here are present in 12 out of the 14 cities, reflecting the urban concentration of the sector (Glückler 2007: 953), with the strongest dyadic relations between Frankfurt, Munich, Düsseldorf, Hamburg and Stuttgart (Fig. 1, bottom right).

Overall, German cities present a mixed picture in terms of their sectoral network connectivities. Compared to their overall global network connectivity (Table 1), they gain significantly in global ranks in law and management consultancy, but lose position in advertising. Finance and accountancy see some cities rise and others fall. Clear patterns of sectoral specialization also emerge that are reflected in global positions: Frankfurt and Munich rise significantly in finance, law and management consultancy, Berlin in accountancy and in law (being the capital city). Hamburg and Stuttgart also score well in these sectors plus management consultancy, whereas Düsseldorf shows strengths in law and management consultancy. Frankfurt leads the connectivity table for all sectors except for accountancy, the most ubiquitous of advanced services.

#### 4.3 Geographical orientation of external relations in 2008

Global network connectivities can also be disaggregated geographically to assess the direction of external relations for individual cities. As indicated above, this provides a measure of a city's 'hinterworld', the geographical pattern of its advanced producer service relations across the globe. The findings offer new insights into how German cities are positioned in terms of access to key markets in different parts of the world. Table 4 presents comparative measures of five key orientations for each of the 14 German cities, calculated by applying equation (3) as explained in section 3.1.

Table 4: City hinterworlds (relative concentration of connections) of German cities<sup>a</sup>

German cities		European cities		Top 10 cities globally <sup>b</sup>		NYLON		Beijing – Hong Kong – Shanghai	
DO	1.87	DO	3.99	F	4.28	F	1.29	F	1.09
K	1.38	N	3.68	M	2.94	M	0.90	M	0.77
N	1.35	M	3.46	D	1.58	K	0.49	D	0.40
L	1.33	HH	3.45	K	1.18	D	0.48	K	0.29
DD	1.32	K	3.30	HH	0.20	HH	0.12	HH	0.01
E	1.29	D	3.14	B	-0.60	B	-0.12	B	-0.23
H	1.07	B	2.11	S	-0.97	S	-0.24	S	-0.25
HB	1.00	S	1.85	N	-1.93	N	-0.45	HB	-0.64
HH	0.89	F	1.73	HB	-2.64	DD	-0.66	N	-0.67
D	0.84	H	0.75	L	-3.00	HB	-0.69	DO	-0.71
M	0.75	HB	0.55	DO	-3.01	L	-0.75	L	-0.86
S	0.67	DD	-0.11	DD	-3.14	E	-0.78	E	-0.94
B	0.65	L	-0.19	E	-3.34	DO	-0.82	DD	-0.96
F	-0.05	E	-0.30	H	-3.61	H	-0.84	H	-1.01

<sup>a</sup> for city codes, see Table 1

<sup>b</sup> London, New York, Hong Kong, Paris, Singapore, Tokyo, Sydney, Milan, Shanghai, Beijing

The first column sums up the connection of each city to other German cities. This indicator of 'localism' is relative (as are all other measures in Table 4), i.e. it is the less globally connected cities (Table 1) that show more local connections. Unsurprisingly, Frankfurt is the least local of all large German cities; its value close to zero suggests balanced advanced producer service connections within and outside of Germany. All other cities score positively, indicating a preponderance of domestic over cross-border connections. The ranking is largely the opposite of Table 1, with two notable exceptions: Stuttgart appears relatively more non-local than its global network connectivity ranking would suggest, and Cologne ranks as the second most local of all the 14 German cities, marking a significant contrast to its neighbour on the Rhine, Düsseldorf, in terms of orientation of its corporate servicing links. Compared to cities in many other countries, however, German cities are remarkably 'un-local', which may reflect the export-orientation of the German economy and the associated need for trans-border advanced producer service provision. For example, the most local German city in Table 4, Dortmund (1.87), is less focused on domestic linkages than cities other than London in the UK (from Manchester 2.47 to Plymouth 6.75) or cities other than New York in the USA (from Chicago 2.52 to Palo Alto 15.27) (Taylor/Ni/Derudder et al. 2011: 247, 259 ff.).

Orientation towards other European cities (see Table 4) sees some movement of positions, but overall a mixed picture emerges. Three cities are relatively under-linked to Europe, but only by a small margin: Essen in the Rhine-Ruhr region, and the East German cities of Leipzig and Dresden. All other cities show some over-linkage within Europe. Among the leading cities, Munich and Hamburg show the strongest connections to other European cities, ahead of Cologne and Düsseldorf. Berlin and Frankfurt are also over-linked, but to a lesser degree.

Moving from the European to the global scale in the remaining columns of Table 4 reveals a significant scalar break between a small group of five German cities that are globally over-linked (plus two that are only slightly under-linked) and the majority that display a higher degree of under-linkage. Orientation towards the 10 globally top ranked cities (by global network connectivity) is strongest in Frankfurt, followed by Munich, Düsseldorf, Cologne and Hamburg. All other cities remain under-linked to the apex of the world city network. Hannover in particular scores lowest on global orientation, together with smaller advanced producer service centres in the Rhine-Ruhr region and East Germany.

Two more restricted measures confirm this positioning. The first considers linkage to the leading dyad of contemporary globalization, New York – London (NYLON). Rankings remain almost unchanged, although Cologne is positioned third, just ahead of Düsseldorf, in this measure of linkage to the traditional core cities of the global economy. The strong connectivity of most of Germany's major cities to NYLON reflects close post-war economic ties with the USA and Western Europe. The second measure considers linkage to an emerging new central city dyad in globalization, the three Chinese cities of Beijing, Hong Kong and Shanghai. Again, Germany's leading cities show a degree of over-linkage, albeit smaller than the connections to NYLON, indicating a balance of external linkages to both Northern America and Pacific Asia. Düsseldorf and Cologne swap place again, due to the former city's established links with Pacific Asia.

Overall, German cities are characterised in their geographical orientation by a relatively low degree of local concentration, comparatively strong over-linkage within Europe, and a polarization in terms of global over- and under-linkage.

#### 4.4 Connectivity changes 2000-2008

While the analysis above has focused on an evaluation of the external relations of German cities in 2008, information from the earlier GaWC data collection in 2000 can be used to assess their trajectory in the world city network between the turn of the 21st century and the onset of the current financial crisis. To ensure consistency and comparability between the two data collection exercises, some adjustments were made to the data structure, both in terms of number of cities included and to account for the changing sectoral composition of the data.<sup>11</sup> A standardised relative measure of connectivity change was then produced to compare a city's absolute connectivity change with changes in the overall distribution in the world city network (Derudder/Taylor/Ni et al. 2010). Table 5 shows the result of the change analysis for the seven leading German cities.

Table 5 Adjusted global network connectivities (GNC) and relative connectivity change 2000-2008

City	Adjusted GNC 2000	Adjusted GNC 2008	Absolute Change	Relative Change (SRESID)
Berlin	0.35	0.36	0.01	-0.49
Stuttgart	0.24	0.25	0.01	-0.56
Munich	0.37	0.35	-0.02	-0.86
Hamburg	0.37	0.35	-0.02	-1.04
Frankfurt	0.58	0.52	-0.06	-1.48
Düsseldorf	0.38	0.31	-0.07	-1.63
Cologne	0.23	0.15	-0.08	-1.76

The emerging overall picture is one of absolute and relative decline in the integration of German cities in the world city network. Only Berlin and Stuttgart

<sup>11</sup> Global network connectivities were recalculated for 307 cities present in both the 2000 and the 2008 data. 132 cities scored a global network connectivity of one-fifth or more of the most connected city in either year. Adjusted global network connectivities were then calculated for 100 firms x 132 cities (2000) and 175 firms x 132 cities (2008). Connectivity

marginally improve their global network connectivity between 2000 and 2008. All other leading German cities show a decrease in global connectivity. This is against a general trend of positive absolute connectivity change in the world city network: 97 out of 132 cities worldwide experience absolute connectivity gains in this period (Derudder/Taylor/Ni et al. 2010: 1870). In terms of position, Frankfurt remains ahead of all other German cities, despite significant losses in connectivity, indicative of its more general decline as an international financial centre (cf. Engelen/Grote 2009). Berlin moves from fifth to second place in Germany, while still not showing any substantive gain in connectivity. The most pronounced losses in connectivity take place in Düsseldorf and Cologne: both cities lose substantial ground as strategic locations for globally operating advanced producer services.

This scenario of decline is exacerbated in terms of relative connectivity change. All seven cities experience negative relative change over the period 2000-2008, compared to the overall world city network. Frankfurt, Düsseldorf and Cologne are among the ten cities worldwide that have experienced the largest relative connectivity decline (together with five Northern American cities and two offshore financial centres; Derudder/Taylor/Ni et al. 2010: 1873). While German cities are standing still or losing connectivity, cities in other regions of the world (especially in Pacific Asia) are fast gaining ground, with Shanghai and Beijing witnessing the highest positive changes in terms of their connectivity in the world city network (Derudder/Taylor/Ni et al. 2010: 1873).

## **5 Conclusion**

This paper has employed a global perspective and a specific network model to investigate the integration of leading German cities in the world city network. Overall, the analysis reveals a geography of advanced producer services that is polycentric in character but does not map directly onto the distribution of other metropolitan functions.<sup>12</sup> Six German cities act as prime strategic nodes in the

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measures for 2000 were also adjusted to match the 2008 sectoral distribution. For details, see Derudder/Taylor/Ni et al. (2010).

<sup>12</sup> Compare, for example, the results presented here with the mapping of the metropolitan indices calculated by Blotevogel and Schulze (2009: 45 ff.): In this broader assessment of



organizational networks of major knowledge intensive business service firms locating parts of their operations in Germany. Frankfurt remains the German city best integrated in global circuits of corporate services, reflecting its post World War II ascendancy to international financial and business service centre. It is the preferred location for all advanced producer service sectors except the comparatively ubiquitous accountancy sector. Frankfurt is the only German city with a dominance of international over domestic links in organizational firm networks. It also ranks ahead of other German cities in the orientation of its global linkages to the apex of the world city network, including its traditionally strong transatlantic ties and newly established connections to the rapidly expanding Chinese cities. After Frankfurt, Berlin, Hamburg and Munich share similar levels of integration in the world city network, but with varying strengths in different advanced producer service sectors. They are followed closely by Düsseldorf and Stuttgart. Perhaps the most notable absence from this set of well-linked cities is Cologne, which can be partly explained by its proximity to Düsseldorf, the key node for international advanced producer service firms in the Rhine-Ruhr region.

The analysis has also provided a first indication of how German cities have fared in the 2000s with regard to their integration in the world city network. This reads largely as a story of absolute and relative decline between 2000 and 2008, and more work is needed to assess the changing strategies of major global advanced producer service firms with regard to locational decisions in Germany. As the data collection in 2008 was completed just before the current financial crisis had impacted on many of the firms (and by implication, cities) in this study, further monitoring is urgently required. A first analysis of the fate of banking centres in the crisis does not make comfortable reading for German cities: Munich, Stuttgart and Frankfurt are among the top 10 cities worldwide with the largest pre-tax losses in Tier 1 capital of their banks in 2008 (Derudder/Hoyler/Taylor 2011: 177). The restructuring in the banking sector may also have a significant impact on other corporate service firms, and hence on the role of German cities in the future configuration of the world city network.

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metropolitan functions, Frankfurt tends to rank below Berlin and Munich, joining Hamburg in a second tier of German cities.

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