Global city connectivity and the establishment of MNC regional headquarters

ABSTRACT

Global cities are preferred locations for multinational corporation (MNC) investment because they host advanced producer services (such as marketing, accounting and finance), their cosmopolitan environments, and their interconnectedness to the international market place. Yet, like MNCs, global cities are not a homogenous group and individual firms make unique choices to locate their operations in idiosyncratic global cities. We examine the ways in which city and firm heterogeneity drive MNC location choices for new regional headquarters (RHQ) establishments. In particular, we focus on the concept of global city connectivity (i.e., the position of cities within worldwide inter-city networks) to argue that certain types of MNCs are more likely to locate their RHQs in those global cities that are more connected and that this relationship is more pronounced in knowledge-intensive industries as well as for RHQs that have an entrepreneurial mandate. Further, we find that a global city's geographic centrality within the MNC's regional network of affiliates in the region attracts RHQs, but that this effect is mitigated by the strength of the city's international connectivity. Our inferences are drawn from mixed logit analysis of the location choices for 1292 RHQs in 72 global cities during 2003-2012.

Keywords: global cities, regional headquarters, networks, location choice

Acknowledgements: We thank Jon Copestake from the EIU for providing us with city level livability data, and Ben Derudder for provision of city connectivity data for 2004, 2008 and 2010.

INTRODUCTION

The important role of cities in the world economy has received increasing attention (Beaverstock et al., 2002; Derudder et al., 2010; Sassen, 2001; Taylor, 2001). Major cities that function as command and control nodes in the global reach of large corporations have been coined as "global cities" (Friedmann, 1986; Sassen, 1996). Key characteristics of global cities

include the availability of advanced producer services (such as marketing, accounting and finance), a cosmopolitan environment, and a high degree of interconnectedness to local and global markets (Goerzen, Asmussen and Nielsen, 2013).

While research on global cities focused mostly on these places as locales that facilitate global economic activity (Sassen, 1995; 2001), more recently scholars interested in cities have turned their attention to the concept of connectivity among global cities (see, e.g., Derudder et al., 2010, Doel & Hubbard, 2002, Alderson & Beckfield, 2004, Beaverstock, Doel, Hubbard, & Taylor, 2002). Concurrently, scholars focused on MNC behaviour and performance have similarly examined the ways and means by which global firms connect across geographic space (Wagner, Hoisl, & Thoma, 2014; Lecocq, Leten, Kusters & Looy, 2011). We propose to bring together these separate literatures to examine the conditions under which global city connectivity and MNC location choice combine.

More specifically, we focus on the regional headquarters location choice as one of the most important location strategy decisions made by MNCs. Research has indicated that corporate headquarters are disproportionately concentrated in metropolitan areas (Bel and Fageda, 2008; Klier and Testa, 2002), and this trend appears to be continuing in emerging economies (McKinsey & Company, 2013). Although some studies have examined the characteristics of locations that attract headquarters investments, most of these were conducted at the country level, ignoring heterogeneous locational characteristics within countries (Benito, Lunnan and Tomassen, 2011; Birkinshaw et al., 2006; Laamanen, Simula and Torstila, 2012; Voget, 2011). Other studies, mostly within the regional economics domain, adopted a slightly more fine-grained perspective on location (e.g., at the county or metropolitan level) have restricted their attention to headquarters locations within a given region such as the US (Diacon and Klier, 2003; Henderson and Ono, 2008; Klier and Testa, 2002; Strauss-Kahn and Vives, 2009), Europe (Bel and Fageda, 2008), or China (Ma, Delios and Lau, 2013). While these studies have enhanced our knowledge of headquarters location choices, our study, therefore, is the first to examine the locational determinants of regional headquarters (RHQ) locations worldwide in the context of global cities. We argue that analyzing location choices at the city level is appropriate because MNCs ultimately choose a specific location within a country for investment (Goerzen et al., 2013) or may relocate headquarters operations between cities within a country (Strauss-Kahn and Vives, 2009). We

analyze location choices across a set of global cities, spread over five continents, that have been shown to be globally attractive and internationally connected (MasterCard, 2008).

Further, our study focuses on regional headquarters (RHQs) with a mandate covering multiple countries in their specific region (e.g., Europe, North America, East Asia, etc.). Globalization has been accompanied by a regionalization trend and the world economy has increasingly fragmented itself into major regions: the Americas, Europe and East Asia (Levy, 1995; Rugman, 2000; Rugman and Verbeke, 2004). Regionalization has given impetus to the establishment of RHQs to develop and coordinate regional activities and their number has risen strongly in recent years. Ambos and Schlegelmilch (2010), for example, report a rise in the number of European regional headquarters by 76 percent during 2000-2010 and Enright (2005) finds more than 1,100 RHQs in the Asia-Pacific region. RHQs act as a bridge between the corporate HQ and the host region and is generally expected to deal with the tradeoffs between global integration and local responsiveness (Hoenen, Nell and Ambos, 2014; Prahalad and Doz, 1987), to implement global strategies at a regional level, and to act on regional opportunities (Yeung et al., 2001).

We argue that both city heterogeneity and the specific mandate of RHQ drive MNC location decisions for new RHQ establishments. We suggest that MNCs choose those global cities that provide the best fit with the nature of its RHQ operations. Building on Beaverstock, et al., 2002, DeRudder et al., 2010, and Taylor, 2001 we hypothesize that two types of networks are of interest: the international connectivity of the city in international city networks associated with the cross-border activities of global producer service firms, and the geographic position of the city in the firm's network of regional affiliates. Empirically, we draw on an extensive database on foreign direct investments in cross-border headquarters activity, and conduct mixed logit analyses of the location choices for 1292 RHQ investments in 72 global cities, 2003-2012.

BACKGROUND AND HYPOTHESES

Global cities are interlinked through the activities of multinational firms, and in particular those of advanced producer service firms (Beaverstock, et al., 2002; Doel and Hubbard, 2002; Taylor, 2001). This characteristic makes global cities attractive to RHQs, which are responsible

for the provision of regional headquarters services and intra-firm knowledge sharing across borders (Monteiro, Arvidsson and Birkinshaw, 2008; Lunnan and Zhao, 2014). RHQs benefit in these tasks from the international connectivity provided by local internationally operating producer services firms. For RHQs with an administrative role, cities that are on average located in closer proximity to regional affiliates are likely to be attractive as proximity reduces costs and increases effectiveness of regional coordination.

The establishment of regional headquarters has risen as a solution to the trade off between global integration and local responsiveness (Prahalad and Doz, 1987), as RHQs act as a bridge between the corporate HQ and the host region. The importance of RHQs for multinational firms has been documented for various regions (e.g. Yeung et al., 2001; Alfoldi, Clegg and McGaughey, 2012; Mahnke et al., 2012). Despite the rising importance of RHQs, the locational choice for regional headquarters has received surprisingly little attention, with most of the literature focusing on (re)locations of corporate HQs. The literature has suggested that HQs of multinational firms tend to locate in large cities which have superior transportation and communication infrastructure (Bel and Fageda, 20008; Testa, Klier and Ono, 2005). Multinational firms operating at an international or global scale require top management to collect and manage information across geographical dispersed establishments when performing the coordination, command and control role within the firm.

An RHQ can perform one of two different of roles within an MNC: entrepreneurial or administrative (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 MEANS). An administrative role, on the other hand, implies serving as the command, control, and coordination center of a regionally dispersed value chain, orchestrating resource pooling and leading efforts to achieve synergies.

Global cities' international connectivity through cross-border networks of producer services. In this context, the notion of 'global cities', providing multinational firms with international connectivity, is highly relevant. The definition of world cities or global cities dates back to 1915 when Patrick Geddes defined 'world cities' as 'those places where a disproportionate amount of the world's business is conducted' (Geddes, 1915). More recently, scholars define global cities as the location of transnational corporate or multinational firm

headquarters (Friedmann, 1986; King, 1990). The literature suggests that the key characteristics of global cities include high levels of advanced producer services, a cosmopolitan environment and a high degree of interconnectedness to local and global markets (Goerzen *et al*., 2013). This interconnectedness – the notion that global cities form a network through corporate linkages (Beaverstock, *et al*., 2002; Taylor, 2001) is regarded as a key trait. Taylor (2001) deemed advanced producer service firms (e.g. accounting, advertising, finance, insurance and law firms) as the primary actors in the world city network formation. The global network of offices of advanced producer services firms allows 'seamless' services for their corporate (HQ) clients such that the global city network can be regarded a 'complex amalgam of multifarious office networks of corporate service firms' (Taylor, 2001). Wagner, Hoisl and Thoma (2014) similarly argue that producer service firms can generate and facilitate flows of knowledge across geographically dispersed organizations. Doel and Hubbard (2002) argue that world cities are hubs of knowledge production that create a global space of (knowledge) flows, while the competitiveness of a city is determined by this international connectedness more so than by its local characteristics.

Multinational firms' regional affiliate networks. A multinational firm is defined as 'a group of geographically dispersed and goal disparate organizations that include its headquarters and the different national subsidiaries' and is seen as a network of subsidiaries with a hierarchically acting headquarters (Ghoshal and Bartlett, 1990; Rugman and Verbeke, 2001). Multinational firms' subsidiaries are both embedded in internal networks and their external environments (Andersson, Forsgren and Holm, 2002; Ciabuschi, Dellestrand and Martin, 2011; Foss, Foss and Nell, 2012; Nell, Ambos and Schlegelmilch, 2011). As a critical node of these networks, a RHQ is imbedded in its parent firm's internal networks and its host location environment (Hoenen *et al.*, 2014). Within the internal network, the RHQ builds links with local subsidiaries across the host region to monitor, coordinate and control these subsidiaries' business activities, and is involved in lateral links with sister RHQs of the parent multinational firm to exchange information or to cooperate with each other to achieve synergies. Externally, the RHQ collects and reports information on regional talent, markets, business opportunities, and environmental changes such as those related to regulations. Both in their internal coordinating role and the external information gathering role, RHQs can benefit from the presences of internationally connected advanced producer services firms.

Hypotheses

The rationale of the establishment of a RHQ is to create value to the multinational firm through such activities as knowledge sharing, synergy management and the provision of supporting services (Goold and Cambell, 1998; Goold, Campbell and Alexander, 1994; Lunnan and Zhao, 2014). The flows of assets, knowledge, information and resources in a RHQ's internal and external networks are indispensable for it to create value to enhance the competitive advantage of the multinational firm. To fulfil their administrative and entrepreneurial roles, RHQs regularly need to source business services such as accounting, advertising, financing, consulting and human resource management (Sassen, 1996; Ono, 2003) and the availability of such services in a location increases the location's attractiveness for headquarters investments (Davis and Henderson, 2008; Klier and Testa, 2002; Strauss-Kahn and Vives, 2009).

A particular strength of local producer services firms occurs when such firms operate an international network, allowing them to assist RHQs in their internationally coordinated efforts in accounting, marketing campaigns, human resource management, and new business exploration. Bel and Fageda (2008) in this regard emphasize that 'executing information exchanges between cities can be critical for the headquarters of large firms that operate on a global scale'. Hence, a global city with a high degree of international producer services connectivity is an ideal location for a RHQ to create value to the focal firm, as the RHQ benefits from 'seamless' services from producer services firms, gain or disseminate information, access nonlocalized resources, and can thus better perform its entrepreneurial and coordination roles. The viability of producer services firms with the capability to 'connect' the RHQ to their wider networks is expected to be an important driver of location choices for new RHQ establishments.

Hypothesis 1*: The propensity of a firm to choose a particular global city as the location for its RHQ is higher, the greater the city's international producer service connectivity.*

RHQs are often involved in managing information and knowledge across geographically dispersed establishments, gathering external market intelligence and purchasing or providing knowledge-intensive services in advertising, accounting, and consulting. RHQs also play an

important role in facilitating knowledge transfer and identifying and absorbing knowledge within or outside the region (Lunnan and Zhao, 2014). Firms operating in knowledge-intensive industries such as telecommunications, business services and technology intensive manufacturing (OECD, 1999) are involved in more complex patterns of information exchange and knowledge transfer within their internal and external networks, leading to increased demand for international connectivity. As it is costly to search, process and exchange information, the costs of information exchange can be substantial for HQs of firms in knowledge-intensive industries (Bel and Fageda, 2008). Firms operating in knowledge-intensive industries establishing a RHQ will value global cities with a higher degree of international connectivity of producer services as a preferential location, because the availability of connected producer services firms can increase knowledge transfer efficiency and achieve cost reductions in coordination efforts and information exchange. This suggests the 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 producer services connectivity is stronger for firms operating in knowledge-intensive industries.*

The role of RHQs has received increasing attention in the literature (e.g. Lunnan and Zhao, 2014; Mahnke *et al*., 2012; Hoenen *et al*., 2014; Yeung *et al*., 2001). Two types of roles of RHQs have been distinguished (e.g. Chandler, 1991; Lasserre, 1996; Mahnke *et al*., 2012; Hoenen *et al*., 2014): an entrepreneurial role involving scouting for talent, acquiring market knowledge and seeking out business opportunities, and signaling commitment to local markets; and an 'administrative' role in managing affiliates of the focal firm in the region. The heterogeneity in the roles performed by RHQs is also expected to have consequences for the valuation of, and 'fit' with, global city characteristics. The different types of RHQ roles will require different city environments and the locational choice for RHQs will align with their roles. Specifically, we propose that RHQs with an entrepreneurial role are likely to value a global city's producer services connectivity more than RHQs with an administrative and coordinating role. RHQs performing an entrepreneurial role are typically established at the early stages of firms' establishment in the region and regional market penetration. The process of seeking business opportunities, exploring regional environments and markets is likely to rely more strongly on access to a range of producer services such as marketing, advertising and human resources

services. As firms establishing an entrepreneurial RHQ tends to lack previous experience in the host region, an internationally connected city with networked producer services firms can help the firm mitigate information shortages and the liability of foreignness. In contrast, firms establishing RHQs with a coordinating role have already been operating existing affiliates in the host region and have accumulated regional experience, such that overcoming the liability of foreignness and addressing information needs are less imperative. This suggests the following hypothesis:

Hypothesis 3: *The positive relationship between the propensity of a firm choosing a global city for its RHQ and the city's international producer services connectivity is stronger for RHQs with an entrepreneurial role than for RHQs with an administrative role.*

The geographic characteristics of a firm's existing network of subsidiaries, when the RHQ performs an administrative role, will also be a major consideration in RHQ location decisions. Geographic distance generally increases coordination costs by increasing transport and travel costs, and by making the exchange of tacit knowledge more costly (e.g., Castellani, Jimenez and Zanfei, 2013; Berry, Guillen and Zhou, 2010). Prior research has found that national headquarters of manufacturing firms tend to be located to close to production plants (Henderson and Ono (2008). If a city is located close to the existing affiliates of the firm in the region, travel costs are reduced, (tacit) knowledge exchange can be faster and more effective, and communication and coordination costs can be reduced. This implies that firms will have a preference for those global cities that are positioned geographically more central to the existing network of affiliates, exhibiting a smaller average geographic distance to these affiliates. We hypothesize:

Hypothesis 4*: The propensity of a firm to choose a particular global city as the location for its RHQ is higher, the smaller the average geographic distance between the city and the firm' existing affiliates in the region.*

While the cost of coordination of regional affiliates rises for distant cities, the degree to which geographic distance hampers communication and coordination is likely to be a function of the city's international producer service connectivity. The established networks of producer services firms can assist the RHQ in its coordination role by offering regionally integrated and coordinated services such as marketing, finance & accounting. These networks and connective

capabilities can bridge geographic distance for the investing firms, rendering integration over geographic distance less costly. It follows that geographic distance weighs less in location decisions if the city is characterized by stronger international producer services connectivity.

Hypothesis 5: *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 producer services connectivity.*

DATA, VARIABLES AND METHODS

Our analysis draws on an extensive database on cross-border greenfield investments (FDI Markets) compiled by the Financial Times Ltd. The dataset records more than 120,000 cross-border investment projects between 2003 and early 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 and Rabellotti, 2013; D' Agostino, Lauren and Santangelo, 2013). The dataset identifies the investing firm, the type of project, the host country and host city, and the 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 headquarters investment projects. For our study, we are interested in regional headquarters covering a wider territory and multiple potential global cities as potential host of the investment. Global headquarters[1] and purely national headquarters projects (e.g. German headquarters) were not selected with the exception of US headquarters – as the US hosts 11 global cities. In total we identified 2510 such RHQ investments. Below we provide one illustrative description of a RHQ project with a broad regional mandate:

> *'US-based big data analytics company Lakeside Software has opened a regional headquarters for Europe, the Middle East and Africa (EMEA), based in London, the UK.*

[1] Only few (114) 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 note that adding these projects to the sample did not alter the empirical results.

The office has been set up in response to rapidly expanding demand in EMEA for the company's SysTrack IT business intelligence solutions.'

Our analysis focuses on RHQ investments in 'global cities'. We include the cities that are ranked as having the most important 'Global Power' by the Mastercard, an authoritative source on city research (Mastercard, 2008). Matercard ranks 75 global cities based on seven dimensions of city characteristics such as legal and political framework, economic stability, ease of doing business, financial flow, business center, knowledge creation and information flow and livability. Data constraints did not allow us to include three of these cities: Beirut, Chengdu and Chongqing. Among the RHQ projects, 1438 investments are located in these 72 cities and form the subject of analysis.

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 active controlling firm behind the investment project and this firm's worldwide affiliate network. We examined historical ownership data in ORBIS and information on mergers and acquisitions in the Zephyr database to establish firm consolidation in earlier years. Since not all firms with RHQ investment projects were included in ORBIS, our sample of RHQ projects was reduced to 1292 investments made by 1146 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. For instance, the broad regional mandate of the example RHQ project above implies that global cities in Europe, the Middle East and Africa are potential locations, but not cities in Asia or the Americas.

Variables

Dependent variable. The dependent variable in the analysis is a binary variable taking the value of one if a city is selected for a focal regional headquarters investment project, and zero otherwise.

Hypothesis testing variables. Data on international producer service *connectivity* (hypothesis 1) 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 2012. Taylor (2001) ranked 315 cities based on their connectivity in the network of world cites established by world top 100 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 (such as accountancy, advertising, finance, insurance, law, and management consultancy) through offices in at least 15 cities, including at least one in each of the Asia Pacific, Western Europe and North America. It is assumed that the flows of information between a node (city) and the other nodes in the network is a function of the service value of the office.[2] The connectivity of a city then is the product of a firm's service values in a city with the firm's service values in all other cities, summed over all firms (Derudder *et al*., 2010).[3] Taylor (2001) finds that London, New York, Hong Kong, Paris, Tokyo and Singapore are the best connected cities. The scope of the analysis of city networks has been expanded in the more recent years to 526 cities. We obtain yearly data on cities' connectivity by interpolating values for the intermediate years. Connectivity is taken as a relative index score of the city compared to London (with the score of London taking the value 100).

To test hypothesis 2, we created an interaction term between international producer service connectivity and a dummy variable indicating whether the firm operates in knowledge-intensive industries. We determine the knowledge intensity of the industry in which the focal firm is active from the detailed sector description in the FDI Markets dataset, using the classification of the OECD. Knowledge-intensive industries include high and medium-high technology based manufacturing, telecommunications, financial services, business services (real estate, advertising, accountancy, legal, and consultancy), education and health.

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,

[2] This service value is measured on a scale of 1-5 depending on the size and scope of the office.
[3] The measure of connectivity resembles the nodal degree centrality in social network theory (Freeman, 1978).

relevant information is provided only for a minority of projects. We therefore combine this information with information on regional affiliates from the ORBIS database. We rely on the notion that firms not operating affiliates in the region at the time of the RHQ establishment cannot assign an administrative role to RHQ, such that the RHQ will focus on entrepreneurial activities. In case there are affiliates in the region, the RHQ will perform an administrative role – although we note that this may be combined with an entrepreneurial role. Existing affiliates of the focal investing firms were identified by applying a minimum of 50 percent ownership to ensure management responsibilities 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.

We checked the consistency between the categorization based on affiliates in the region and the texts on RHQ projects and found a high accuracy. Below we provide two examples of a RHQ with an entrepreneurial role and a RHQ with an administrative role, respectively:

> *'US-based Information Builders, a provider of business intelligence, analytics and integration solutions, has opened its first subsidiary in south-east Asia. The subsidiary is headquartered in Singapore and will service regional customers and partners, including those in Singapore, Malaysia, Indonesia and India. The office will enable the company to expand upon its business activity and further increase its presence by pursuing new industry sectors and offering a wider range of consultancy and professional services to existing and future clients.*
>
> *'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.'*

The first RHQ takes on an entrepreneurial role, while the second RHQ takes on an administrative role. Information Builders had no prior affiliates in Asia, while Konica Minolta has an extensive affiliate network in Asia. We test hypothesis 3 by creating an interaction term between

international producer service connectivity and a dummy variable taking a value of 1 for RHQs with a pure entrepreneurial role, 0 otherwise.

The *average* geographic *distance* (Hypothesis 4) between a focal global city and the affiliates of the investing firm in the region was determined by geocoding each affiliate based on the address information, 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. Finally, we test hypothesis 5 by including an interaction term between international *connectivity* and *average distance*. We take these two variables in deviation from their means before interacting, such that the main effect of connectivity represents its effect when distance takes the mean value.

Control variables. We include a wide range of control variables in our analysis. We control for *population*, *population density* (population divided by surface area of the city), and city level *GDP per capita*. Data on city population and GDP come from the OECD's metropolitan data and Citymayor data, and data on surface areas of cities are retrieved from city websites and Wikipedia. In addition, we include 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. 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 to their political power and regulatory roles (e.g. Ma *et al*., 2013).

The models include two cost-related factors, i.e. the *corporate tax rate* and the local *wage level*. 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 confirmed by earlier studies **(**e.g. Laamanen *et al*., 2012; Strauss-Kahn *et al*., 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 headquarters investments (Davis and Henderson, 2008; Strauss-Kahn and Vives, 2009) as a motivation for headquarters relocation may be to economize on costs. Data on wage levels at the city level are obtained from the UBS' Price and Earnings reports. We control for the *livability* of the city, drawing on data provided by the Economist Intelligence Unit (EIU). Livability is a score based on assessments of stability,

healthcare, cultural amenities, education, and infrastructure. The employees and executives of RHQs are usually highly educated individuals and expatriates requiring a rich environment for their family to live in.

We include two language-related variables. First, we control for *language similarity*, which is a dummy variable taking the value one if the city and the home country share at least one official language, and zero otherwise. Second, we control for the English language proficiency in the host country of the city. A host country's population with a higher level of English language proficiency will reduce communication costs and facilitates multinational firms' business activities. We follow Slangen (2011) and Cuypers and Hennart (2014) and use the average TOEFL (Test of English as a Foreign Language) scores published by Educational Testing Services (ETS) as the English proficiency of a country.

Finally, we include two variables related to the firms existing operations. Geographic *distance to home city* is the distance between the home city of the investing firm and the potential host cities. *Existing affiliates in the city* is the number of existing affiliates of the firm in operation in the city at the time of the RHQ investment and controls for colocation benefits and prior city experience. All continuous variables are taken in logarithmic form, and all variables are one year lagged with respect to the year of the RHQ investment.

The correlation coefficients between the variables are given in Table 1.

Methods

Within the location choice literature (e.g. Alcacer and Chung, 2007; Head, Ries and Swenson, 1995), the conditional logit model (McFadden, 1974) has been widely used to analyze the location determinants of foreign direct investments. A drawback of this model is the restrictive assumption of independence of irrelevant alternatives (IIA). The IIA property states that for any two alternatives the ratio of probabilities is independent of the characteristics of any other alternative in the choice set. This property also implies the absence of correlations between error terms across alternatives. In practice however, this assumption is frequently violated in location choice analyses. In line with more recent studies (e.g. Basile, Castellani and Zanfei, 2008; Chung and Alcacer, 2002), we therefore estimate mixed logit models, which do not rely on the IIA assumption (McFadden and Train, 2000).

The mixed logit model starts from a random utility maximization setting to examine the location choices of RHQ investments. Having a choice set of alternative host global cities r = 1,.,, R to locate an overseas RHQ project at time t, multinational firm f seeks to maximize its expected utility ($U_{fr,t}$) as a function of observable regional or firm attributes and unobservable location factors ε_{fr}. The expected utility of a multinational firm f choosing city r among other host cities at time t can be expressed by the function:

$$U_{fr,t} = \alpha X_{fr,t-1} + \varepsilon_{fr} \tag{1}$$

in which $X_{fr,\ t-1}$ represents a vector of city-specific characteristics that can vary across industries or firms, while ε_{fr} defines a city-specific independent random disturbance term. While the standard conditional logit model restricts the coefficients α to be equal across firms, the mixed logit allows the coefficients to be normally distributed. Accordingly, coefficients are decomposed into a fixed part and a random part that accounts for unobservable effects. The error term incorporates the random components of the coefficients and takes the following form:

$$\varepsilon_{fr} = \lambda_f Z_{fr,t-1} + \mu_{fr} \tag{2}$$

where $Z_{fr,t-1}$ is a vector of observable variables, while λ_f is a vector of randomly distributed parameters with zero mean following a normal distribution with variance Ω. The parameter μ_{fr} is an independent and identically distributed error term. If the parameter λ_f would be observed, the probability that a firm f would locate its foreign RHQ investment in city r could be expressed as a standard conditional logit model. However, since the coefficients in the mixed logit model are not known but are assumed to follow a certain density function $g(\lambda_f)$, 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 describing the random nature of the coefficients. This is described by the following equation:

$$P_{fr} = \int \frac{\exp(\alpha X_{fr,t-1} + \lambda_f Z_{fr,t-1})}{\sum_{j=1}^{J} \exp(\alpha X_{fj,t-1} + \lambda_f Z_{fj,t-1})} g(\lambda_f) d(\lambda_f) \quad (3)$$

There is no closed form solution for the mixed logit probability such that this probability has to be approximated by simulation techniques. Values for the coefficients are drawn from their density functions and the conditional probability (equation 3) is calculated for these values. This is repeated several times and the simulated probabilities are averaged to obtain an approximation of the mixed logit probability. We follow the suggestion of Revelt and Train (1998) and use 100 draws, while we assume that the density function follows a normal distribution.

We note that our empirical model includes variables with different characteristics. A number of variables vary over cities and time (e.g. international producer service connectivity, liveability, GDP, population), while there are also time-varying firm- and city-specific variables (e.g. number of prior subsidiaries and average distance between the city and the firm's affiliates in the host region). Yet other factors are firm- and city-specific but remain constant over time (language similarity and geographic distance between home city and the global city). 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.

EMPIRICAL RESULTS

Table 2 reports results of the mixed logit models examining the determinants of location decisions for RHQ investments. Model 1 reports the results of a baseline model that includes only the control variables. Model 2-6 report the results of models with the hypothesis testing variables included, and model 7 includes all variables simultaneously.

In model 1 all control variables, with the exception of capital city, are significant with the expected sign. English language proficiency, livability, population, GDP per capita, the ratio of country to region GDP, language similarity, and the number of the firm's existing affiliates in the city have a positive influence, while the corporate tax rate, wage levels of skilled labor, the distance between the focal city and the firm's corporate headquarters and population density

reduce the probability of RHQ investment. The latter effect may be explained from congestion effects.

Model 2 includes the first hypothesis testing variable, the international producer service connectivity. Compared with Model 1, this model shows a significantly improved fit, indicated by a highly significant loglikelihood ratio test. The positive and significant effect of international producer service connectivity supports Hypothesis 1. Model 3 includes the interaction term between international producer service connectivity and the dummy for knowledge-intensive industries. The interaction term is positive and significant, in support of Hypothesis 2. The interaction term between international producer service connectivity and the dummy indicating a pure entrepreneurial role for the RHQ is positive and significant in Model 4, in support of Hypothesis 3. The average distance between the global city to the regional affiliates of the focal firm has a negative effect (Model 5), in support of Hypothesis 4. While the interaction between distance to affiliates and connectivity is positive and significant in Model 6, the interaction term loses its significance in the model 7 with all variables included, providing only partial support for Hypothesis 5.

The estimates for the random parts of the coefficients show that there exists significant heterogeneity (in Model 7) in the effects of average distance, population, capital city, number of existing affiliates and the two interaction terms between connectivity and knowledge-intensive firms, and RHQs with an entrepreneurial role.

CONCLUSION AND DISCUSSION

In one of the first quantitative analyses of the location drivers of regional headquarters (RHQ) investments, our study finds broad support for the notion that locational preferences are heterogeneous and differ across firms and RHQ mandates. Locations are determined at the nexus of city characteristics and firm and project attributes. For RHQs with an administrative role, the geography of the network of existing affiliates is a key driver, while for firms operating in knowledge intensive industries and for RHQs with an entrepreneurial role, the international connectivity provided by locally active and globally operating producer services firms is a major attractor. We found qualified evidence that the connective capabilities of global cities can also

help to bridge geographic distance between RHQs and the firm's affiliates by reducing coordination costs. Hence, both intra-firm cross-border networks and inter-city networks of 'seamless' producer services are important and interconnected phenomena in location decisions for RHQs.

Our research contributes to an emerging literature in international business on the role of global cities in multinational firms operations (Goerzen et al., 2013; Ma *et al*., 2013). 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; Talyor, 2001), but they have received little attention in international business research. 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 take a prominent or less prominent place. Our study may serve as a bridge between the economic geography literature and the international business literature by combining the view on global cities in the former domain with the notion of the heterogeneous roles of RHQs in the latter stream of literature. By focusing on the key characteristics of global cities and locational choice for RHQs at this fine-grained regional level, we provide new insights into the locational drivers of RHQs and the co-evolution of global cities and multinational firms.

Our analysis is subject to a number of limitations. First, our focus on global cities, while allowing a detailed analysis of location drivers, implied that the analysis could not include RHQ projects located in other cities. Firms that choose to invest in global cities in the first place are likely to have specific traits (Goerzen *et al*., 2013), which raises concerns of selection bias in our empirical results. We note that such bias may be less likely to occur in location models where locational traits are dominant drivers of decisions and firm traits only play a role in interaction with these locational drivers. In future research we aim to investigate whether firms' propensity to invest in global cities, estimated from a Heckman-type first step regression relating firm traits to the decision to invest in a global city, is a systematic source of firm heterogeneity in location decisions. Another more demanding approach to deal with this issue is to augment the number of projects included in the analysis by adding a range of additional cities to the choiceset. The challenge here is to find relevant data on all dimensions included in the analysis.

Second, our core independent variable, connectivity is assessed at the worldwide level, which contrasts with the regional mandate of the RHQs in our sample. We expect that the regional connectivity of global cities may play an additional and even greater role in location decisions for RHQs than worldwide connectivity. For example, we can postulate that a RHQ with an administrative role which is assumed to coordinate and orchestrate activities of subsidiaries within the region will put more value on a city's regional connectivity than its international connectivity. In future work, we hope to be able to calculate relevant regional connectivity characteristics to examine the 'fit' between RHQ mandates and global city roles in even more detail.

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Table 1. Correlations

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Location choice	1.00														
2. Connectivity	0.17	1.00													
3. English proficiency	0.01	0.06	1.00												
4. Livability	0.06	0.15	0.20	1.00											
5. Corporate tax rate	-0.22	0.03	0.23	0.07	1.00										
6. Wage level	0.05	0.08	0.26	0.86	0.06	1.00									
7. Population	0.01	0.19	-0.51	-0.45	0.20	-0.47	1.00								
8. Population density	-0.08	-0.14	-0.02	0.03	0.25	0.06	0.12	1.00							
9. Country/region GDP ratio	0.05	-0.12	-0.20	0.09	0.23	0.24	0.32	0.00	1.00						
10. GDP per capita	0.09	0.26	0.21	0.83	-0.09	0.81	-0.52	-0.11	0.01	1.00					
11. Language similarity	0.13	0.07	0.16	-0.14	-0.01	-0.09	0.11	-0.03	-0.06	-0.16	1.00				
12.Distance from home city	-0.02	0.02	-0.12	-0.15	0.00	-0.18	0.16	-0.02	-0.12	-0.17	0.07	1.00			
13.Capital city	0.01	0.37	-0.02	-0.10	-0.06	-0.21	0.06	0.05	-0.46	0.05	-0.08	0.00	1.00		
14. Number of prior affiliates in the city	0.13	0.11	-0.01	-0.03	-0.05	-0.08	0.06	0.00	-0.05	-0.03	0.05	-0.04	0.06	1.00	
15. Average distance from regional affiliates	-0.02	-0.01	-0.06	-0.09	0.00	-0.10	0.08	0.00	-0.03	-0.10	-0.01	-0.04	0.00	0.25	1.00

Table 2: The results of mixed logit models: location choice for RHQs in global cities

VARIABLES	(1) Baseline Model	(2) H1	(3) H2	(4) H3	(5) H4	(6) H5	(7) Full Model
Connectivity		2.625***	1.549***	2.111***	2.611***	2.733***	1.332***
		(0.231)	(0.257)	(0.256)	(0.213)	(0.246)	(0.275)
Connectivity*knowledge-intensive industry			1.616***				1.377***
			(0.291)				(0.306)
Connectivity* entrepreneurial role				0.904***			0.651**
				(0.300)			(0.315)
Average distance to regional affiliates					-0.700***	-0.775***	-0.727***
					(0.195)	(0.217)	(0.197)
Connectivity*average distance						0.373***	0.196
						(0.142)	(0.144)
English language proficiency	8.041***	5.442***	5.324***	5.358***	5.446***	5.368***	5.333***
	(0.643)	(0.671)	(0.649)	(0.651)	(0.662)	(0.675)	(0.636)
Livability	3.231***	3.504***	3.440***	3.397***	3.487***	3.416***	3.471***
	(0.685)	(0.693)	(0.696)	(0.693)	(0.710)	(0.714)	(0.686)
Corporate tax rate	-1.802***	-1.408***	-1.379***	-1.384***	-1.446***	-1.445***	-1.417***
	(0.094)	(0.113)	(0.105)	(0.105)	(0.109)	(0.114)	(0.105)
Wage level	-0.222*	-0.317**	-0.296**	-0.288**	-0.279**	-0.265*	-0.260*
	(0.129)	(0.135)	(0.134)	(0.134)	(0.137)	(0.143)	(0.136)
Population	0.473***	-0.442***	-0.453***	-0.450***	-0.408***	-0.418***	-0.428***
	(0.087)	(0.097)	(0.093)	(0.094)	(0.096)	(0.099)	(0.094)
Population density	-0.106***	-0.070*	-0.082**	-0.081**	-0.081**	-0.091**	-0.102***
	(0.036)	(0.037)	(0.038)	(0.038)	(0.036)	(0.039)	(0.038)
GDP ratio country / region	0.349***	0.490***	0.465***	0.475***	0.472***	0.469***	0.431***
	(0.057)	(0.062)	(0.060)	(0.061)	(0.060)	(0.060)	(0.062)
GDP per capita	0.965***	0.197	0.197	0.197	0.122	0.121	0.125
	(0.143)	(0.144)	(0.147)	(0.147)	(0.142)	(0.149)	(0.145)
Language similarity	1.008***	0.768***	0.638***	0.682***	0.740***	0.725***	0.646***
	(0.120)	(0.143)	(0.129)	(0.132)	(0.139)	(0.138)	(0.147)
Distance from home city	-0.389***	-0.386**	-0.383**	-0.397***	-0.271*	-0.275	-0.268*
	(0.139)	(0.185)	(0.150)	(0.153)	(0.159)	(0.172)	(0.156)
Capital city	0.161	0.077	0.110	0.115	0.090	0.125	0.082
	(0.124)	(0.129)	(0.130)	(0.130)	(0.129)	(0.141)	(0.128)
Prior affiliates in the global city	1.744***	1.537***	1.662***	1.668***	1.004***	0.997***	1.040***
	(0.248)	(0.253)	(0.244)	(0.237)	(0.222)	(0.212)	(0.211)

Table 2-continuted

Standard errors of random parts coefficients							
Connectivity		1.060**	0.285	0.451	1.104***	1.242***	0.128
		(0.486)	(0.229)	(0.449)	(0.335)	(0.394)	(0.174)
Connectivity*knowledge-intensive firms			1.645***				1.489***
			(0.298)				(0.478)
Connectivity*RHQ with an entrepreneurial role				1.608***			-0.950
				(0.411)			(0.707)
Average distance					0.756***	0.703**	0.659***
					(0.217)	(0.276)	(0.243)
Population	0.889***	0.532***	0.490**	0.513**	0.414	0.512***	-0.429**
	(0.140)	(0.173)	(0.211)	(0.208)	(0.272)	(0.165)	(0.208)
Language similarity	-1.214**	-1.253*	0.651	0.852**	1.280***	0.865	-1.248***
	(0.528)	(0.639)	(0.398)	(0.397)	(0.447)	(0.621)	(0.360)
Prior affiliates in the global city	-1.822***	1.786***	2.190***	2.074***	-1.242***	1.287***	0.873**
	(0.468)	(0.624)	(0.520)	(0.500)	(0.434)	(0.415)	(0.383)
Number of observations	22,516	22,516	22,516	22,516	22,516	22,516	22,516
Number of RHQ investments	1292	1292	1292	1292	1292	1292	1292
Wald chisquare	758.7***	783.8***	715.3***	706.4***	746.9***	739.1***	716.4***
LR ratio test		174.12***(vs.Model1)	27.82 (vs. Model2)	8.72(vs.Model2)	75.62****(vs.Model2)	1.48(vs.Model5)	34.30**(vs.Model6)

Standard errors clustered by parent company in parentheses

*** p<0.01, ** p<0.05, * p<0.1