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René Belderbos, Helen S. Du and Anthony Goerzen

KU Leuven, UNU-MERIT and Maastricht University; NEOMA Business School; Queen's University

ABSTRACT Regional headquarters (RHQs) perform a crucial bridging function between corporate headquarters, regional affiliates, and other regional actors. Their bridging role and associated connectivity needs lead MNCs to locate their RHQs in highly connected 'global cities'. We examine how the interplay between global city connectivity, geographic distance, and RHQ roles determine the likelihood that particular cities are chosen as a location for MNCs' RHQ investments. Our inferences are based on an analysis of location choices for 1031 RHQs among 48 global cities. We find that while the geographic distance of a global city to the MNC's regional affiliates diminishes the likelihood that a given city is chosen, these distance effects disappear when the global city is highly connected. Well connected global cities, furthermore, attract investment in RHQs by MNCs from more distant countries-of-origin. On average, city connectivity is a more important characteristic for RHQs that have an entrepreneurial role.

Keywords: connectivity, geographic distance, global cities, location choice, regional headquarters

INTRODUCTION

One of the manifestations of the increasing disaggregation and fragmentation of corporate headquarter (HQ) operations of multinational corporations (MNCs) is the growing importance of regional headquarters (RHQs) (see, e.g., Desai, 2009; McKinsey & Company, 2013). RHQs play an important intermediary or bridging role between corporate headquarters, local affiliates, and other actors across multiple countries in their regions (e.g., Hoenen et al., 2014; Lehrer and Asakawa, 1999). RHQs perform intra-regional coordination and control activities as well as entrepreneurial opportunity-seeking tasks by building ties with external actors such as existing and potential clients,

Address for reprints: René Belderbos, Department of Managerial Economics, Strategy and Innovation, Faculty of Economics and Business, KU Leuven, Naamsestraat 69, B-3000 Leuven, Belgium (rene.belderbos@kuleuven.be).

suppliers, as well as local governments. At the same time, they maintain close contact with corporate headquarters to integrate and transfer knowledge and to align regional with corporate strategies. In doing so, RHQs are generally expected to manage the trade-offs between global integration and local responsiveness (Hoenen et al., 2014; Prahalad and Doz, 1987), to implement global strategies at a regional level, and to act on regional opportunities (Yeung et al., 2001).

A distinct aspect of HQ operations is that they are disproportionately concentrated in metropolitan areas (Bel and Fageda, 2008; Klier and Testa, 2002) – a trend which is also appearing in developing economies (McKinsey & Company, 2013). The economic geography literature has suggested that 'global cities', such as London, New York, and Singapore, are a preferred location for MNCs. These cities are noted for the availability of advanced producer services (such as marketing, accounting, law, and finance), their cosmopolitan environment and, of particular importance for our purposes, their extensive connectedness to local and global actors (Goerzen et al., 2013). Their unique set of connections to the world economy allows these cities to function as centres of command and control that provide MNCs with global reach (Friedmann, 1986; Sassen, 1996).

While there is an emerging understanding of the importance of global cities for HQ operations, our study examines which global city characteristics are most influential in the MNC's RHQ location choice. This is important because we currently lack insight into drivers of the location decision for RHQs, whilst these decisions will have important consequences for MNCs' effective operations. More specifically, we examine how the interplay between global city connectivity and geographic distance influences spatial transaction costs and the location decisions for new RHQs. Drawing on the extant literature, we conceive of connectivity as multifaceted, including international flows of people, knowledge, and services. We define spatial transaction costs as those expenses (e.g., communication, coordination, and monitoring) that relate to the governance and monitoring of actions in the alignment of geographically dispersed activities to achieve synergies or other competitive advantage (Baaij and Slangen, 2013). Our core argument is that city connectivity can reduce several forms of spatial transaction costs, which, in turn, reduces the role of geographic distance in the location choices of MNCs. Furthermore, the importance of connectivity for city location decisions depends on the function of the RHQ and its network of affiliates in the region.

Our study contributes to the literature on HQ locations and the spatial disaggregation of HQ functions as well as the economic geography literature on global cities. We respond specifically to the recent call in Cano-Kollmann et al. (2016) for new insights into the interplay between geographic distance, MNCs, and connectivity. Our results inform the geography and global city literatures by demonstrating the role of connectivity in attracting RHQs with specific mandates and positions in MNCs' networks. To the literature on HQ locations we contribute what we believe to be the first study of the specific drivers of *regional* HQ locations in contrast to prior research which has focused on corporate or divisional HQs (e.g., Bel and Fageda, 2008; Benito et al., 2011; Birkinshaw et al., 2006; Laamanen et al., 2012; Voget, 2011). We demonstrate that the international connectivity of cities, rather than their local characteristics, determines much of their attractiveness to RHQ operations. Empirically, we draw on an extensive database of new RHQ investments by MNCs and conduct a mixed logit analysis of MNCs'

location choices for 1031 greenfield RHQ investments from among 48 global cities between 2003–12.

LITERATURE REVIEW

We review the relevant literatures on RHQs and HQ location decisions, the importance of spatial transactions costs for the (spatial) organization of MNCs, and prior work on the concept of connectivity.

Regional Headquarters Roles within an MNC

The emergence of RHQs is one of the responses to the regionalization trend in the world economy (Rugman, 2000; Rugman and Verbeke, 2004). Regionalization has given impetus to the establishment of RHQs to develop and coordinate regional activities. According to Ambos and Schlegelmilch (2010), the number of European RHQs has risen by 76 per cent during 2000–10 and, in 2005, more than 1100 RHQs were established in the Asia-Pacific region (Enright, 2005). Similarly, our own data on RHQs include more than 300 new RHQs established annually in recent years.

The general role of the RHQ is to bridge the distance between HQ, regional affiliates, and markets. The establishment of RHQs has risen as a solution to the trade-off between global integration and local responsiveness: to create value within the MNC by sharing knowledge, synergizing management, and providing support services (Goold and Campbell, 1998; Lunnan and Zhao, 2014). The RHQ builds links with affiliates across the host region to monitor, coordinate, and control their business activities. At the same time, it maintains a strong relationship with the HQ to exchange information and to achieve intrafirm synergies. Externally, the RHQ collects and reports information concerning regional market opportunities and business environment changes. In their role as brokers, RHQs have to understand local contexts as well as corporate priorities (e.g., Alfoldi et al., 2012; Ambos and Schlegelmilch, 2010; Yeung et al., 2001).

The literature on RHQs has identified two major mandates with which they can be charged: an entrepreneurial and administrative (e.g., Chandler, 1991; Lasserre, 1996; Mahnke et al., 2012). An entrepreneurial role entails scouting for talent, seeking out new business opportunities, signalling commitment to local markets, and sharing information with corporate HQ. RHQs with an entrepreneurial mandate may also function as a regional beachhead for business development, preparing for the establishment of other affiliates (Lasserre, 1996). An administrative role, on the other hand, includes serving as the command, control, and coordination centre of dispersed activities in the region, orchestrating resource pooling, and leading the effort to achieve intrafirm synergy.

Given the bridging function of the RHQ and role as a central node in the MNCs' affiliate networks, RHQs have strong needs to connect to a variety of internal and external actors across locations, enabling flows of knowledge, information, and resources. This implies that the MNC's RHQ location decision is likely to be influenced by the international connectivity that a location can facilitate.

While the role of cities and city connectivity in the world economy has received attention in the geography literature (Alderson and Beckfield, 2004; Beaverstock et al., 2002;

Doel and Hubbard, 2002; Derudder et al., 2010; Sassen, 2001; Taylor, 2001), prior literature on MNCs' RHQ location decisions has paid scant attention to global cities and the role of connectivity. For instance, Goerzen et al. (2013) and Ma et al. (2013) both examine the relationship between firm characteristics and MNCs' location decisions but do not consider the role of connectivity. Bel and Fageda (2008) examine the role of airport infrastructure in location decisions but only for HQs and those in European metropolitan areas. Further, the recent thought pieces by Hoenen and Kostova (2015) as well as Baaij and Slangen (2013) consider various aspects of geographic distance and the relationships among HQ and subsidiaries but do not raise the concept of locational attributes in general or of global cities.

Spatial Transaction Costs, MNC Management and HQ Operations

MNCs are driven to evaluate continuously the location of their operations and to relocate them whenever opportunities emerge to provide price-quality combinations that are satisfying to their demanding customers (Choi and Linton, 2011). These opportunities may include taking advantage of changing costs and qualities of labour, shifting knowledge bases, new (or dilapidating) infrastructure, and changes in socio-economic conditions. In addition, MNCs need to maintain their proximity to important stakeholders such as customers, shareholders, financiers, and competitors (Birkinshaw et al., 2006; Laamanen et al., 2012; Strauss-Kahn and Vives, 2009).

Since MNCs are compelled to situate their operational and administrative activities in locations that provide the greatest advantage, they become increasingly dispersed geographically, creating acute managerial and operational challenges (Kunisch et al., 2015). These management challenges take many forms including the coordination of strategic and tactical marketing decisions across locations, make or buy choices, as well as a myriad of small, critical decisions relating to accounting, finance, and taxation, human resources and staffing – not to mention emerging global issues such as environmental sustainability and social justice.

Organizing and monitoring corporate and local decisions can be achieved through a variety of channels including face-to-face interaction, telephone, video conferencing, emails, faxes, and letters (Bouquet et al., 2009; Nobel and Birkinshaw, 1998). A critical underlying element in this process is whether the knowledge and information to be transferred is explicit, as in the case of rules or instructions, or tacit, as in the case of experience or more nuanced insights. Less explicit, tacit knowledge requires greater attention because the transmission is not straightforward; personal monitoring is often necessary requiring on-site demonstrations or face-to-face communication (Bresman et al., 1999). Further, while the transfer of explicit, codifiable information may be a simple coordinating activity, it is still not without significant cost and effort – management time in particular. Previous authors have made the point that various types of distance (e.g., geographic, social, cognitive, institutional, economic, and cultural) increase the costs of exchanging knowledge with subsidiaries and of coordination and monitoring (Ambos and Håkanson, 2014; Asmussen and Goerzen, 2013; Dellestrand and Kappen, 2012; Slangen, 2011) because of travel time (Boeh and Beamish, 2012) and managerial opportunity cost (McCann, 2011). A key issue in the analysis of regional coordination

and control of an MNC's dispersed operations, therefore, is that of the spatial transaction costs of information and knowledge (Baaij et al., 2015; Barner-Rasmussen et al., 2007; Beugelsdijk et al., 2010; Cano-Kollmann et al., 2016) that vary with the RHQ's role within the MNC.

Cities and International Connectivity

The concept of international connectivity of cities has received most attention in the economic geography literature (e.g., Bathelt et al., 2004) and more recently has been studied from a finer grained perspective by focusing on the individuals and firms that create this connectivity (Lorenzen and Mudambi, 2013; Saxenian and Hsu, 2001). Connectivity is defined as the ease and intensity with which people, goods, capital, and knowledge flow across space.

Three approaches have been developed to understand this connectivity: the infrastructure approach, the corporate organization approach, and the knowledge-centred approach. The infrastructure approach focuses on the set of enabling systems and technologies that underpin border-crossing urban networks (see, e.g., Derudder et al., 2010; Smith and Timberlake, 2001). From this perspective, global city connectivity is facilitated by air transport, telecommunication circuits, and non-voice data transfer systems (Knox and Taylor, 1995). These enabling communication and transport networks undergird the flows of capital, people, and information which are fundamental to the connectivity of places (Córdoba Ordóñez and Gago García, 2010; Mahutga et al., 2010; Pirie, 2010).

The corporate organization approach, in contrast, starts from the observation that relations between cities are created primarily by firms pursuing transnational location strategies (see, e.g., Alderson and Beckfield, 2004; Derudder et al., 2003; Wall and van der Knaap, 2011). Research from this perspective has singled out connectedness through the networks of corporate service firms as a key trait of global cities. This literature builds upon the concept that global cities are part of a process of servicing global capital through advanced producer service firms (e.g., accounting, advertising, finance, insurance, and law). These service firms weave cities into a global network, such that intra-firm flows of information, knowledge, and direction can be estimated from the size and functions of pairs of city offices (Taylor, 2001), an approach that has been widely applied to analyse inter-urban connectivity in different contexts (Bassens et al., 2010; Hoyler et al., 2008; Huang et al., 2007; Taylor and Aranya, 2008).

The third strand of research, the knowledge-centred approach, has emphasized that interregional and intercity relations can also be defined by flows of knowledge and information. This literature has argued that, to succeed in a world in which competition is increasingly based on knowledge, a city or region cannot rely only on its own local knowledge base but also needs to encourage external knowledge inflows (Asheim and Coenen, 2006; Bathelt et al., 2004). Dynamic regions and cities are characterized both by dense local knowledge circulation and by strong international connections to outside knowledge networks (Laud et al., 2009). World cities seen as hubs of knowledge production, creating a global space of knowledge flows, while the competitiveness of a city is determined more by its international connectedness than by its local characteristics

(Doel and Hubbard, 2002). Research in this tradition has shown that regions' technological performance is positively associated with cross-regional and international linkages (Maggioni et al., 2007; Miguélez and Moreno, 2013). Geographically distant inventor network ties are important conduits for knowledge flows as they increase the diversity of ideas within the local knowledge base and enrich local innovation dynamics (Bell and Zaheer, 2007; Boschma and Frenken, 2010; Malmberg and Maskell, 2002). Thus, city connectivity could also be gauged through indicators of international knowledge flows and knowledge co-creation such as co-invention, co-authorship, and citation patterns (Matthiessen et al., 2010).

Each concept of connectivity within the literature focuses on a specific aspect of linkages between locations. For MNCs and their RHQs, these dimensions of connectivity are all relevant, such as the ease of travel across locations as related to airport infrastructure, the presence of producer services firms generating knowledge flows between cities and providing seamless functional services to MNCs, and the international flows of ideas and knowledge due to individual and intra-MNC international (co-inventor) linkages. We conclude that the concept of connectivity must be broadly defined to capture traits that are relevant to MNCs. We adopt, therefore, an integrative approach, conceptualizing connectivity as encompassing the effects of flows of people (airport passengers), services (producer services firms), and knowledge (co-invention). In our hypothesis development below, we build on this more inclusive concept of international connectivity.

HYPOTHESIS DEVELOPMENT

International Connectivity and RHQ Location

Given their role as intermediaries between external actors, affiliates within the region, and with corporate HQs, RHQs have unique international connectivity needs. RHQs play an important role in identifying and absorbing knowledge within the region and facilitating knowledge transfer to affiliates and corporate HQs (Lunnan and Zhao, 2014). As it is expensive to search, process, and exchange information, the spatial transaction costs associated with this task can be substantial. RHQs established in a global city with strong international knowledge connections would be in a better position to access knowledge from distant origins within the city.

Knowledge exchange, cross-unit collaboration, and effective coordination across units also requires that managers, employees, and external partners meet, build ties, and exchange tacit knowledge (Castellani et al., 2013). This requires manager and employee mobility across dispersed locations where partners and business opportunities exist. The direct and indirect costs of travel including expenditures as well as management time are, therefore, an important consideration in the establishment of RHQs (Boeh and Beamish, 2012; Bel and Fageda, 2008; Testa et al., 2005). Thus, aside from reducing the costs of mobility, global cities would reduce the needs for RHQ management to travel to seek out information as these places are hubs of learning and knowledge.

To fulfil their administrative and entrepreneurial roles, RHQs regularly need to source business services such as accounting, advertising, finance, consulting, and human

resource management (Ono, 2003; Sassen, 1996). Producer services firms with global operations and offices can connect the RHQ to these firms' wider networks. Thus, in their internal coordinating role as well as their external information gathering role, RHQs can benefit from the presence of internationally connected advanced producer services firms, which are positioned in global cities to provide these specialized services to MNCs. A global city with a high degree of international producer service connectivity is likely to be a preferred location for an RHQ as it benefits from the seamless services provided. It follows that the attractiveness of a city for RHQ establishment increases with these key dimensions of a city's international connectivity, leading to our first hypothesis:

Hypothesis 1: *The propensity of a firm to choose a particular global city as the location for its RHQ is positively associated with the city's international connectivity*.

The Impact of Heterogeneous RHQ Roles

The role of RHQs has received increasing attention from scholars as MNCs attempt to match their organizational structures to the demands placed upon them (Hoenen et al., 2014; Lunnan and Zhao, 2014; Mahnke et al., 2012; Yeung et al., 2001). In the literature, of the two types of RHQ roles that have been identified, one of them is an entrepreneurial role that involves scouting for talent, acquiring market knowledge, seeking out business opportunities, and signalling an emerging commitment to local markets, with the other being an administrative role in managing regional affiliates (Ambos and Schlegelmilch, 2010; Chandler, 1991; Hoenen et al., 2014; Lasserre, 1996; Mahnke et al., 2012). We expect that heterogeneity in the roles performed by RHQs would also have consequences for the valuation of global city characteristics. These different RHQ roles would require different city environments and, therefore, the locational choices for RHQs would align with these roles.

We propose that an RHQ with an entrepreneurial role is likely to value international connectivity more highly than an RHQ with an administrative role. RHQs performing primarily entrepreneurial roles typically would be established in the early stages of an MNC's entry in a region, as they penetrate a new regional market. In these early stages, in-house managerial resources and expertise would be stretched to capacity (Slangen, 2016). The process of seeking new business opportunities and exploring the regional environment, therefore, would depend on the flow of information and ideas through the global city's international knowledge connections as well as the advanced producer service firms (e.g., marketing, advertising, human resources services) that are internationally coordinated and can provide information, contacts, ideas, and leads that are useful in the entrepreneurial stage. Given that travel intensity will be high when the MNC aims to establish itself in a new region, connectivity provided by air infrastructure also is important.

Since MNCs that establish an entrepreneurial RHQ tend to lack previous experience in that particular host region, an internationally connected city can address its salient connectivity needs. In contrast, MNCs that establish an RHQ with a coordinating or

administrative role will already have been operating affiliates in that region. Through these operations, the RHQ can draw upon an existing regional knowledge base. In this situation, addressing cross-border informational needs and acquiring access to external sources of knowledge would be less salient, as per our following hypothesis:

Hypothesis 2: *The positive relationship between the propensity of a firm to choose a global city for its RHQ and the city's international connectivity is stronger for RHQs with an entrepreneurial role than for RHQs with an administrative role.*

The Role of Geographic Distance in the RHQ Location Decision

Geographic distance generally increases coordination costs by adding to the spatial transaction costs of transport and travel expenses, thereby making the exchange of tacit knowledge more costly (Berry et al., 2010; Boeh and Beamish, 2012; Castellani et al., 2013). Prior research has found that national HQs of manufacturing firms tend to be located in close proximity to production plants (Henderson and Ono, 2008) illustrating the benefits of collocation (e.g., Alcacer and Delgado, 2013; Defever, 2012). In the context of RHQs, the MNC has to cope with at least two types of geographic distance to other units of the MNC: distance to the corporate HQ and, if the RHQ performs an administrative role, distance to regional affiliates.

Since MNCs are compelled to locate their operations wherever the greatest advantages are available, such operations are becoming increasingly dispersed geographically. Yet, prior research shows that spatial transactions costs arise whenever organizations need to bridge distances. This dispersion creates significant management challenges that must be overcome through the establishment and ongoing activities of both HQ and RHQ (Kunisch et al., 2015).

Organizing and monitoring management choices requires RHQs to engage in various personal or direct interactions such as on-site demonstrations or face-to-face communication (Bouquet et al., 2009; Bresman et al., 1999) especially when the knowledge and information to be shared or transferred is less explicit. When geographic distances rise, the cost of these information sharing activities also rise (Asmussen and Goerzen, 2013; Dellestrand and Kappen, 2012; Slangen, 2011). While an obvious spatial transaction cost is that of travel (Boeh and Beamish, 2012) a less obvious but perhaps somewhat more important is that of managerial opportunity cost (McCann, 2011).

While the rationale of setting up an RHQ is to bridge distance to local affiliates because the corporate HQ is located too far away to perform coordination functions effectively, geographic distance to corporate HQ is a key spatial transaction cost factor that would favour cities in the region that are more proximate to the HQ. At the same time, the geographic characteristics of a MNC's existing network of subsidiaries is likely to be a major consideration in location decisions for RHQs with an administrative role since closer interaction with, and coordination of, these affiliates is a core objective of these RHQs. Further, if a city is located close to the existing affiliates of the firm in the region, management travel costs would be minimized and tacit knowledge exchange would be faster and easier, reducing the spatial transaction costs of communication and

coordination. This implies that MNCs would have a preference for those global cities that are positioned geographically closer to the HQ and geographically more central to the existing affiliate locations, leading to our next hypotheses:

Hypothesis 3a: *The propensity of a firm to choose a particular global city as the location for its RHQ is negatively associated with the geographic distance between the city and the firm's corporate headquarters.*

Hypothesis 3b: *The propensity of a firm to choose a particular global city as the location for its RHQ is negative associated with the average geographic distance between the city and the firm' existing affiliates in the region.*

Global Cities' International Connectivity in Mitigating the Effect of Geographic Distance

While the essential role of an RHQ is to initiate, facilitate, and organize effectively the flow of information across distances, these organizations must also economize on these activities and at the same time aim to overcome their inherently higher costs due to the liability of foreignness (Asmussen and Goerzen, 2013). A key issue in the analysis of the regional coordination and control of an MNC's dispersed operations, therefore, is how to reduce or overcome the spatial transaction costs of information and knowledge transfer (Baaij et al., 2015; Beugelsdijk et al., 2010; Cano-Kollmann et al., 2016).

We argue that the choice to locate an RHQ in a global city is an important way in which MNCs mitigate the spatial transaction costs of geographic distance. Global cities are able to provide advanced producer services (such as marketing, accounting, law, and finance) and are extensively connected to local and global markets through infrastructures that facilitate the movement of people, information and knowledge (Goerzen et al., 2013). This connectivity reduces the effects of distance by reducing management travel time through efficient and effective transportation modes (e.g., airports). It also makes it possible for managers to avoid the direct and opportunity costs of travel in the first place, as cross-border services can be obtained from advanced producer services firms and as international and regional knowledge flows into the global city and, thereby, towards the RHQ.

Taken together, a global city's international connectivity bridges geographic distance for the RHQ, making coordination, integration, communication, and knowledge exchange over geographic distance more effective and less costly. It follows that geographic distance would have a lesser bearing on location decisions for RHQs by MNCs if the city is characterized by stronger international connectivity, as per our hypotheses below.

Hypothesis 4a: *The negative relationship between the propensity of a firm to choose a global city for its RHQ and the geographic distance with corporate headquarters is mitigated by the city's international connectivity*.

Hypothesis 4b: *The negative relationship between the propensity of a firm to choose a global city for its RHQ and the average distance between a city and the firm's existing affiliates is mitigated by the city's international connectivity*.

The conceptual model containing our hypotheses is illustrated in Figure 1.

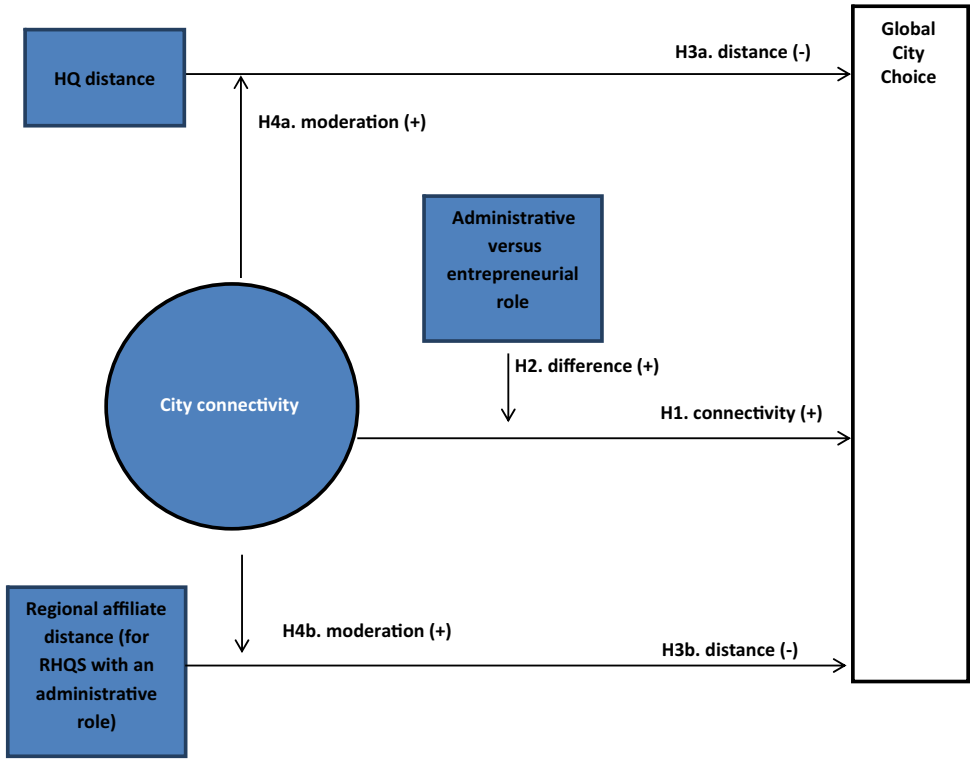

Figure 1. Conceptual model. [Colour figure can be viewed at wileyonlinelibrary.com]

DATA, VARIABLES, AND METHODS

Our analysis draws on an extensive database on cross-border greenfield investments compiled by the Financial Times Ltd (FDI Markets). The dataset records more than 120,000 cross-border investment projects between 2003–12, covering activities such as HQs, R&D, manufacturing, and sales & service. The coverage of the FDI Markets database is seen as representative for FDI flows (Castellani et al., 2013; Crescenzi et al., 2014; D'Agostino et al., 2013). Our dataset identifies the investing firm, type of project, host country, host city, and sector in which the investing firm operates and contains a short text describing the characteristics of the investment project. From these texts, we coded the type and regional mandate of HQ investment projects. We are interested in regional headquarters covering multiple potential global cities as potential host locations of the RHQ investment. Global corporate headquarters and purely national headquarters projects (e.g., a French HQ) were not selected.[1] In total, we identified 2,510 such RHQ investments. Below, we provide an illustration of an RHQ project with a broad regional mandate:

> *'Lexicon Relocation, a subsidiary of US-based The Suddath Companies, has announced that it has opened its new pan Asia headquarters in Hong Kong. The company, a leading provider of employee relocation and global assignment management services, has placed its new office in the*

Hopewell Centre tower on Queen's Road East. Lexicon Relocation selected Hong Kong for its pivotal position as one of the world's leading financial and business centres, an established gateway to the Asia-Pacific region and preferred location for multinational companies as well as their regional headquarters'.

In line with our research question, our analysis focuses on RHQ investments in 'global cities'. We include cities that are ranked as having the most important 'Global Power' by MasterCard (2008), which ranks 75 global cities based on seven dimensions of city characteristics such as legal and political framework, economic stability, and ease of doing business, information flows, and livability. A number of data limitations, described below, required us to limit the analysis to 48 of these global cities.

A second source of firm-level data concerns information on worldwide affiliate ownership available in Bureau van Dijk's ORBIS database. Using ORBIS we identified the controlling MNC behind the RHQ investment project as well as the MNC's regional affiliates. Existing affiliates of the focal MNCs were identified by applying a minimum of fifty percent ownership of first tier affiliates to ensure management responsibility and control. Affiliate networks in earlier years were determined using information on the dates of incorporation and, if applicable, dates of acquisition or divestment based on information from the Zephyr M&A database. With the limitation of RHQ projects to those located in 48 cities, since not all firms with RHQ investment projects could be matched to ORBIS, our sample of RHQ projects was reduced to 1031 investments made by 940 firms.

A specific feature of the current analysis of RHQs is that the choice set – the set of global cities from among which the firm chooses one as a location for the RHQ project – differs across projects, depending on the specific regional mandate of the RHQ. This is because, by definition, regional headquarters are located within the region that constitutes their geographic mandate. We determined the precise regional mandate from the available text descriptions and constructed the relevant choice set of global cities accordingly. For instance, the regional mandate of the RHQ project described above implies that global cities in Asia are potential locations but cities in Europe or the Americas are not (see Table I). Singapore, Hong Kong, and Shanghai are the three cities that received most investments in the Asia Pacific region; London, Amsterdam, and Dublin are the top three cities in Europe, while San Francisco, Atlanta, Chicago, and New York are the top cities in North America.

Variables

The dependent variable in our analysis is a binary variable taking the value of one if the city is selected for RHQ investment, and zero for all other cities. The choice set for an RHQ investment consists of those global cities that are located within the area of the regional mandate of the RHQ.

Hypothesis testing variables: Connectivity. Our measure of connectivity is a composite of three items: cities' producer services connectivity, airport passenger traffic, and international co-inventor activity. Data on international producer service connectivity of cities are

Table I. The distribution of RHQ investments across global cities within regions

Global city	*No. of RHQ investments*	*No. of entrepreneurial RHQs*	*No. of administrative RHQs*
Host region-Asia Pacific			
Singapore	173	93	80
Hong Kong	112	80	32
Shanghai	53	12	41
Sydney	24	21	3
Beijing	17	10	7
Melbourne	12	10	2
Tokyo	7	5	2
Seoul	4	2	2
Total	402	233	169
Host region-Europe			
London	165	115	50
Amsterdam	48	27	21
Dublin	38	22	16
Copenhagen	30	24	6
Munich	23	15	8
Paris	20	18	2
Dusseldorf	18	12	6
Geneva	17	9	8
Berlin	16	13	3
Brussels	13	11	2
Stockholm	13	9	4
Vienna	13	4	9
Barcelona	10	9	1
Zurich	10	6	4
Madrid	8	4	4
Prague	7	1	6
Frankfurt	6	4	2
Hamburg	5	2	3
Budapest	5	5	0
Warsaw	4	3	1
Edinburgh	2	2	0
Milan	1	0	1
Athens	0	0	0
Lisbon	0	0	0
Rome	0	0	0
Total	472	315	157
Host region-North America			
San Francisco	26	22	4
Atlanta	23	16	7
Chicago	18	7	11
New York	18	13	5
Miami	15	8	7
Boston	14	11	3
Houston	11	8	3
Washington	4	2	2
Philadelphia	7	5	2

Table I. *Continued*

Global city	*No. of RHQ investments*	*No. of entrepreneurial RHQs*	*No. of administrative RHQs*
Dallas	4	2	2
Los Angeles	5	3	2
Toronto	1	1	0
Vancouver	0	0	0
Total	146	98	48
Host region-Latin America			
Mexico City	4	2	2
Santiago	7	3	4
Total	11	5	6

obtained from Loughborough University's GaWC resources for the year 2000, and from Derudder et al. (2010) for the years 2004, 2008, and 2010. Taylor (2001) ranked 315 cities based on their inter-connectivity created by multinational producer services firms. Connectivity is calculated as the weighted number of linkages between a city and 314 other world cities created by the world's top 100 producer service firms through their global networks of offices. These firms supply advanced producer services (accountancy, advertising, finance, insurance, law, and management consultancy) through offices in at least fifteen cities, including at least one in each of the Asia Pacific, Western European, and North American regions. The connectivity index is based on the premise that flows of information between cities in the network are a function of the importance of the office. Service values of offices function as connectivity weights and are measured on a scale of 1–5 depending on the size and scope of the offices (Derudder et al., 2010). The scope of the analysis of city networks has been expanded in the more recent years to 526 cities and to cover 175 large producer services firms. Connectivity is taken as a relative index score of the city compared to London (with the score of London taking the value 100).

Airport connectivity has been found to attract HQ operations (e.g., Bel and Fageda, 2008). As an indicator of the international flow of people to and from a city, we include the yearly number of passengers recorded at the global cities' airports, drawn from airports' and city websites. We would have liked to use international passenger traffic and information on flight destinations but this information was not available for a large set of cities on different continents. Even using international air passengers would not constitute a superior measure of connectivity of a city, as airports differ in the importance of transit passengers. We normalize airport passenger flows by expressing passenger numbers as an index relative to London (100).

Co-inventor connectivity measures are derived from patent application data. Patent data are drawn from the OECD REGPAT database, which provides fine-grained regional indicators for patents, utilizing the addresses of the applicants and inventors to allocate patents to regions. The database covered more than 5500 regions mainly across OECD countries. Since regionalized patent data are not available for a range of non-OECD countries, this reduces the number of cities we can include in the analysis to 48.

We retrieve patents filed under the Patent Co-operation Treaty (PCT). Since the PCT provides a unified procedure for filing patent applications to protect inventions in each of the contracting states of the PCT, these patents are generally applied for inventions for which firms seek protection in various regions (e.g., USA, EU, and Japan) and are the least likely to exhibit a regional or city bias. We matched inventors to global cities based on available concordances linking NUTS-3/TL3 regions with metropolitan areas on the basis of the regionalized addresses of the inventors.[2] When a patent with an inventor in a global city involves at least one co-inventor residing outside the global city's country, we count this as an international knowledge linkage. Our measure of international knowledge connectivity is then constructed as the share of city patents with international knowledge linkage(s) in the total number of patents invented in the city. We normalize the measure to a scale of 0–100, with Geneva in the year 2006 as the benchmark. We calculate our composite measure of connectivity by averaging the indexed scores across the three dimensions of connectivity. Hence, we adopt the 'maximum-weight' approach to aggregation (see, e.g., OECD, 2008) using for each city the formula $C=100\sum_{x=1}^{3}\left(\frac{X_i}{X_{\max}}\right)/3$, with Xi the value for the different connectivity dimensions.[3]

RHQ mandates. We utilize information on the mandate of the RHQ and data on regional affiliates drawn from ORBIS to establish the presence of an entrepreneurial or administrative role for the RHQ. Although the description of the projects sometimes allows us to determine the specific role, relevant information is provided only for a minority of projects and information on potential joint roles is often lacking. Therefore, we rely primarily on information on regional affiliates from the ORBIS database. We start from the notion that firms without operating affiliates in the region at the time of the RHQ establishment would not have an administrative role and, therefore, the RHQ would focus on entrepreneurial activities. In case there are affiliates in the region, the RHQ would perform an administrative role – although we recognize this may often be combined with an entrepreneurial role. We checked the consistency between this categorization based on affiliates in the region and the texts on RHQ projects and found a high accuracy. Below, we provide two examples of RHQ descriptions: one RHQ with an entrepreneurial role and one with an administrative role, respectively:

> *'June 2012 - Big Nerd Ranch (United States) is investing in the city of Amsterdam (West-Nederland), Netherlands in the Business Services sector in a Headquarters project, creating 5 jobs. US-based Big Nerd Ranch, which offers immersive IT courses and learning centres, has opened its first international facility in Amsterdam, the Netherlands, creating five jobs. The European headquarters will offer a full schedule of classes and bootcamps in areas of IT, and employment is expected to double at the site by 2013'.*
>
> *'Office equipment manufacturer Konica Minolta Business Technologies, a subsidiary of Japan-based Konica Minolta, has established a new headquarters office in Singapore. The new presence will employ 189 people and will engage in the supervision and management of the company's sales, logistics and marketing activities in the Southeast Asia region. Konica Minolta Business Solutions*

Asia has been established to manage the office, one of a number the company is opening in south-east Asia and the Middle East'.

Big Nerd Ranch had no prior affiliates in Europe, while Konica Minolta has an extensive affiliate network in Asia. We test Hypothesis 2 by creating two separate variables for connectivity effects: connectivity for RHQs with only an entrepreneurial mandate and connectivity for RHQs with an administrative role (which could be combined with an entrepreneurial role). We perform t-tests on the equality of coefficients, while also taking into account that the impact of connectivity changes depending on distance.

Distance. The variable distance to HQ (H3a) is the great circle geographic distance between HQ and the focal host city. It was determined by geocoding the HQ city address and each global city in the choice set; for global cities, we used the coordinates of the city centre. The average geographic distance between a focal global city and the affiliates of the investing firm in the region (H3b) was determined by geocoding each affiliate based on the address information, thereby establishing latitude and longitude. Distance is the great circle distance between the affiliate and the global city; average distance is the average of distances between the city and the firms' affiliates. We test Hypotheses 4a and 4b by including interaction terms between connectivity and average distance to regional affiliates and between international connectivity and distance to HQ.

We take the variables connectivity, distance to HQ, and distance to affiliates in deviation from the sample mean before interacting such that the coefficient of the main effects of connectivity and the two distances variables represent their effects evaluated at mean distance and mean connectivity, respectively.

Control variables. We include a wide range of control variables in our analysis. We control for city population, population density (population divided by surface area of the city), city-level GDP per capita. Data on city population and GDP are drawn from the OECD's metropolitan data and Citymayors data and data on surface areas of cities are retrieved from city websites. In addition, we include as an indicator of the economic importance of the city's country in the region (country/region GDP ratio) the ratio of the country's GDP to the host region GDP. Firms may prefer cities located in a major market in the region. Country level GDP data are taken from the World Development Indicators. We also include a dummy variable indicating whether the city is a capital city. Capital cities may be more attractive to headquarters due the concentration of political power and their regulatory roles (e.g., Ma et al., 2013). As a proxy for the availability of human capital in the city, the models include the number of world top 400 universities in the city. Data on world top 400 universities come are drawn from the Times Higher Education yearly rankings.

We control for a number of other 'distance' effects between the home country of the MNC and the country of the global city. First, we control for language distance, drawing on data from Dow and Karunaratna (2006). The language distance measure takes into account the 'closeness' of languages, the incidence of languages spoken in a both country, and the heterogeneity of spoken languages in the countries. Language issues

may be less salient if the English language proficiency in the host country is strong since this would reduce communication costs and facilitates multinational firms' business activities. We follow Slangen (2011) and Cuypers et al. (2015) by taking the average Test of English as a Foreign Language (TOEFL) scores published by Educational Testing Services (ETS) divided by the maximum score that an examinee can obtain as the measure of English language proficiency. In addition, our analyses include a composite measure of other non-spatial dimensions of distance between the country of origin and the country of the global city. The composite measure aggregates over cultural distance, economic distance, and institutional distance using the maximum-weight approach. The measure of cultural distance draws on the 6-component indicators due to Hofstede et al. (2010) using the aggregation method proposed by Kogut and Singh (1988). The measures of institutional distance and economic distance are taken from Berry *at al.* (2011).[4]

The models include three cost-related factors, i.e., the corporate tax rate, the local wage level, and costs related to labour market rigidities. Taxes are an important component of operational cost for most international firms and the location of headquarters of a firm is often the place where profits are taxed (Desai, 2009). Corporate tax levels are likely to have a negative effect on the attractiveness of cities for HQ activities, as suggested by earlier studies (e.g., Laamanen et al., 2012; Strauss-Kahn and Vives, 2009; Voget, 2011). Data on corporate tax rates at the country level are obtained from KPMG. High wage costs have also been found to discourage HQ investments (Davis and Henderson, 2008; Strauss-Kahn and Vives, 2009). Data on wage levels of skilled employees at the city level are obtained from the UBS' Price and Earnings reports. We use information on employment rigidity (at the country level) from the World Bank's Doing Business reports to include a variable measuring labour market rigidities. The rigidity index is the average of three sub-indices: a difficulty of hiring, rigidity of hours, and difficulty of firing. The labour market rigidity index takes values on a 0–100 scale. Finally, we control for the presence of firms' existing affiliates in the city at the time of the RHQ investment to controls for colocation benefits and prior city experience (Alcacer and Delgado, 2013; Defever, 2012).

All continuous variables are taken in logarithmic form and all variables are one year lagged with respect to the year of the RHQ investment. Summary statistics of the explanatory variables are provided in Table II and coefficients of correlation are given in Table III. On average, the composite connectivity index of global cities is about 39, which compares to a level of 82 for London (2011) as the most connected city. The average distance between the city and the focal firm's affiliates in the region is 660 kilometers. Among the RHQs, 65 percent have an entrepreneurial role – investments occur without any prior existing affiliate in the region. Our correlation coefficients show no multicollinearity concerns.

METHODS

Analysis of the decision by MNCs in which global city – from among a set of regional alternatives –to locate an RHQ requires a discrete choice model. The most commonly used model in the location choice literature (e.g., Alcacer and Chung, 2007; Belderbos et al., 2011; Head et al., 1995) is the conditional logit model (McFadden, 1974) which is

Table II. Descriptive statistics

Variable	*Description and data sources*	*Mean*	*Stdev.*	*Min*	*Max*
Location choice	Location choice for a RHQ project. A binary variable taking the value of one if a city in the choice set is selected for the focal MNC's regional headquarters investment project and zero for all other cities in the choice set	0.07	0.25	0	1
Connectivity	City's composite connectivity index: producer service connectivity, airport connectivity and co-inventor international connectivity. Relative to the maximum value (100)	38.81	11.22	19.05	82.25
Entrepreneurial role	RHQ only has an entrepreneurial role. Dummy variable indicating whether the focal firm has no affiliate in the host region prior to the RHQ investment, based on ORBIS. Role categorization confirmed by information on the mandates of RHQs from FDI Markets	0.65	0.48	0	1
Geographic distance to HQ	Distance between global city· and city of HQ. In thousand kilometres, great circle method	8.19	3.01	0.03	19.62
Average geographic distance to regional affiliates	In thousand kilometres. Regional affiliate data obtained from ORBIS	0.66	1.32	0	14.07
Language distance to HQ	Language distance between country of origin and country of the city (Dow and Karunaratna, 2006)	5.05	1.32	1.22	6.09
Other distance to HQ	Composite index of non-spatial distance between country of origin and country of the city: economic institutional and cultural distance, each relative to the maximum value (100). *Sources*: Hofstede and Berry et al. (2010)	16.16	9.41	1.48	62.05
Labour market rigidity	Index of difficulty of hiring, rigidity· of hours, and difficulty of firing in the country of the city. World Bank's Doing Business report	28.99	20.00	0.00	72.00
Population	In millions. *Source*: OECD and Citymayor	4.96	623	0.68	36.80
Population density	Population divided by the area of the city (Thousand persons square km)	6.46	8.32	0.30	49.37
GDP per capita	In thousand US Dollars	47.02	17.30	4.73	95.61
Ratio of country GDP to region GDP	GDP of the country of the city relative to overall GDP of the region that forms the mandate of the	0.05	0.05	0.00062	0.61

Table II. *Continued*

Variable	*Description and data sources*	*Mean*	*Stdev.*	*Min*	*Max*
	RHQ. Source: OECD and World Development Indicators				
Capital city	Dummy variable indicating whether the global city is a capical city	0.59	0.49	0	1
Number of top 400 universities	Times Higher Education website	2.31	1.97	0	9
English proficiency	Country level TOEFL scores relative to maximum scores, by ETS	0.81	0.10	0.54	0.95
Corporate tax rate	Corporate tax rate of the country of the city (percentage), from KPMG	29.08	6.95	12.50	45.00
Wage level	City wage level index relative to Zurich (100), by UBS	55.08	24.99	6.74	108.38
Firm's # of existing affiliates in the city	Number of prior affiliates of the focal firm in the city. Data obtained from ORBIS	0.15	1.86	0	92

Note: Descriptives are for untransformed continuous variables. Continuous variables are taken in natural logarithm in the empirical models.

consistent with a conceptualization of a choice process in which firms choose the location that provides them the largest net benefits. The conditional logit model, however, provides consistent estimates only under relatively strict assumptions: the requirement that relative choice probabilities stay equal with or without the inclusion of other alternatives (the 'independence of irrelevant alternatives') and the related requirement of the absence of correlations between error terms across alternatives. In practice, these assumptions are often violated if preferences among firms are subject to heterogeneity. A solution is to estimate a generalized form of the conditional logit model: the mixed logit model (e.g., Basile, Castellani and Zanfei, 2008; Chung and Alcacer, 2002) which relaxes the assumptions (McFadden and Train, 2000) and allows for investor heterogeneity. The mixed logit model estimates a set of 'fixed' coefficients as well as the random parts of these coefficients that account for unobservable heterogeneous preferences. Formally, we estimate the following equation:

$$P_{fr} = \int \frac{\exp\left(\alpha X_{fr,t-1} + \lambda_f Y_{fr,t-1}\right)}{\sum_{J=1}^{J} \exp\left(\alpha X_{fj,t-1} + \lambda_f Z_{fj,t-1}\right)} g(\lambda_f) d(\lambda_f) \quad (1)$$

Where P_{fr} is the probability that firm f invests in city r rather than in cities j. $X_{fr,\ t-1}$ represents a vector of city characteristics for which coefficients α are estimated, $Z_{fr,t-1}$ is the corresponding vector of city characteristics, and λ_f a vector of random parameters.[5]

We note that our empirical model includes variables with different characteristics. A number of variables differ over cities and time (e.g., connectivity), while there are also time-varying firm- and city-specific variables (e.g., distance to affiliates). Yet other factors are firm- and city-specific but remain constant over time (language distance and

Table III. Correlations

	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*
1. Location choice																
2. Connectivity	**0.25**															
3. Geographic distance to HQ	**0.04**	**0.05**														
4. Geo. distance to regional affiliates	0.00	0.01	**0.15**													
5. Language distance to HQ	**−0.13**	**−0.09**	0.00	−0.01												
6. Other distance to HQ	**0.11**	**0.11**	**0.30**	**0.10**	**0.51**											
7. Labour market rigidity	**−0.18**	**−0.18**	−0.**14**	**−0.11**	**0.33**	**−0.08**										
8. Population	**0.05**	**0.39**	0.**14**	**0.18**	0.**13**	**0.19**	**−0.11**									
9. Population density	**−0.03**	**0.14**	**−0.04**	**−0.02**	**0.04**	0.00	**−0.12**	**0.12**								
10. GDP per capita	0.00	**−0.05**	**−0.17**	**−0.15**	**−0.04**	**−0.17**	0.01	**−0.29**	**−0.12**							
11. Country/region GDP ratio	**0.07**	0.00	**−0.06**	−0.01	**−0.07**	**−0.16**	−0.01	**0.41**	**−0.09**	**−0.07**						
12. Capital city	**0.05**	**0.23**	**−0.02**	−0.01	**0.24**	**0.32**	**0.1 6**	**0.09**	**−0.09**	**0.12**	**−0.34**					
13. Top 400 universities	**0.21**	**0.58**	**0.04**	**0.05**	**−0.13**	**0.04**	**−0.24**	0.**39**	0.00	**0.14**	**0.13**	**0.20**				
14. English proficiency	**0.17**	**0.04**	**0.02**	0.00	**−0.58**	**−0.23**	**−0.55**	**−0.38**	**−0.10**	**0.21**	**−0.03**	**−0.26**	**0.14**			
15. Corporate tax rate	**−0.11**	−0.01	**−0.05**	0.00	**0.03**	**−0.27**	**0.34**	**0.23**	**0.09**	**−0.11**	**0.40**	**−0.30**	−0.01	**−0.18**		
16. Wage level	**−0.03**	**−0.03**	**−0.16**	**−0.12**	**−0.24**	**−0.42**	**−0.22**	−0.**14**	**0.33**	**0.45**	**0.17**	**−0.36**	**0.12**	**0.41**	**0.24**	
17. Firm's # of existing affiliates in the city	**0.07**	**0.05**	0.01	**0.08**	0.01	**0.06**	**−0.05**	**0.02**	−0.01	**−0.03**	**−0.02**	**0.04**	**0.05**	0.01	**−0.06**	**−0.07**

Note: significant correlations in bold.

geographic distance). Finally, a number of variables in the models are only available at the country level, such as the corporate tax rate. As noted earlier, the choice set for each RHQ investment project consists of the global cities that are located within the region that constitutes the mandate of the RHQ.

We report the fixed coefficients as the coefficients of interest while summarizing the results of the random parts of the coefficients, where these are significant. Conditional logit models were also estimated and delivered nearly identical results with generally higher significance of the coefficients of interest.

EMPIRICAL RESULTS

Table IV reports results of the mixed logit models of the determinants of location decisions for RHQ investments. Model 1 reports the results of a model that includes only the control variables. Models 2–5 report the results of models with the hypothesis testing variables (cumulatively) included. Model 5 includes all variables.

Model 1 shows that the location choice for RHQ is positively and significantly related to city size (population), GDP per capita, the number of top 400 universities in the city, the level of English language proficiency in the country of the city, the host country's relative importance in the region (country/region GDP ratio), and the number of the firm's existing affiliates in the city. Higher wages of skilled labour and the language distance between the MNCs country of origin and the country of the global city reduce the probability that a city receives RHQ investments. A counterintuitive result is the positive coefficient for non-spatial distance between the home and host countries (cultural, economic, and institutional), a finding to which we return in the Discussion section.

Model 2 includes the first hypothesis testing variable, the composite measure of connectivity. Compared with Model 1, this model shows a significantly improved fit, as indicated by a highly significant loglikelihood ratio test. The positive and significant effect of connectivity supports Hypothesis 1. Model 3 includes the two connectivity variables separately for RHQs with only an entrepreneurial role and RHQs with an administrative role, respectively. The coefficient on connectivity for entrepreneurial RHQs is only slightly higher than the coefficient on connectivity for administrative RHQs, and a t-test cannot reject their equality. Hence, in this model Hypothesis 2 is rejected.

Model 4 includes the variables distance to HQ and average distance to affiliates. While distance to affiliates is negative and significant in support of Hypotheses 3b, distance to HQ has a negative sign but is not significantly different form zero, lending no support to Hypotheses 3a. Model 5 adds the interaction effects between the two distance variables and connectivity. Both interactions are significant and positive, in support of Hypotheses 4a and 4b. At the same time, in the complete specification of Model 5, the connectivity effect of RHQs with an administrative role is no longer significant and a t-test indicates that the difference in the connectivity effects between RHQs with an entrepreneurial role and RHQs with an administrative role now is significant at the 5 per cent level. Hence, Hypothesis 2 does appear to receive support if the effects of distance are taken into account, an issue to which we return below.

The estimates for the random parts of the coefficients show that there exists significant heterogeneity in the estimates only for some of the variables. In the fully specified Model

Table IV. The determinants of RHQ location choice across global cities: Results of mixed logit models

	(1)	*(2)*	*(3)*	*(4)*	*(5)*
Connectivity		2.457***			
		(0.282)			
Connectivity – RHQ with an entrepreneurial role			2.640***	2.638***	4.006***
			(0.393)	(0.366)	(0.713)
Connectivity – RHQ with an administrative role			2.479***	2.433***	0.264
			(0.370)	(0.365)	(1.188)
Geographic distance to corporate HQ				−0.158	−0.081
				(0.320)	(0.208)
Connectivity * geographic distance to corporate HQ					0.613**
					(0.255)
Average geographic distance to regional affiliates				−0.795***	−0.756**
				(0.283)	(0.296)
Connectivity * average geographic distance to regional affiliates					0.520**
					(0.255)
Language distance to corporate HQ	−0.967***	−0.697***	−0.652***	−0.676***	−0.543*
	(0.227)	(0.198)	(0.247)	(0.213)	(0.302)
Other (cultural, institutional and economic) distance to corporate HQ	0.640***	0.426***	0.437***	0.454***	0.388**
	(0.149)	(0.153)	(0.151)	(0.142)	(0.158)
Labour market rigidity	−0.220	−0.143	−0.099	−0.105	−0.167
	(0.134)	(0.094)	(0.105)	(0.104)	(0.120)
Population	0.347**	−0.427***	−0.460**	−0.370***	−0.457
	(0.138)	(0.156)	(0.192)	(0.131)	(0.296)
Population density	0.012	0.003	−0.016	−0.042	−0.045
	(0.065)	(0.047)	(0.057)	(0.064)	(0.055)
GDP per capita	0.687***	0.674***	0.590***	0.545**	0.517*
	(0.201)	(0.218)	(0.218)	(0.221)	(0.288)
Country/region GDP ratio	0.156**	0.343***	0.325***	0.285***	0.291***
	(0.077)	(0.074)	(0.075)	(0.073)	(0.100)
Capital city dummy	−0.174	−0.123	−0.085	−0.032	−0.108
	(0.155)	(0.152)	(0.213)	(0.168)	(0.152)
Number of top 400 universities	0.337**	0.187	0.178	0.129	0.167
	(0.148)	(0.145)	(0.180)	(0.108)	(0.285)
English proficiency	5.994***	4.298***	4.126***	4.419***	4.913***
	(0.788)	(0.728)	(0.929)	(0.754)	(0.852)
Corporate tax rate	0.052	−0.222	−0.390	−0.176	−0.171
	(0.379)	(0.326)	(0.654)	(0.581)	(0.497)
Wage level	−0.390***	−0.277**	−0.210	−0.205	−0.209
	(0.135)	(0.141)	(0.248)	(0.185)	(0.174)
Firm's # of existing affiliates in the city	1.842***	1.655***	1.679***	0.957***	1.058***
	(0.335)	(0.331)	(0.363)	(0.208)	(0.262)
Standard errors of random parts coefficients					
Average geographic distance to regional affiliates				1.000***	0.754*
				(0.353)	(0.410)
Connectivity * average geographic distance to regional affiliates					

Table IV. *Continued*

	(1)	*(2)*	*(3)*	*(4)*	*(5)*
Labour market rigidity					0.743**
					(0.367)
Population	0.653**				
	(0.268)				
GDP per capita	1.337***	1.682***	1.481*	1.705***	
	(0.465)	(0.535)	(0.851)	(0.450)	
Capital city dummy				−0.744*	
				(0.386)	
Number of top 400 universities	2.206***	2.338***	2.216***	-1.239***	
	(0.738)	(0.833)	(0.747)	(0.363)	
Observations	14,933	14,933	14,933	14,933	14,933
Number of RHQ projects	1.031	1.031	1.031	1.031	1.031
Number of firms	940	940	940	940	940
Average number of cities in choice set	14	14	14	14	14
Wald chi-square	477.7***	458.2***	438.4***	541.1***	406.1***
Likelihood-ratio test		110***	112***	58***	2
		(vs. Model 1)	(vs. Model 2)	(vs. Model 3)	(vs. Model 4)

Results are for 1031 RHQ investments by 940 MNCs in 48 global cities. RHQs with entrepreneurial mandate are the first establishments of the MNC in the city; RHQs with administrative mandates may or may not combine this with an entrepreneurial role. The independent variables are lagged by one year (see Table II for definitions). The continuous variables are in natural logarithm and their coefficients can be interpreted as close to elasticities. Cluster-robust standard errors in parentheses; *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

5, this only concerns distance to regional affiliates and labour market rigidity. This suggests that there is limited investor heterogeneity that leads to variation in the MNCs' appreciations of city characteristics. The variation in the coefficient for distance to affiliates may be an artefact of the specific role this variable plays for administrative RHQs only. The mixed logit specification ensures that the estimated main coefficients of the explanatory variables are consistent.

Interpretation of the Results

The contrasting results for the difference between the coefficient of connectivity for RHQs with an administrative and entrepreneurial role (H2) occur because Model 5 takes into account that the importance of connectivity for the administrative RHQ depends crucially on the distance to regional affiliates. This also implies that the outcomes of the test for H2 depends on this distance. In Model 5, where distance and connectivity are demeaned, the main effect of connectivity for administrative RHQs is estimated at the sample mean of distance to regional affiliates. Hence, for administrative RHQs in cities with an average distance to affiliates (and average distance to their HQs – but this aspect is identical for entrepreneurial RHQs), connectivity effects for administrative RHQs are weak and not significantly different from zero, so Hypothesis 2 is confirmed. Yet, once average distance to regional affiliates increase, the impact of

connectivity rises remarkably and becomes significant. We calculate that at the mean distance for only the subset of administrative RHQs, the coefficient of connectivity rises to 2.7 and is significant. At the maximum observed distance in the sample, the coefficient rises further to 3.9. This is still below the coefficient on connectivity for entrepreneurial RHQs but the difference in coefficients is no longer significant. Hence, Hypothesis 2 only holds when distance to regional affiliates is not particularly high.

Although coefficients estimated with nonlinear models such as the mixed logit model are generally not directly interpretable, it has been shown that the average elasticity of the probability of location choice with respect to a logarithmic transformed independent variable can be calculated as (Z-1)/Z times the coefficient of the variable where Z is the total number of choices (Greene, 2003, p. 723; Head et al., 1995, p. 237). In our model, the average number of choices (cities) in the choice set is fourteen. With a choice set of this size, the estimated coefficients for the logarithmically transformed variables are close to elasticities. The estimates on connectivity show that connectivity can have major effects on the attractiveness of global cities for RHQ investments. The estimates in Model 2, for instance, suggest that a twenty percent increase in connectivity leads to a 45 per cent increase in the probability that a city is chosen as the location for RHQ investment. By comparison, Shanghai experienced a more than 60 per cent increase in connectivity between 2002 and 2011.

We also examined the magnitude of the moderating influence of connectivity on the effect of distance. While at average connectivity, the point estimate for affiliate distance is −0.76 (in Model 5 in Table IV), our calculations show that this effect becomes more strongly negative (−1.18) at the minimum level of connectivity in the sample, but that distance becomes insignificant at the maximum connectivity. Similarly, while at average connectivity the effect of HQ distance is insignificant (Model 5), this distance effect does become significantly negative (−0.74) at the minimum value of connectivity. These findings support the notion that connectivity can render geographic distance inconsequential.

Robustness Checks and Supplementary Analysis

We conducted a number of robustness checks and supplementary analyses. First, our composite indicator of connectivity averages over three dimensions of connectivity. The rationale of using a composite indicator is that each of the separate connectivity indicators in the composite measure has its own drawbacks and measurement error, capturing the broader connectivity benefits of a city only partially. To corroborate the importance of using a composite measure, we also estimated models with the individual indicators as the focal connectivity measure. These models showed qualitatively similar but substantially less significant effects. We interpret these results as indicative that the composite measure more accurately reflects relevant international connectivity of cities.

Another potential concern is the role of external agglomeration effects. Although the analysis controlled for 'internal' agglomeration and collocation benefits due to the presence of earlier established affiliates in the city, knowledge spill-overs due to the agglomeration of HQs within the city may also provide location benefits to RHQs (Alcacer and Delgado, 2013; Bel and Fageda, 2008; Crescenzi et al., 2014). The real effects of agglomeration are notoriously difficult to disentangle from the city conditions that

attract HQ investments in the first place, since these conditions cause HQs to cluster in specific cities, which creates a naturally high correlation between prior RHQ investments and the probability of subsequent RHQ investments (Belderbos et al., 2011). Furthermore, analysis of agglomeration effects is hampered by the lack of data on establishments (by industry) at the global city level. With these caveats in mind and as a second best solution, we explored the robustness of our findings to the potential influence of agglomeration effects by including a proxy for HQ agglomeration in the cities. We followed Crescenzi et al. (2014) by taking 3-year cumulative prior HQ investments in the city as an indicator of HQ agglomeration, scaled by total investments in the city in these three years. Although the use of prior HQ investment data shortened our sample to 2006–12, the empirical results were broadly similar.

Third, another concern is the restriction of our analysis to a set of 48 well-connected global cities, which may potentially lead to selection bias. To examine this, we extended the number of cities in the choice set by including 22 additional global cities (as defined by Mastercard) that are less well connected (e.g., Bangkok, Bogota, Buenos Aires, Tel Aviv) and 18 non-global cities (e.g., Antwerp, Brisbane, Calgary, Manchester, Seattle, Stuttgart, Suzhou). Due to data constraints, we could not test models with the composite indicator of connectivity. Instead, we compared empirical results of models including these different sets of cities using producer service connectivity as the focal measure. The coefficient on connectivity for administrative and entrepreneurial RHQs increased rather than decreased in these specifications, suggesting that our results are not upward biased due to selection effects. We posit that the increased variation across cities due to the inclusion of less connected improves the identification of connectivity effects.

Fourth, the question rises how unique RHQ location choices are in the context of global city connectivity. We examined this in a supplementary analysis of the determinants of global city location choice for other types of investments by the focal firms. We identified 796 investments (e.g., in manufacturing, sales, marketing, logistics) by 236 of the focal firms in the region after the establishment of the RHQ. The results showed clearly that what matters for location choice is the geographic distance to the RHQ, rather than distance to HQ or distance to other regional affiliates. This result is consistent with our theory: affiliates established later in the region communicate primarily with the focal RHQ rather than with HQ.[6]

DISCUSSION

RHQs have become a key MNC organizational initiative in the effort to manage the trade-offs between global integration and local responsiveness, to implement global strategies at the regional level, and to act on regional opportunities. A distinct aspect of MNC investments, and their HQ operations more specifically, is that they are disproportionately concentrated in metropolitan areas (Bel and Fageda, 2008; McKinsey & Company, 2013). In fact, prior research has found that MNCs have a clear preference for global cities because of their cosmopolitan environment, advanced producer services, and extensive connectedness to local and global markets, (Goerzen et al., 2013). Yet, prior literature on MNCs' HQ operations and location decisions has paid little attention to the role of global cities' connectivity. Our research, therefore, is designed to examine

the concept of global city connectivity and the role it plays in reducing spatial transaction costs that influence the location decisions for new RHQs. In doing so, our study contributes to the literature on HQ locations as well as to the economic geography literature on global cities, by responding to the call by Cano-Kollmann et al. (2016) to examine the interplay between geographic distance, RHQ roles, and connectivity.

Whereas previous literature has conceptualized city connectivity from several different lenses including the corporate organization perspective that focuses on connectivity provided by the international offices of advanced producer services firms (e.g., Taylor, 2001; Taylor and Aranya, 2008; Wagner et al., 2014), an infrastructure perspective that focuses on, for instance, airports (Bel and Fageda, 2008; Córdoba Ordóñez and Gago García, 2010; Derudder et al., 2010; Mahutga et al., 2010; Pirie, 2010), and a knowledge-centred perspective that focuses on knowledge exchange across locations (Bathelt et al., 2004; Bell and Zaheer, 2007; Boschma and Frenken, 2010; Laud et al., 2009; Matthiessen et al., 2010; Miguélez and Moreno, 2013), our research combines these perspectives. We conceptualize and test a new measure of city connectivity that encompasses the effects of flows of people (i.e., airport passengers), services (i.e., producer services firms), and knowledge (i.e., co-invention). Our results go beyond these earlier contributions by suggesting that each of these partial measures are unlikely to provide an adequate view of connectivity and that a composite measure can more accurately represent international connectivity.

Our argument is that city connectivity reduces several forms of spatial transaction costs, which, in turn, diminishes the role of geographic distance in location choice. We believe our analysis, a mixed logit analysis of the location choices of 1031 new RHQ investments in 48 global cities between 2003–12, is among the first quantitative analyses of the locational drivers of RHQ investments. We find strong support for the role of city connectivity in attracting new RHQ investments: our estimates suggest that a 20 per cent increase in connectivity leads to a 45 per cent increase in the probability that a given city is chosen as the location for RHQ investment. We find qualified support for the notion that the location decision for RHQs with a focused entrepreneurial role are more sensitive to city connectivity than RHQs that are (also) mandated with an administrative role, as entrepreneurial RHQs have specific needs to establish relationships with local actors and cannot rely on existing affiliates and regional experience. We find that location decisions for administrative RHQs, with regional coordination and control tasks, are driven by the existing spatial configuration of affiliates, with geographic distance to these affiliates making cities less attractive. Most salient, we show that that global cities' connectivity can render geographic distance between a city and an MNC's regional affiliates inconsequential for the MNC's location decision.

We find only a weakly discouraging effect of the geographic distance to HQ on city location choice, while the effects of city connectivity increase strongly across this distance. This indicates that highly connected cities are more likely to attract RHQs of MNCs from distant home countries. We posit that this relates to the specific role of RHQs as bridges of distance between corporate HQ and regional affiliates and markets. The decision to establish an RHQ in a region is likely to be driven by the very distance between the region and corporate HQ. In case the region of interest is relatively proximate, there is probably no reason why the corporate HQ cannot perform control,

coordination, and entrepreneurial tasks related to its affiliates in the region. Given a substantial distance to the region of interest, however, the MNC is more likely to establish an RHQ precisely to deal with the challenges of distance for effective management and coordination. Connectivity then reduces the costs and inconveniences related to geographic distance to HQ, which we find to be a key city characteristic attracting distant MNCs' RHQs.

Previous studies such as Baaij et al. (2015), Beugelsdijk et al. (2010), Baaij and Slangen (2013) and Cano-Kollmann et al. (2016) have made the point that the spatial transaction costs of information and knowledge change with various types of distance (e.g., geographic, cultural, etc.) thereby increasing the costs of coordination and monitoring (Asmussen and Goerzen, 2013; Boeh and Beamish, 2012; Dellestrand and Kappen, 2012; McCann, 2011; Slangen, 2011). We contribute to this stream of research by noting that spatial transaction costs matter for RHQs both with regard to the HQ relationships and with regard to relationships with regional affiliates. Hence, we provide evidence for the notion highlighted in Baaij and Slangen (2013) that HQ disaggregation leads to complex patterns of decision making, involving multiple relationships between corporate HQs, RHQs and affiliates.

We observed that non-spatial distance (economic, cultural and economic) between the country of the city and the country of origin of the MNC attract, rather than discourages, the establishment of RHQs. This pattern is consistent with the bridging nature of RHQs and the necessity for RHQs to locate in 'distant' countries to perform this bridging function well. It is also related to the specific nature of global cities: global cities are enclaves of cosmopolitanism that may be located inside culturally or institutionally distant countries but do not share all the traits of the country (e.g., Goerzen et al., 2013). Hence, if RHQs are located in countries with greater non-spatial distance from HQ they may play a more effective bridging role while the cosmopolitan global city environment facilitates operating in such countries. Our findings correspond to the notion that there is important subnational variation in cultural and other local traits with implications for MNC operations in host countries. However, while this variation may increase complexity of doing business (Slangen, 2016), our findings indicate that if it stems from the presence of unique global city environments, it may facilitate operations of MNCs.

While the characteristics of global cities and the evolution of urban agglomerations have been important areas of study in the economic geography literature (Beaverstock et al., 2002; Derudder et al., 2010; Sassen, 1996; Taylor, 2001), these phenomena have received little attention in international business research. Our research contributes to an emerging literature on the role of global cities in multinational firms' location strategies (Goerzen et al., 2013; Ma et al., 2013). More specifically, our focus has been on one of the defining notions in the economic geography literature on global cities, i.e., that global cities are not 'bounded phenomena', but are an intrinsic part of a global network of cities in which they may take a prominent place. Thus, our study serves as an important bridge across the economic geography and international business literatures by combining the view on global cities in the former domain with the notion of the heterogeneous roles of RHQs in the latter. By focusing on the key characteristics of global cities and locational choice for RHQs at a fine-grained regional level, we extend Goerzen et al.'s (2013) analysis of global cities by providing new insights into their effect on

the RHQ location strategies of MNCs. Our argument is that the connectivity needs of RHQs are heterogeneous depending on their mandate and the existing geographic configuration of affiliates and the MNC HQ. At the same time, since there is substantial heterogeneity among global cities as well, a given global city would be chosen if it economizes significantly on spatial transaction relating to the connectivity needs of the RHQ. Hence, both city heterogeneity and MNC heterogeneity drive location decisions for new RHQ establishments.

Our research also extends the HQ location analysis of Benito et al. (2011), Laamanen et al. (2012), and Voget (2011) that focused on corporate or divisional HQs by examining the specific drivers of regional HQ locations; we demonstrate that the international connectivity of cities, rather than these cities' local characteristics, are behind much of their attraction for RHQ operations. Moreover, we augment the work done by Bel and Fageda (2008), Henderson and Ono (2008), and Ma et al. (2013) that examined HQ locations at the country or regional level; while these studies have enhanced our knowledge of HQ location choices, our study delves beyond into the locational determinants of RHQ locations worldwide in the subnational context of global cities. We believe this is an important extension since MNCs ultimately choose a specific investment location within a country (Goerzen et al., 2013) and may even relocate HQ operations between cities within a country (Strauss-Kahn and Vives, 2009).

We acknowledge that our research is just a first step in the study of connectivity and HQ configurations. Our composite measure of connectivity based on producer services connectivity, airport passenger flows, and the intensity of international co-invention is imperfect and future research should continue this effort to develop improved indicators. Better indicators of connectivity may also aim to differentiate connectivity measures with respect to their geographic patterns and scope. For instance, intra-regional connectivity of global cities may play a greater role in RHQ location decisions than worldwide connectivity or international connectivity. It is conceivable that an RHQ with a focused administrative role, coordinating and orchestrating subsidiary activities within the region, may put more value on a city's regional connectivity than its international connectivity. Furthermore, the bilateral connectivity between the home city of the MNC and a given global city may be a more precise determinant of the firm's location choice than is the city's overall international connectivity. Therefore, more detailed analysis of the connectivity characteristics that drive location choice relating to the best 'fit' between the geography of the MNC and the connectivity of the city is a promising avenue for future research.

We also note that our measures distinguishing entrepreneurial from administrative mandates are imperfect. While we could identify new RHQs with an entrepreneurial mandate at establishment, taking on a pioneering role for the MNC in the region, we could not assess to what extent RHQs with an administrative role take on entrepreneurial tasks. This limitation in demarcation may also relate to the less clear-cut findings concerning the differential impact of connectivity for RHQs with different mandates. We suggest that future work combines secondary data with survey data to bring more detail on RHQs relationships and roles into the analysis.

Another concern with respect to our findings may be that of possible endogeneity that relates to our research design. While we acknowledge this concern, our view is that

endogeneity may be less worrisome given that our analysis relates to the location decision at the level of the individual RHQ. Thus, we believe that -at the firm level- city characteristics could reasonably be understood as given, since the individual RHQ choice would not truly add to city connectivity. At the same time, we acknowledge that the perception of endogeneity stems from the fact that, at the aggregate level over time, global city connectivity and HQ activities co-evolve.

Our study focuses on RHQs and their relationships with regional affiliates and HQs. Headquarter configurations could have a more complex nature in which divisional HQs play a role and HQ tasks are dispersed and allocated to specialized units (e.g., Baaij et al., 2015; Barner-Rasmussen et al., 2007; Birkinshaw et al., 2006; Desai, 2009). Our exploration of the role of connectivity for other HQs suggested that connectivity is an important consideration of divisional and functional HQs as well. We recommend that the analysis of complex headquarter operations and the relationships between such headquarters receives the attention it deserves in future work.

CONCLUSION

RHQs' complex needs to connect over geographic space, related to their role as 'bridge' between corporate HQ and the MNCs' affiliates and external partners in the region, lead MNCs to establish RHQs in internationally connected 'global' cities. Which city in a region is chosen to establish the RHQ depends on the 'match' between city connectivity and the heterogeneous connectivity needs of RHQs, and is related to the geography of existing operations of the MNC and the RHQ's mandate. Cities' international connectivity, as manifested in flows of people, services, and knowledge, can render geographic distance inconsequential and can attract RHQs from MNCs based in distant locations.

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NOTES

[1] Relatively few (70) headquarters investment projects with a worldwide mandate were identified. These projects were excluded in the analysis to be consistent with our focus on RHQs. We return to this issue in the supplementary analysis. US headquarters were maintained because mandates are often extended to North America and because such RHQs have a least 11 US global cities to choose from.

[2] Here we use a methodology developed by the OECD (2011) to demarcate metropolitan areas. Urban areas are identified as functional economic units using population density and travel-to-work flows.

[3] Similar empirical results were obtained if we adopted a minimum-maximum aggregation (OECD, 2008) rather than the maximum weight aggregation.

[4] We also explored including non-spatial distance effects to the countries hosting regional affiliates, but found no significant effects.

[5] Since the locational choice probability has to be calculated over all possible values of λ_f, the mixed logit probability is obtained by taking the integral of the multiplication of the conditional probability with the density functions.

[6] Among the 236 firms investing in new affiliates in the region, 100 firms invested after establishing an entrepreneurial RHQs, confirming that these investments often pave the way for further expansion by the firm in the region.

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