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Global cities, connectivity, and the location choice of MNC regional headquarters

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ABSTRACT

One of the manifestations of the increasing diversity in multinational corporation (MNC) operations is the growing importance of regional headquarters (RHQs). RHQs assume an intermediary, bridging role between the corporate headquarters and local affiliates and other actors in their respective regions. They can have a coordination and control (i.e., administrative) mandate as well as an opportunity seeking (i.e., entrepreneurial) mandate. Since these mandates require RHQs to interact with various internal and external entities and exchange knowledge across distant locations, MNCs tend to locate their RHQs in highly connected "global cities" because these places allow the firm to economize on spatial transaction costs. In this paper, we explore the interplay between geographic distance, RHQ roles, and connectivity by analyzing *which* global city is selected by an MNC when establishing an RHQ. We argue that there is substantial heterogeneity among MNCs in the importance they attach to city connectivity—which we conceptualize as encompassing the effects of the international flows of people, knowledge, and services—because the connectivity needs of an RHQ varies in relation to its corporate mandate as well as to the geographic configuration of the MNC's activities. Our mixed logit analysis of the location choices for 1,031 newly established RHQs in 48 global cities between 2003 and 2012 provides qualified support for the notion that the relationship between city connectivity and location choice is more pronounced for RHQs with an entrepreneurial role. Although the geographic distance of a city to the MNC's regional affiliates discourages the establishment of RHQs with administrative roles, distance effects disappear when the city is highly connected. Moreover, well connected cities are able to attract MNCs' RHQs from distant countries-of-origin.

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

INTRODUCTION

One of the manifestations of the increasing disaggregation and fragmentation of corporate headquarters operations (HQ) of multinational corporations (MNCs) (see, e.g., Desai 2009; McKinsey & Company, 2013) is the growing importance of regional headquarters (RHQs). RHQs have a mandate covering multiple countries in their regions (e.g., Europe, North America, or East Asia) and they play an important intermediary or bridging role between corporate headquarters and local affiliates and other regional actors (e.g. Hoenen, Nell, & Ambos, 2014; Lehrer & 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, 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 tradeoffs between global integration and local responsiveness (Hoenen *et al.*, 2014; Prahalad & Doz, 1987), to implement global strategies at a regional level and to act on regional opportunities (Yeung, Poon & Perry, 2001).

The emergence of RHQs is a response, at least partially, to the regionalization trend in the world economy which is fragmented into major regions: the Americas, Europe, and East Asia (Rugman, 2000; Rugman & Verbeke, 2004). Regionalization has given impetus to the establishment of RHQs to develop and coordinate regional activities. In fact, the number of European RHQs has risen by 76 percent during 2000-2010 (Ambos & Schlegelmilch, 2010) and, in 2005, more than 1,100 RHQs were established in the Asia-Pacific region (Enright, 2005). In fact, our own data on RHQs include more than 300 new RHQs established annually in recent years.

A distinct aspect of HQ operations is that they are disproportionately concentrated in metropolitan areas (Bel & Fageda, 2008; Klier & Testa, 2002) - a trend which appears to be emerging also in developing economies (McKinsey & Company, 2013). The economic geography literature has suggested that major cities with unique connections to the outside world, so-called “global cities” such as London,

New York, and Singapore, function as centers of command and control that provide MNCs with global reach (Friedmann, 1986; Sassen, 1996)[i]. These cities have been 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 markets (Goerzen, Asmussen, & Nielsen, 2013). While the role of cities and city connectivity in the world economy has received substantial attention in the geography literature (Alderson & Beckfield, 2004; Beaverstock *et al*., 2002; Doel & 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) examine the relationship between firm characteristics and MNCs' decisions to locate affiliates in a global city but do not consider the role of connectivity. Ma, Delios & Lau (2013) limit analysis to Shanghai and Beijing as destination for foreign firms' investments but also do not consider city connectivity. Bel & Fageda (2008) examine the role of airport infrastructure in location decisions for HQs but only for European metropolitan areas. Further, the recent thought pieces by Hoenen & Kostova (2015) as well as Baaij & 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 global cities specifically.

While there is a good understanding of the general importance of global cities for HQ operations, our study is designed to understand *which* global city is chosen from a set of alternative locations in the region in which the MNCs choose to locate their RHQs. We 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. Drawing on the extant literature, we conceive of connectivity as multifaceted, including international flows of people, knowledge, and services (as discussed in greater detail in our conceptual background section below). Further, we define spatial transaction costs as those expenses that relate to the governance and monitoring of actions in the alignment of dispersed activities to achieve synergies or other competitive advantage (Baaij & Slangen, 2013). As such, spatial transaction costs can take several

forms such as the costs of communication, monitoring, and coordination not only of subsidiaries but also of external partners, as we discuss in detail in our hypotheses development section below. Our argument is that city connectivity can reduce several forms of spatial transaction costs which, in turn, reduces the role of geographic distance in location choice.

We begin with the premise that RHQs, given their bridging function between corporate headquarters and regional affiliates, face significant spatial transaction costs and have strong connectivity needs, such that MNCs are likely to locate RHQs in global cities to take advantage of these cities' connectivity, thereby economizing on the costs.[ii] While an understanding of the general importance of global cities for HQ operations is emerging, our study aims to understand *which* global city is chosen from a set of alternative locations in the region. We argue that the connectivity needs of RHQs are heterogeneous, depending on their mandate, the existing geographic configuration of affiliates, and the MNC's HQ. At the same time, there is substantial heterogeneity among global cities as well, such that a given global city would be chosen if it economizes significantly on spatial transaction costs given the connectivity needs of the RHQ. Hence, both city heterogeneity and RHQ roles drive MNC location decisions for new RHQ establishments. In fact, we show that global cities' connectivity can render inconsequential the geographic distance between a city, the corporate HQ, and its regional affiliates.

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-Kollman, Cantwell, Hannigan, Mudambi, & Song (2016) for new insights into the interplay between geographic distance, RHQ roles, and connectivity. Empirically, we draw on an extensive database of new RHQ investments by MNCs and conduct a mixed logit analysis of the location choices for 1,031 greenfield RHQ investments in 48 global cities between 2003 and 2012. Our results inform the geography and global city literatures by demonstrating the role of connectivity in attracting RHQs with specific mandates and positions in the 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 & Fageda, 2008; Benito, Lunnan & Tomassen, 2011; Birkinshaw *et al*., 2006; Laamanen, Simula & Torstila, 2012; Voget, 2011). We demonstrate that the international connectivity of cities, rather than these cities' local characteristics, determines much of their attraction for RHQ operations.

We note that most prior studies of HQ locations were conducted at the country level, ignoring heterogeneous locational characteristics within countries. Other work, mostly within the regional economics domain, has adopted a subnational perspective but has restricted attention to HQ locations within a given region (e.g., the European Union) or country (e.g., Bel & Fageda, 2008; Diacon & Klier, 2003; Henderson & Ono, 2008; Klier & Testa, 2002; Ma, Delios & Lau, 2013; Strauss-Kahn & Vives, 2009). While these studies have enhanced our knowledge of HQ location choices, our study examines the locational determinants of RHQ locations worldwide in the context of global cities. Analyzing HQ location choice at the city level is most appropriate because MNCs ultimately choose a specific location within a country for investment (Goerzen *et al*., 2013) and may relocate HQ operations between cities within a country (Strauss-Kahn & Vives, 2009). Therefore, our study analyzes RHQ locations across a set of global cities, spread over five continents, that have been shown to be globally attractive and internationally connected (MasterCard, 2008).

ANALYSIS OF BACKGROUND CONCEPTS

The Importance of Spatial Transaction Costs to 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 & Linton, 2011). These opportunities may include taking advantage of changing costs and qualities of labor, shifting knowledge bases, new (or dilapidating) infrastructure, emerging image or reputation, and changing qualities of life. In addition, MNCs need to maintain their

proximity to important stakeholders such as customers, shareholders, financiers, and competitors (Birkinshaw *et al*., 2006; Laamanen, Simula & Torstila, 2012; Strauss-Kahn & Vives, 2009).

Since MNCs are compelled to situate their operational and administrative operations in locations that provide the greatest advantage, they become increasingly geographically dispersed creating acute management and operational challenges that must be overcome (Kunisch, Menz & Ambos, 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. These exchanges of knowledge and information between head office and subsidiaries are essential also because they allow for learning, thereby increasing the MNC's knowledge base which could be a source of competitive advantage (Bouquet *et al*., 2009; Gupta & Govindarajan, 2000).

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 & Birkinshaw, 1998). A critical underlying element in this process is whether the knowledge and information to be transferred is explicit, in the case of rules or instructions, or tacit, in the case of experience or more nuanced insights. Less explicit, tacit knowledge requires great attention because the transmission is not straightforward. Thus, personal monitoring is often necessary requiring on-site demonstrations or face-to-face communication (Bresman, Birkinshaw & Nobel, 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 & Håkanson, 2014; Asmussen & Goerzen, 2013; Dellestrand & Kappen, 2012; Slangen, 2011) through travel time (Boeh & 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, McCann, & Mudambi, 2010; Cano-Kollmann *et al*., 2016) that vary with the RHQ's role within the MNC as discussed below.

Regional Headquarters Roles within an MNC

An MNC is defined as a group of geographically dispersed and goal disparate operations that include its HQ and the different national subsidiaries that can be seen as a network of subsidiaries with a hierarchically acting headquarters (Ghoshal & Bartlett, 1990; Rugman & Verbeke, 2001). MNCs' affiliates are embedded in internal networks as well as their external environments (Ciabuschi, Dellestrand & Martin, 2011; Foss, Foss & Nell, 2012; Nell, Ambos & Schlegelmilch, 2011). As a critical node in these networks, an RHQ is embedded in its parent firm's internal network and its regional environment (Hoenen *et al.*, 2014).

The general role of the RHQ is to bridge the distance between HQ, regional affiliates, and markets and the establishment of RHQs has risen as a solution to the trade-off between global integration and local responsiveness (Prahalad & Doz, 1987). The rationale of the establishment of an RHQ is to create value within the MNC by sharing knowledge, synergizing management, and providing supporting services (Goold & Campbell, 1998; Lunnan & Zhao, 2014). Within the internal MNC network, the RHQ builds links with local subsidiaries across the host region to monitor, coordinate, and control these subsidiaries' business activities. At the same time, it maintains a strong relationship with the HQ and -if present- sister RHQs or divisional HQs, to exchange information and to achieve intrafirm synergy. Externally, the RHQ collects and reports information concerning regional market opportunities and business environment changes (e.g., new government regulations). In their role as brokers, RHQs have to understand local affiliate contexts as well as the corporate priorities of their HQs. The importance of RHQs for MNCs has been documented in various regions, Asia-Pacific and Europe in particular (e.g., Alfoldi, Clegg & McGaughey, 2012; Ambos & Schlegelmilch, 2010; Yeung *et al*., 2001).

The literature on RHQs has identified two major mandates with which these intermediate management units can be charged: an entrepreneurial role and an administrative role (e.g., Chandler, 1991; Lasserre, 1996; Mahnke *et al*., 2012). An entrepreneurial role entails scouting for talent, seeking out new business opportunities, and signaling commitment to local markets. RHQs assist regional affiliates in identifying opportunities, to act on them, and to share information with corporate HQ. Opportunities identified in one particular affiliate context may have value beyond that context and the RHQ is instrumental in drawing attention to this within the region and at corporate HQ. RHQs with a specific entrepreneurial mandate may also be established as a first investment in a region to function as a regional beachhead for business development and to prepare for the establishment of other affiliates (Lasserre, 1996). An administrative role, on the other hand, implies serving as the command, control, and coordination center of dispersed activities in the region, orchestrating resource pooling, and leading the effort to achieve intrafirm synergy.

Given the specific bridging function of the RHQ and its presence as a central node in MNCs' affiliate networks, RHQs have strong and diverse needs to connect to a variety of internal and external partners in different locations. They have a responsibility to encourage the flow of assets, knowledge, information, and resources in the internal and external networks of the MNC, which are indispensable in creating value and enhancing competitive advantage. This implies that the MNC's decision as to where to locate the RHQ with its bridging function takes on greater strategic importance and is likely to be governed by the international connectivity that the location can facilitate, as discussed below.

Cities and International Connectivity

The concept of international connectivity of cities or regions has received most attention in the economic geography literature (e.g., Bathelt, Malmberg & Maskell, 2004) and more recently has been studied from a more integrated perspective focusing on the role of individuals and firm actors that create this connectivity (Lorenzen & Mudambi, 2013; Saxenian & Hsu, 2001). We define connectivity as the ease and intensity with which people, goods, capital, and knowledge flow across space. Connectivity

created by organizations is referred to as 'organizational pipelines' - since flows are focused and directed - while connectivity via individuals is decentralized and more dispersed (Lorenzen & Mudambi, 2013). MNCs are responsible for most of the 'organizational pipeline' linkages, while ethnic diasporas are perhaps the most salient example of connectivity created by groups of individuals (Saxenian, 2006; Saxenian & Hsu, 2001).

Three approaches have been developed within the economic geography and cities literatures to understand this connectivity: the infrastructure approach, the corporate organization approach, and the knowledge-centered 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; Derudder & Witlox, 2008; Malecki, 2002; Smith & Timberlake, 2001). From this perspective, global city connectivity is facilitated by air transport, telecommunication circuits, and non-voice data transfer systems (Knox & Taylor, 1995). These enabling communication and transport networks undergird the flows of capital, people, and information which are fundamental to the connectivity of key cities (Córdoba Ordóñez & Gago García, 2010; Mahutga, Ma, Smith & Timberlake, 2010; Pirie, 2010). Among these networks, airline linkages offer the clearest illustration of global city connectivity (Knox & Taylor, 1995). The literature on HQ (re-)location has confirmed the importance to firms of a well-developed airline traffic infrastructure (Bel & Fageda, 2008; Testa, Klier & Ono, 2005).

In contrast, the corporate organization approach starts from the observation that relations between cities are primarily created by firms pursuing transnational location strategies (see, e.g., Alderson & Beckfield, 2004; Derudder *et al*., 2003; Wall & van der Knaap, 2011). This model builds upon the concept that global cities are part of a process of servicing of global capital by advanced producer service firms (e.g., accounting, advertising, finance, insurance, and law). This differs from maps of infrastructural flows (i.e., airlines, etc.) because the basic agents of world city connection from this perspective are global service firms with their worldwide office networks. These service firms weave cities into a global network in the course of their work, such that intra-firm flows of information, knowledge, and direction

can be estimated from the size and functions of pairs of city offices. In this way, connectivity between cities can be estimated by the presence of leading global service firms across these cities generating in a world city network (Taylor, 2001), an approach that has been widely applied to analyze inter-urban connectivity in different contexts (Bassens *et al*., 2010; Hoyler, Freytag & Mager, 2008; Huang, Lu, & Sellers, 2007; Taylor & Aranya, 2008).

Research that has adopted the corporate organization approach has singled out connectedness as a key trait of global cities through the networks of corporate service firms. These firms generate and facilitate flows of information across geographically dispersed organizations (Wagner, Hoisl & Thoma, 2014) and provide seamless services for their corporate clients (Beaverstock, *et al*., 2002; Doel & Hubbard, 2002). Corporate clients are often MNCs and, more specifically, the HQ command and control operations of MNCs. Thus, a city's position in these global city networks via organizational pipelines provided by internationally producer services firms is likely to be an important attractor to HQ operations as they can assist them in the provision of HQ services across borders (Lunnan & Zhao, 2014; Monteiro, Arvidsson & Birkinshaw, 2008).

The third strand of research (i.e., the knowledge-centered 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 only rely on its own local knowledge base but also needs to encourage external knowledge inflows (Asheim & Coenen, 2006; Bathelt *et al*., 2004). Dynamic regions and cities are characterized both by dense local knowledge circulation as well as by strong international connections to outside knowledge networks (Laud, Grein & Nachum, 2009). This approach shares the notion of the corporate organization approach that world cities are 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 locally bounded characteristics (Doel & Hubbard, 2002).

Research in this tradition has shown that regions' technological performance is positively associated with such cross-regional and international linkages (Maggioni, Nosvelli & Uberti, 2007; Miguélez & 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 & Zaheer, 2007; Boschma & Frenken, 2010; Malmberg & Maskell, 2002).[iii] 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, Schwarz, & Find, 2010).

Taken together, we conclude that various meaningful concepts of connectivity have been analyzed in the extant literature, yet each focuses on a specific aspect of interlinkages between distant locations due to individuals and organizations. For MNCs and their (R)HQ operations, these individual concepts cover partially overlapping dimensions of connectivity 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. Hence, the connectivity concept should be broadly defined to capture relevant traits of cities. We adopt, therefore, an integrative and broader 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 make use of 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 & 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 variety of distant origins within the city, facilitating this task.

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, Jimenez & Zanfei, 2013). This requires manager and employee mobility across dispersed locations, such as corporate HQ, affiliates, and locations in the region where partners and business opportunities are present. 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 & Beamish, 2012; Bel & Fageda, 2008; Testa, Klier & Ono, 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.[iv]

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 who position themselves in global cities to provide these specialized services to MNCs. This reasoning suggests that 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 an MNC 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 by scholars as MNCs attempt to match their organizational structures to the demands placed upon them (Hoenen *et al*., 2014; Lunnan & Zhao, 2014; Mahnke *et al*., 2012; Yeung *et al*., 2001). In the literature, two types of RHQ roles have been identified, one of which is an entrepreneurial role that involves scouting for talent, acquiring market knowledge, seeking out business opportunities, and signaling an emerging commitment to local markets, with the other being an administrative role in managing regional affiliates (Ambos & 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, and fit with, 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 and coordinating role. RHQs performing primarily entrepreneurial roles typically would be established in the early stages of an MNC's entry in a region, as it penetrates 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, by design, 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 likely to be important.

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

have been operating existing affiliates in that region. Through these operations, the RHQ can draw upon an existing knowledge base on regional conditions and opportunities. In this situation, addressing cross-border informational needs and acquiring access to external sources of knowledge would be less likely to be salient. This suggests our following hypothesis:

Hypothesis 2: *The positive relationship between the propensity of a firm choosing a global city for its RHQ and the city's international connectivity is stronger for RHQs with an entrepreneurial role than 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, Guillen & Zhou, 2010; Boeh & Beamish, 2012; Castellani, Jimenez & Zanfei, 2013). Prior research has found that national manufacturing HQs tend to be located in close proximity to production plants (Henderson & Ono, 2008) and has shown the benefits of collocation (e.g. Alcacer & Delgado, 2013; Defever, 2012).

Based on this reasoning, the RHQ 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. 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 favor 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 time would be minimized, travel costs would be reduced, tacit knowledge exchange would be faster and more effective, thereby 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 hypothesis:

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

Since MNCs are compelled to locate their operations wherever the greatest advantages are available, they are becoming increasingly dispersed geographically. Yet, we know from prior research that spatial transactions costs arise whenever organizations need to bridge distances. This dispersion creates significant management challenges that must be overcome organizationally, through the establishment and ongoing activities of both HQ and RHQ (Kunisch, Menz, & Ambos, 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, Birkinshaw, & Nobel, 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 & Goerzen, 2013; Dellestrand & Kappen, 2012; Slangen, 2011). While an obvious spatial transaction cost is that of travel (Boeh & Beamish, 2012) a less obvious but perhaps somewhat more important is that of managerial opportunity cost (McCann, 2011).

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 &

Goerzen, 2013). A key issue in the analysis of the regional coordination and control of an MNC's dispersed operations, therefore, is that of the spatial transaction costs of information and knowledge transfer (Baaij *et al*., 2015; Beugelsdijk, McCann & Mudambi, 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, Asmussen & Nielsen, 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 since international and regional knowledge flow 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 hypothesis below.

Hypothesis 4a: *The negative relationship between the propensity of a firm choosing 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 choosing 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.*

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 2003-2012, 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, Pietrobelli & Rabellotti, 2014; D'Agostino, Laursen & Santangelo, 2013). Our dataset identifies the investing firm, type of project, host country, host city, and sector in which the investing firm operates. The dataset of investments in HQ activity also 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. For our study, 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.[v] 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 -which we describe 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 and since not all firms with RHQ investment projects could be matched to ORBIS, our sample of RHQ projects was reduced to 1,031 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. Table 1 shows the distribution of RHQs over global cities grouped broadly by regional mandate. 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.

**********INSERT TABLE 1**********

Variables

The dependent variable in our analysis is a binary variable taking the value of one if the city in the choice set is selected for the RHQ investment, and zero for all other cities in the choice set. 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 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. The connectivity of a city is the product of a producer services firm's service value in a city and the firm's service values in all other cities, summed over all producer services firms (Derudder *et al*., 2010).[vi] 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. London, New York, Hong Kong, Paris, Tokyo, and Singapore are the best connected cities. Connectivity is taken as a relative index score of the city compared to London (with the score of London taking the value 100).[vii]

Airport connectivity has been found to attract HQ operations (e.g., Bel & 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. The airports of London, New York, Paris, Hong Kong, and Singapore have most passenger traffic in 2011. 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 currently covers more than 5,500 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., US, 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.[viii] 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 and we normalize the measure to a scale of 0-100, with Geneva in the year 2006 as the benchmark. Cities with the most internationally connected inventive activities tend to be cities in smaller and open economies: Geneva, Brussels, Zurich, Lisbon, and Singapore.

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 $C = 100 \sum_{x=1}^{3} (\frac{X_i}{X_{max}})/3$, with Xi the value for the different connectivity dimensions.[ix] The top ranked cities in 2011 are New York, Shanghai, Hong Kong, Singapore, and Paris.

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 south-east 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 center. 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 and the 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 international *connectivity* and *average distance* and between 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 language distance data from Dow & 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, Ertug & Hennart (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. [x] 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 (*other distance*). 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, Hofstede & Minkov (2010) using the aggregation method proposed by Kogut & Singh (1988). The measures of institutional distance and economic distance are taken from Berry at al. (2011)[xi].

The models include three cost-related factors, i.e., the corporate tax rate, the local wage level, and costs related to labor 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 & 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 & Henderson, 2008; Strauss-Kahn & 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 from the World Bank's Doing Business reports to include a variable measuring labor market rigidities. The rigidity index is the average of 3 sub indices: a difficulty of hiring, rigidity of hours, and difficulty of firing. The labor 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 & 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 2 and coefficients of correlation are given in Table 3. 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.[xii] 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 without any existing affiliate in the region prior to the RHQ investment. On average, the 48 global cities are home to almost two world top 400 universities. About 59 percent of the global cities are capital cities. The correlation coefficients show no multicollinearity concerns.

**********INSERT TABLES 2 AND 3**********

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 & Chung, 2007; Belderbos & van Olffen, 2011; Head, Ries & Swenson, 1995) is the conditional logit model (McFadden, 1974) which can be derived from firms' profit maximization. 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; a solution, however, is to estimate a generalized form of the conditional logit model: the mixed logit model (e.g., Basile, Castellani & Zanfei, 2008; Chung & Alcacer, 2002) which relaxes these assumptions (McFadden & Train, 2000). The mixed logit model estimates a set of fixed coefficients as well as a random parts of these coefficients that account for unobservable effects and become significant if there is substantial heterogeneity among firms or choices. Formally, we estimate the following equation:

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

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 with λ_f a vector of random parameters with zero mean following a density function $g(\lambda_f)$. 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.

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 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 significant random parts of the coefficients. We note that we also estimated conditional logit models. These delivered nearly identical results with generally higher significance of the coefficients of interest.

EMPIRICAL RESULTS

Table 4 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. Model 2-5 report the results of models with the hypothesis testing variables (cumulatively) included. Model 5 includes all variables.

**********INSERT TABLE 4**********

Model 1 shows that 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 labor 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. The only less intuitive 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 our Discussion.

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 percent 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 5, this only concerns distance to regional affiliates and labor market rigidity. This suggests that there are only limited other types of investor and city heterogeneity that lead 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 does ensure 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, with the distance and connectivity variables 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 are weak and not significantly different from zero. 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 we conclude that we find only qualified support for Hypothesis 2.

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 average elasticities approximate over 13/14 of the estimated coefficients of continuous variables (which are all logarithmically transformed in the estimated models). 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 percent increase in the probability that a city is chosen as the location for RHQ investment. By comparison, Shanghai experienced a more than sixty percent 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 4), our calculations show that this effect becomes more strongly negative at the minimum level of connectivity in the sample (-1.18) but that distance becomes insignificant at the maximum connectivity within the sample. Similarly, while at average connectivity the effect of HQ distance is insignificant (Model 5), this distance effect does becomes significantly negative (-0.74) at the minimum value of connectivity in the sample. 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 results showed qualitatively similar but substantially less significant effects across these models. 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 spillovers due to the agglomeration of HQs within the city may also provide location benefits to RHQs (Alcacer & Delgado, 2013; Bel & Fageda, 2008; Creszenzi *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 create a naturally high correlation between prior RHQ investments and the probability of subsequent RHQ investments (Belderbos, van Olffen & Zhou, 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 follow 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. Since we have to use three years prior investment data from the same data source we draw on to identify RHQ investments we lose these years of data and we can estimate the model for only 781 investments during 2006-2012; yet, the empirical results were qualitatively similar. All hypotheses testing variables had the expected sign and all were significant with the exception of the interaction between HQ distance and connectivity.

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 extend 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. While the mean value of producer services connectivity of the 48 global cities is 50.75, the mean values of producer services connectivity of the 22 additional global cities and the 18 non-global cities are significantly lower at 42.80 and 23.55, respectively. The number of RHQ investments increases by 310 to 1,341, including 248 additional investing firms, with an apparent lesser 'taste' for connectivity. 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 cities 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 cities 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 previously established RHQ, rather than distance to HQ or distance to other regional affiliates - while connectivity plays a less pronounced role. Hence, after establishment of the RHQ, it becomes the focal point for post-RHQ investments. The results are consistent with our theory: affiliates established later in the region communicate primarily with the focal RHQ rather than with HQ. Hence, in the relationship between the location for newly established affiliates and the RHQs, distance to

the RHQ matters - just as distance to existing affiliates in the region matters for the location of RHQs in our core analysis. 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.[xiii] We also examined whether the role of connectivity differed in location choices for divisional and functional HQs. Although we could only identify twelve such investments by the focal firms, the results showed a significant impact of city connectivity on location choice for divisional and functional HQs that was comparable to RHQs. Hence, connectivity plays an important role for other HQ location decisions as well.

DISCUSSION

RHQs have become a key MNC organizational initiative in the effort to manage the tradeoffs 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 & 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-Kollman *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 & Aranya, 2008; Wagner *et al*., 2014), an infrastructure perspective that focuses on, for instance, airports (Bel & Fageda, 2008; Córdoba Ordóñez & Gago García, 2010; Derudder *et al*., 2010; Mahutga *et al*., 2010; Pirie, 2010), and a knowledge-centered perspective that focuses on knowledge exchange across locations (Bathelt *et al*., 2004; Bell & Zaheer, 2007; Boschma & Frenken, 2010; Laud *et al*., 2009; Matthiessen *et al*., 2010; Miguélez & Moreno, 2013), our research combines these perspectives to develop a novel integrated approach. 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 1,031 new RHQ investments in 48 global cities between 2003 and 2012, 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 twenty percent increase in connectivity leads to a 45 percent 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 distance to these affiliates making cities less attractive. Moreover, our evidence suggests that after the establishment of an RHQ MNCs will choose locations that are geographically close to this RHQ for their subsequent investments.

Yet 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.

Previous studies such as Baaij *et al*. (2015), Beugelsdijk *et al*. (2010), Baaij & 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 & Goerzen, 2013; Boeh & Beamish, 2012; Dellestrand & 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 & Slangen (2013) that HQ disaggregation leads to complex patterns of decision making, involving multiple relationships between corporate HQs, RHQs and affiliates.

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, the MNC is more likely to establish an RHQ precisely to deal with the challenges of distance for effective management and coordination. The variation in this distance, which depends on which global city in a distant region is chosen, may not often be most salient as a determinant of the RHQ location decision. Connectivity, on the other hand, reduces the costs and inconveniences related to geographic distance to HQ, which we find to be a key city characteristic attracting distant MNCs' RHQs.

A related finding of interest in this regard is that dimensions of 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 & Fageda (2008), Henderson & 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 & Vives, 2009).

Limitations

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, although this effort may be hampered by the difficulty of obtaining detailed data on regional and bilateral connectivity.

As an important limitation of our approach, we 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 of location choice.

A further limitation that may remain with respect to our sample is the fact that the choice set available to our focal firms is relatively small. It may be, however, that this issue is an insurmountable one for researchers interested in global cities because these places are inherently unique and, therefore, limited in number. We have developed several ways to examine the significance of this issue by expanding the number of focal firms in our analysis. For example, we extended our models to encompass additional choices in our set including 22 less connected global cities (as defined by MasterCard) as well as 18 secondary non-global cities. Our results show a pattern consistent with our main findings across the difference choice set extensions. Nonetheless, our suggestion to future researchers is to develop more comprehensive decision sets to compare and contrast firm choices across locations to create confidence in robust findings.

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. Headquarters 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 preliminary 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 headquarters operations and the relationships between such headquarters receives the attention it deserves in future work.

Complementary theoretical perspectives

Our research on the interplay between RHQ roles, geographic distance, and connectivity connects to a broader literature on communication and coordination within multinational firms. Antràs, Garicano, & Rossi-Hansberg (2008), for example, highlight the interaction between host-country management skills and the quality of communication technologies on MNCs location decisions. Similarly, Bloom, Garicano, Sadun & Reenen (2014) examine the impact of information and communication technology suggesting that information technology (e.g., computer assisted design) is a decentralizing force in an MNC's location decision, whereas communication technology (e.g., data intranet) is a centralizing force. Thus, the literature in this stream reinforces the importance of organizational connectivity and has begun to develop a more nuanced conceptual understanding of the nature of transmission and reception of information which is at the heart of connectivity. Further, Zhou (2015) has shown that MNCs operating in

countries with weak institutions can manage connectivity challenges by specifying the ways in which internal channels of information flow and reallocating decision rights can be achieved through organizational hierarchy. Thus, these findings complement and combine with our work by reinforcing the idea that MNCs design their organization structures to mitigate institutional obstacles to match an RHQ's connectivity needs, which vary in relation to its corporate mandate as well as to the overall geographic configuration of the MNC's activities.

We employed spatial transaction cost theory as we believe this is a particularly useful lens in the analysis of RHQ location choices because it focuses directly on the notion of costs of connectivity that are incurred in the alignment (i.e., communication, monitoring, and coordination) of geographically dispersed activities. Since MNCs face inherently higher costs of coordination relative to their domestic counterparts (Buckley & Casson, 1976), they must be particularly sensitive to the costs of international connectivity that emerge as a result of distance. Our basic argument is that global city connectivity can reduce several important forms of spatial transaction costs which, in turn, reduces the impact of geographic distance in location choice. Our focus specifically on the costs of MNC organization, however, does not diminish the importance of alternative perspectives on the question of how MNCs make location choices. One such alternative perspective emanates from the resource-based view of the firm; using this lens, firms would make location decisions based on their idiosyncratic, path-dependent resources that would be used to achieve superior performance. This alternative lens may be seen as a complement to our spatial transaction cost perspective. From the resource-based view, the MNC would focus on how particular resources in a given location could be captured or on the capabilities available in-house that could be leveraged to advantage in that foreign location. In either case, the effort to develop or exploit resources could be reconciled with a spatial transaction cost framework by regarding connectivity as a resource that a firm could either capture through that location decision, or as exploit if the firm has particular capabilities to achieve connectivity. We encourage future studies to explore broader perspectives on the intricate relationship between HQ roles, internal and external connectivity, and location.

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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ENDNOTES

[i] The definition of world cities or global cities dates back to 1915 when Patrick Geddes (1915) defined 'world cities' as 'those places where a disproportionate amount of the world's business is conducted'.

[ii] Indeed our data on global RHQ investments suggest that about 60 percent of RHQs are established in just 75 global cities.

[iii] In a similar vein, the MNC literature on international R&D and intra-firm knowledge flows has shown the importance of international co-inventor teams ('co-practice') to reap the benefits of dispersed knowledge creation (Frost and Zhou, 2005; Singh, 2008). Dispersed R&D activities lead to better quality

inventions only if there is sufficient knowledge exchange and collaboration among units of the firm in different locations (Lahiri, 2010; Singh, 2008).

[iv] Nachum *et al.*, (2008) make a similar argument, but then with respect to countries' proximity to knowledge bases.

[v] 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.

[vi] The measure of connectivity resembles the nodal degree centrality in social network theory (Freeman, 1978).

[vii] We obtain yearly data on cities' connectivity by interpolating values for the intermediate years. For the limited number of HQ investments in 2012, we maintain the connectivity index of 2010.

[viii] 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.

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

[x] We set the score for countries for which English is the official language to the maximum score. An alternative would be to set the score for these countries to the average score for native speakers (Cuypers, Ertug & Hennart, 2015).

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

[xii] The differences in these means between global cities hosting entrepreneurial or administrative RHQs are limited.

[xiii] In some contrast, the results for R&D investments showed a stronger effect of city connectivity likely to be related to greater coordination needs with other R&D units, but no significant negative effect of distance to RHQ.

Table 1. The distribution of RHQ investments across global cities within regions

Host region-Asia Pacific

Global city	No. of RHQ investments	No. of entrepreneurial RHQs	No. of administrative RHQs
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

Global city	No. of RHQ investments	No. of entreprenurial RHQs	No. of administrative RHQs
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

Table 1. –continued

Host region-North America

Global city	No. of RHQ investments	No. of entrepreneurial RHQs	No. of administrative RHQs
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
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

Global city	No. of RHQ investments	No. of entrepreneurial RHQs	No. of administrative RHQs
Mexico City	4	2	2
Santiago	7	3	4
Total	11	5	6

Table 2. Descriptive statistics

Varible Name	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 connecivity, airport conectivity 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 betweeen global city and city of HQ. In thousand kilometers, great circle method	8.19	3.01	0.03	19.62
Average geographic distance to regional affiliates	In thousand kilometers. 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 & 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
Labor 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	6.23	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 RHA. Source: OECD and World Development Indicators	0.05	0.05	0.00062	0.61
Capital city	Dummy variable indicating whether the global city is a captical 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.

Table 3. 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. Labor 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**	**0.16**	**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.

Table 4. The determinants of RHQ location choice across global cities: results of mixed logit models

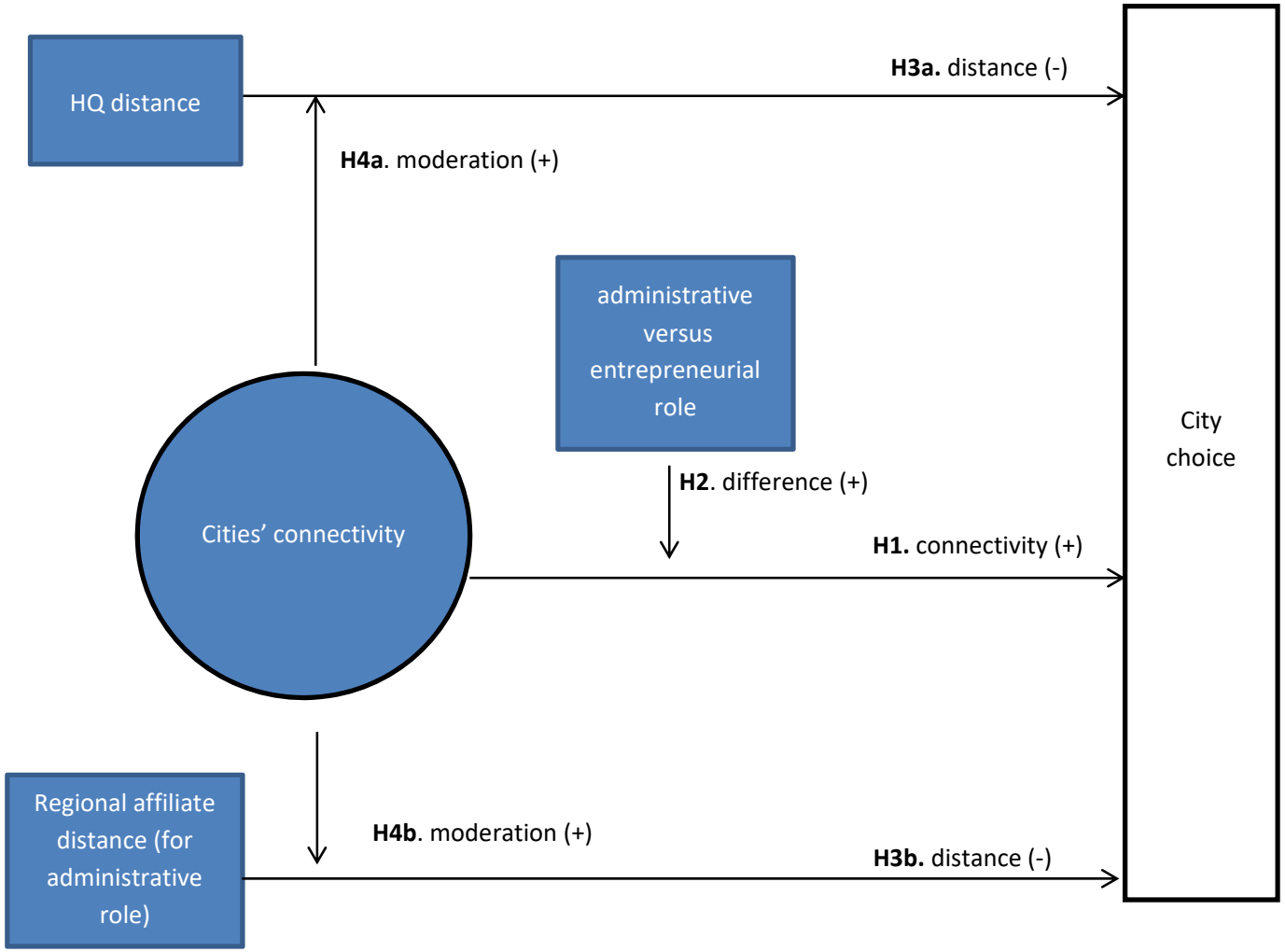
	(1)	(2)	(3)	(4)	(5)
Connectivity		2.457***			
		(0.282)			
Connectivity - RHQ with an entrepreneurial role			2.640***	2.638***	4.006***
			(0.393)	(0.366)	(0.713)
Connectivity - RHQ with an administrative role			2.479***	2.433***	0.264
			(0.370)	(0.365)	(1.188)
Geographic distance to corporate HQ				-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 coporate HQ	0.640***	0.426***	0.437***	0.454***	0.388**
	(0.149)	(0.153)	(0.151)	(0.142)	(0.158)
Labor 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)

Table 4-continuted

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					
Labor 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 chisquare	477.7***	458.2***	438.4***	541.1***	406.1***
Likelihood-ratio test		110***(vs.Model1)	112*** (vs. Model1)	58***(vs.Model3)	2(vs.Model4)

Notes: Results of a mixed logit model (see equation (1)) relating the probability that a particular global city is chosen as the location for a MNC's newly established RHQ to locational characteristics of the cities and MNC and RHQ characteristics. 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 2 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.

Figure 1. Conceptual Model



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