The geography of global corporate networks: the poor, the rich, and the happy few countries

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Abstract. The gradual integration of nations within our globalizing world is strongly related to the economic networks formed by multinational headquarters and their various subsidiaries located across the globe. Although the corporate reach of multinational corporations (MNCs) is clearly global, the geographical scope of their activities remains limited. Focusing on the network of ownership relations between the global Fortune 100 MNC headquarters and their subsidiaries, it is shown that global corporate activity remains unevenly distributed across the globe. Besides showing that richer countries are better connected within the global system than the poorer countries, the authors also reveal considerable differences in connectivity within the group of rich countries. Based on various determinants, these variations in network connectivity are explained.

1 Introduction

Although the process of globalization has been cyclically developing for centuries (Bordo et al, 2005), its magnitude has recently increased dramatically. Between 1970 and 1999, worldwide exports grew at a rate of 5.4% per year and worldwide inflows of foreign direct investment (FDI) increased at an average yearly rate of 11.0% (Barba Navaretti and Venables, 2004). Significant shifts have occurred as the capacity to produce and export manufactured goods has been dispersed across an expanding network of nations (Dicken, 2003), with each nation performing specific tasks in which it has an advantage (Gereffi, 1994; Porter 1990). Facilitated by reduced transportation costs, advanced technologies, increased openness of capital and labour markets, trade liberalization, and institutional harmonization across countries (McCann, 2008), this interorganizational system connects firms and states together to form the modern global economy, resulting in an ever-increasing functional integration of the world.

Nonetheless, there are signs that corporate internationalization remains—as in previous waves of globalization—restricted to the 'happy few' (cf Mayer and Ottaviano, 2007). Exports are driven by a handful of firms. Only 4% of American firms are exporters, shipping a modest share of their goods abroad (Bernard et al, 2007), while the top 1% of European exporters account for roughly 50% of European exports (Mayer and Ottaviano, 2007). Similarly, the top 500 multinational corporations (MNCs) account for over 90% of the world's FDI stock (Rugman, 2005), while in 2004 the top 100 MNCs accounted for 46% of global FDI (Dunning and Lundan, 2008).

Furthermore, the geographical distribution of MNC networks remains persistently disproportionate (Wall and van der Knaap, 2010), in that investments increasingly concentrate within and between a limited number of nations (Driffield and Love, 2005). MNCs create an international division of labour, corresponding to labour
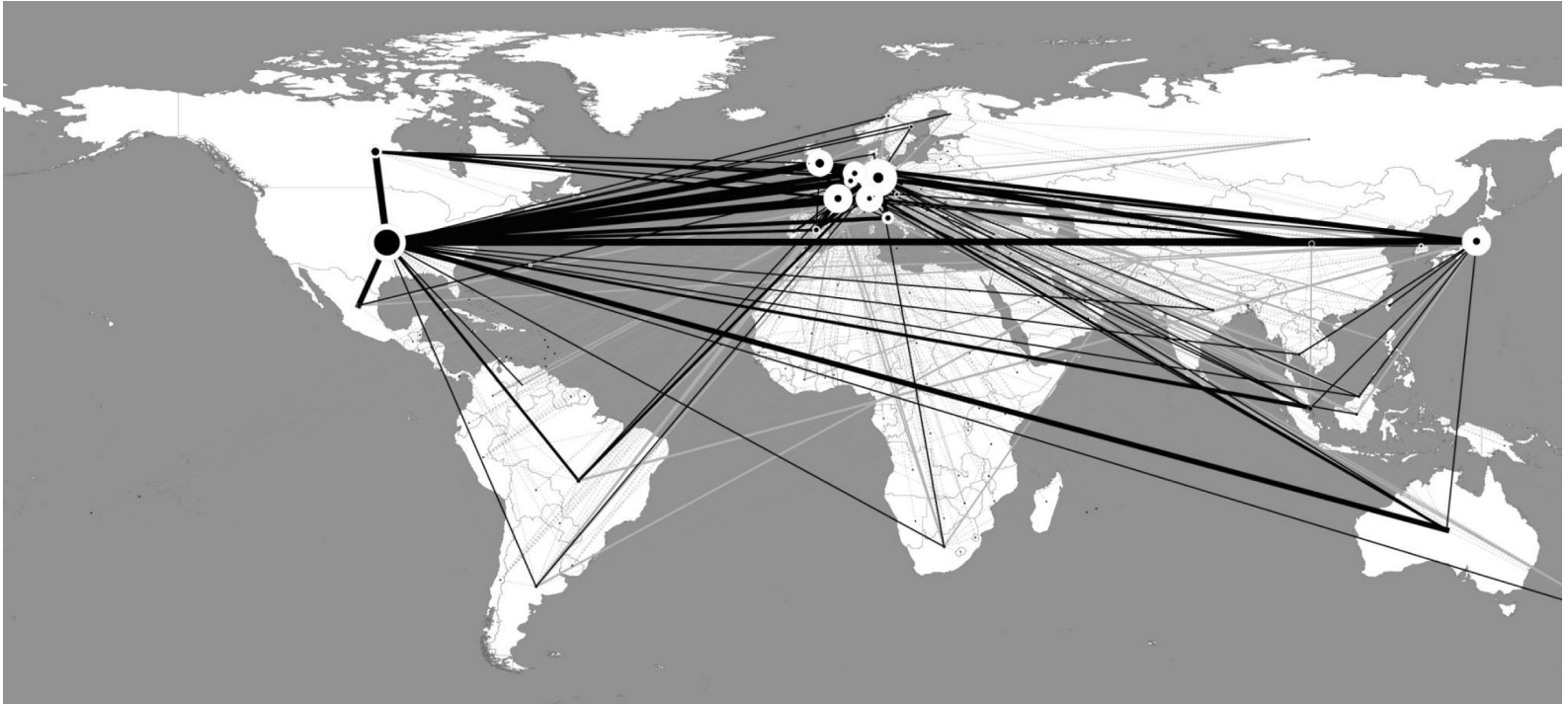
Figure 1. The global corporate network.
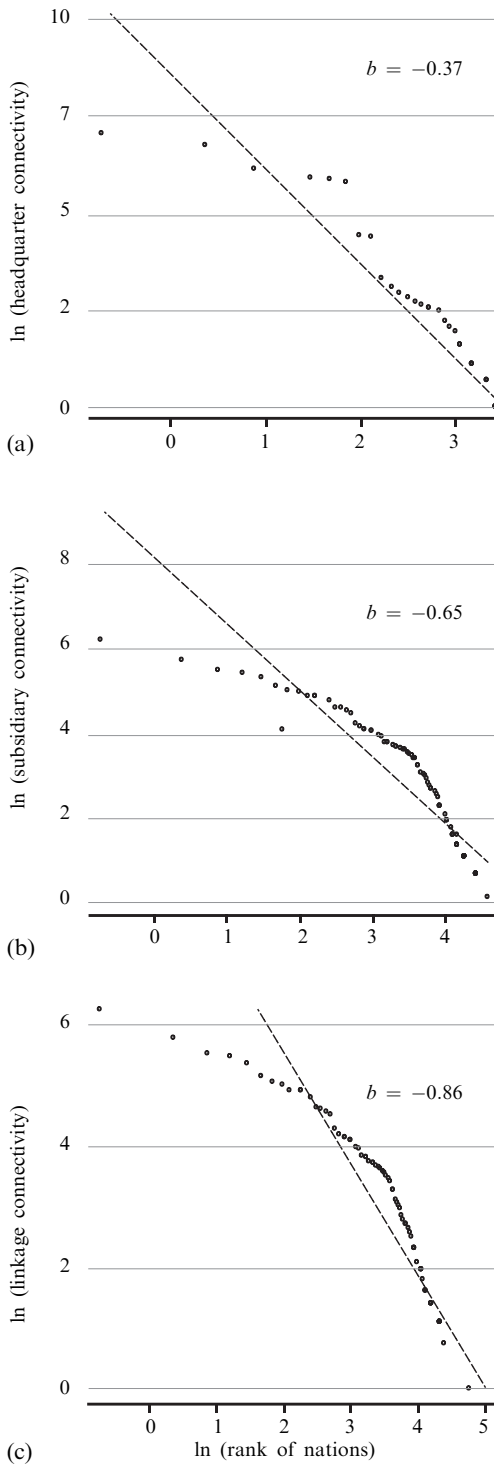
Figure 2. Disproportionality of the global corporate control network: ZipF regressions for (a) headquarter connectivity (number of outgoing linkages) emerging from within a nation; (b) subsidiary connectivity (number of incoming linkages) emanating from outside of the country; and (c) the bilateral connections between countries.

divisions between different levels of corporate hierarchy (Hymer, 1972). Because MNCs centralize high-level decision making and advanced production in a few nations, the rest of the world is generally confined to lower levels of economic activity. This structural division relates to the historical process of cognitive, cultural, social, political, and economic 'embedding' (Dicken and Thrift, 1992), in which these social and physical infrastructures remain relatively fixed (Harvey, 1982).

In this light, we investigate the uneven distribution of today's economy and, particularly, how geographical embeddedness relates to transnational connectivity. Worldwide corporate networks can be explored in various ways: for example, FDI in the form of mergers and acquisitions (Brakman et al, 2006) and greenfield investments (Defever, 2005); worldwide intercorporate directorships (Carroll, 2007); intrafirm trade (Yeaple, 2006); office networks (Taylor, 2004); and ownership relationships between MNC headquarters and subsidiaries (Alderson and Beckfield, 2004).

Our data concern intrafirm ownership, based on the 2005 global Fortune 100 and their many worldwide subsidiaries—resulting in a dataset of 9243 ownership relations. By mapping the data, the geography of these corporate networks was revealed (figure 1). It is clear that the network is polarized into the core regions of North America, Europe, and Pacific Asia. These regions claim 98% of all outwardly directed relations over other nations, and 82% of all incoming relations. It is also evident that a clear North–South divide still exists and the highest intensity prevails in the transatlantic zone between Europe and North America.

This disproportionality is further exemplified in the graphs below (figure 2). Figure 2(a) reveals the number of MNC headquarters located in nations; figure 2(b) shows the number of subsidiaries per nation; and figure 2(c) shows the bilateral linkages between nations. In these graphs the log distribution reveals a highly disproportionate corporate system.[1] Not only are the rich countries better connected to the global corporate network than poorer countries, but considerable differences in connectivity exist within the group of rich countries. In fact, most corporate connections originate from and are targeted at limited countries (the 'happy few') and a high interdependency is found between only some nations (the 'happy couples').

In this paper we study the architecture of today's global MNC network by specifically linking the attributes of home and host countries to the disproportionality of the corporate system. We are not only interested in explaining the differences in national connectivity within the global corporate network, but also the differences in connectivity within the group of rich countries—herewith making a distinction between the rich and the 'happy few'. The remainder of this paper is organized as follows. The next section provides a theoretical overview of MNCs and their global corporate networks, including factors that shape these networks. In section 3 the dataset and methodology are introduced. In section 4 we discuss the main empirical results, followed by our conclusions in section 5.

2 Theoretical framework

2.1 The multinational corporation and FDI

The gradual integration of nations within our globalizing world is strongly characterized by the economic networks formed by MNC headquarters and their subsidiaries located across the globe (Barba Navaretti and Venables, 2004; Brakman and Garretsen, 2008). Since the 1970s the global dispersion of production has broadened as corporations have increasingly sought lower wages, proximity to markets and resources,

[1] The parameter values were estimated using the Zipf regression approach of Gabaix and Ibragimov (2010).

and ways to redistribute their labour. This process has led to the current geographic dispersion of headquarters and their subsidiaries, and the further expansion of global commodity chains. In pursuit of cost reduction and profit maximization, these firms utilize their commodity chains to organize value-added production stages, coordinate various levels of distribution, employ a governance structure which controls the allocation of resources, and facilitate an institutional framework that coordinates between national and international policies (Gereffi, 1994). Moreover, MNC networks overcome informal trade barriers, such as the weak enforcement of contracts across national boundaries and insufficient information about trading opportunities (Rauch, 2001). These cross-border operations lead to a complex organization of economic activities at different geographical scales (Amin, 2002; Henderson et al, 2002). MNC networks therefore represent distinct loci of power which have a significant impact on the contemporary global economy. The expansion of MNC networks takes place through FDI, which concerns long-range investments by an investor in a firm in a country other than that in which where the investor is based. Hence, MNC networks are the outcome of past investments (Ghoshal and Bartlett, 1990) which are long term in nature (Barba Navaretti and Venables, 2004). MNCs enter foreign markets either through mergers and acquisitions (M&As) or greenfield investments. In the contemporary global economy, M&As account for 78% of FDI (Brakman et al, 2006). Furthermore, FDI can be characterized as horizontal or vertical. Horizontal FDI, which constitutes the largest share of FDI, concerns firms which 'duplicate' a number of home-country activities abroad, and mainly target accessing foreign markets. Vertical FDI concerns investments in which firms decide to break up their activities geographically, essentially motivated by savings in production costs.

Firms internationalize if the competitive advantages gained by establishing a subsidiary abroad are high enough to cover the additional costs and risks that are associated with this operation (Hymer, 1976). Following Dunning's 'OLI paradigm' (Dunning, 1977; 1993), firms invest abroad if: they have market power given by the ownership (O) of products or production processes; they have a location advantage (L) in locating their plant in a foreign country rather than in their home country; and have an advantage from internalizing (I) their foreign activities in fully or partially owned subsidiaries, rather than carrying out business through market transactions (trade) or networked relationships with other firms (eg licensing and franchising). In this, location advantage (explaining where firms internationalize) directly affects the structure of global corporate networks, whereas ownership advantage (explaining why firms internationalize) and internalization advantage (explaining how firms internationalize) only indirectly influence MNC location decisions (McCann and Mudambi, 2004). More specifically, it is contended that specific home-market characteristics attribute to the international competitiveness of firms. This, in turn, affects the decision of firms to internationalize and the structure of global corporate networks.

2.2 Determinants of the structure of global corporate networks
In international business, international economics, and economic geography, different theoretical models exist which attempt to explain the structure of global corporate networks (Faeth, 2009; McCann and Mudambi, 2004). Two main approaches can be distinguished for the study of FDI and the location choice of MNCs: first, the international business literature draws on Dunning's eclectic OLI paradigm to explain MNC location choice; and, second, there is the international economics literature, which builds mainly upon general equilibrium models of horizontal and vertical FDI (Markusen and Maskus, 2001). Although neither of these is specific to international business or international economics literature, they tend to highlight different

factors underlying the structure of global corporate networks (Faeth, 2009; McCann and Mudambi, 2005). Hence, in this paper we derive home-country, host-country, and bilateral factors which may explain why the connectivity between certain countries is stronger than between others. By accounting for these factors, our analysis resembles the type of analyses employed in gravity-based modeling of FDI (see eg Bergstrand and Egger, 2007; Loungani et al, 2002).[2, 3]

2.2.1 Home-country determinants

Some countries generate more outward FDI than others. The simplest explanation for this is that some countries are larger than other countries (in terms of GDP or wealth) and therefore have a larger pool of potential investors (Barba Navaretti and Venables, 2004). However, various international business and international economics theories argue that there are particular home-country characteristics which favor headquarters, particularly MNCs.

In the international business literature, home-country determinants of outward corporate connections are based predominantly on ownership and internalization advantages. 'Ownership advantages' refer to the firm's (intangible) assets to which other (foreign) firms cannot easily get access and which provide an MNC certain market power over others. The notion of 'internalization advantages' dates back to Buckley and Casson (1976); these are advantages which make it more profitable for firms to internationalize through FDI than through market transactions or licences. Some of these ownership and internalization advantages are home-country specific in the sense that they are shared by all firms having their home base in that particular country (Dunning, 1993).

Following Hymer (1976), the home-country-specific ownership advantages arise from access to resources that are abundant in the home country, such as availability of economic resources, technology, and skills. In terms of economic resource availability, one should not only consider GDP or wealth, but also well-functioning capital markets. Di Giovanni (2005) shows that firms located in home countries with developed domestic capital markets, have better opportunities to invest abroad. Likewise, technological development in the home country promotes outward FDI, providing firms with a competitive advantage over foreign firms (Narula and Wakelin, 1998). In addition, an economy's openness promotes FDI by facilitating the financing of projects abroad, gaining foreign-market information and offering an opportunity to fight import competition (Kyrkilis and Pantelidis, 2003).

2.2.2 Host-country determinants

A host country must offer a location advantage to a firm that is interesting enough to attract a plant in that country, rather than in the home country. Not surprisingly, host countries which are relatively more attractive will receive more FDI and, hence, will be more central in terms of connectivity to the global corporate network. A similar view can be found in international economics, in which comparative advantages of countries are perceived as 'pull factors' which attract MNC investments.

The relative importance of these different factors depends on the motivation of firms to locate a part of the production process abroad. Dunning (1993; 1998) distinguishes between four motivations of firms to internationalize the production process.

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[2] See Head and Ries (2008) for a formal theoretical motivation of the FDI gravity model.

[3] Note that the determinants presented below are not exhaustive, in that there may still be other factors which can affect the spatial distribution of corporate connections. However, we believe we cover the most important determinants found in the international business and international economics literatures.

(1) *Market-seeking FDI.* Firms will supply their goods or services to the investing market and optionally serve third markets from this location. This form of FDI is typically a form of horizontal investment, in which foreign markets are served by a local affiliate. The new location can also be used to serve the surrounding regions, which is especially important if the location provides access to a large integrated market.[4] In the contemporary literature on FDI, the market-seeking motive is considered the most important reason for firms to invest abroad (Brakman and Van Marrewijk, 2008).

(2) *Efficiency-seeking FDI* is motivated by a reduction of production costs, which can be related to labor, capital, and materials. Differences in the costs of production factors across countries can influence a firm to split up its activities geographically. Efficiency-seeking FDI is often found in host countries with lower labor costs and lower taxes. This type of investment is most often vertical.

(3) *Resource-seeking FDI* is targeted at the acquisition of specific resources at lower cost than would obtain in the home market. In this, the availability of natural resources and local partners to obtain knowledge and exploit these resources are important motivations to invest in a particular market. This type of investment is generally vertical.

(4) *Strategic-asset-seeking FDI* is motivated by the acquisition of assets to promote long-term strategic objectives and sustain the firm's international competitiveness. This type of FDI is driven by the need of firms to acquire specific technological capabilities, management, or marketing expertise—and can reflect both horizontal and vertical FDI.

Apart from these motivations to internationalize, literature on host-country determinants of FDI and corporate relationships has also drawn attention to the quality of institutions in the host country. A bad institutional environment may deter investments as it increases the costs of doing business and raises uncertainty. Daude and Stein (2007) found that corruption, unpredictability of policies, excessive regulation, and poor enforcement of property rights have negative effects on FDI inflow. Benassy-Quéré et al (2007) concluded that not only are bureaucracy, quality of the legal system, and corruption important determinants of FDI, but also the quality of the credit market.

2.2.3 Bilateral determinants

Besides home-country and host-country characteristics, the structure of the global corporate network is influenced by country-pair specific characteristics. These 'bilateral' determinants can be related to transaction costs, the trade-off between FDI and trade, and differences in factor endowments between countries. First, bilateral variables can reflect the 'transactional distance' (cf Obstfeld and Rogoff, 2000) between two countries, where 'distance' is interpreted as a multifaceted concept which keeps countries separated by creating transaction costs (Linders et al, 2008). Literature shows that these barriers still tend to obstruct the creation of economic linkages between countries. In this light, one can distinguish between tangible and intangible barriers. 'Tangible barriers' are those which are directly observable in terms of their effect on the costs or quantity of overseas production. Examples are transport barriers (transportation, communication, and time costs) and trade-policy barriers (absence of free-trade agreements, tariffs, and import and export quotas). 'Intangible barriers' are barriers which cannot be observed in terms of monetary or quantitative restrictions and are related to trust and understanding, which themselves reduce uncertainty in

[4] The importance of market size and accessibility is also explicitly discussed in the New Economic Geography literature (see Barba Navaretti and Venables, 2004).

transactions and reduce the costs of doing business. Intangible barriers to FDI include cultural and institutional distance between countries (Globerman and Shapiro, 2003; Linders et al, 2008).

However, the relationship between tangible barriers to FDI and the number of corporate relationships between countries is far from clear. It is often argued that FDI can be both a substitute for and a complement to international trade (Markusen, 1995). In other words, trade costs raises the costs of doing business abroad but, at the same time, may promote FDI in place of exports. It can be expected that vertical FDI is complementary to trade and distance discourages FDI because of the trade costs related to the shipment of intermediate inputs to the host country and/or finished products back home. In contrast, horizontal FDI replaces exports if the trade costs of gaining market access are high. However, according to Neary (2002), horizontal FDI may take the form of export-platform FDI, in which a foreign plant serves not only the host country but also surrounding countries that are situated within the same free-trade area (eg the European Union). In this case, there would also be a negative relationship between trade costs and FDI.

On a similar note, in the case of market-seeking horizontal FDI, there tend to be more corporate relationships between countries which are relatively similar in size and in endowments. The argument here is that if the differences between countries are too large, all plants will be placed in the location that is preferred in terms of location advantages (Markusen and Maskus, 2001). In case of efficiency-seeking vertical FDI, corporate relationships tend to arise between countries which differ in factor endowments as this type of investment is primarily driven by production-cost differences.

2.3 From the poor to the rich and the happy few countries

The determinants outlined above constitute a general framework to study the structure of global corporate networks. However, Blonigen and Wang (2004) indicate that the determinants of FDI vary systematically across developed and developing countries and, hence, pooling of FDI from/into developing and developed countries would be undesirable (see eg also Collier, 2006). Accordingly, the factors that distinguish the poor from the rich countries in the global corporate network are different from the factors that distinguish the rich from the happy few countries.

First, it is often argued that the motivations of firms to internationalize into rich (developed) countries are different from the motivations of firms to internationalize into poor (developing) countries. According to Dunning (2003), recent flows of FDI to rich countries have been mainly horizontal in nature and provoked by market-seeking and asset-seeking motives. In contrast, recent FDI into poor countries can be best characterized as market seeking, natural resource seeking, and efficiency seeking. In this way, MNCs increasingly relocate some of their production plants to the cheapest developing countries for exports to third markets and for the reduction of production costs. Whereas FDI into rich countries is mainly targeted at securing or augmenting the competitive advantages of the firm, FDI into developing countries is mainly targeted at accessing markets and cheap production, and acquiring resources (Dunning, 2003; Narula and Dunning, 2000).

Secondly, and most importantly, the determinants of outward FDI from rich countries are different from those of poor countries (Dunning et al, 2008). This makes it possible to distinguish the rich from the happy few countries. Although large countries (France, Germany, Japan, the United Kingdom, and the United States) typically export more FDI, this does not explain the prominent position of relatively small countries like Switzerland and the Netherlands in the global corporate network, compared with other small rich countries such as Finland and the United Arab Emirates.

Recently, attention has been drawn to credit provision in the home country as one of the most important explanations for differences between rich countries in outward FDI (Baker et al, 2009; Di Giovanni, 2005; Razin et al, 2004). Razin et al (2004) argue that countries with relatively high setup costs—related to the technological and financial ease by which a foreign subsidiary expands—export less FDI. In this, particularly the provision of cheap financial capital provides financial means for MNCs to expand and grow rapidly and decreases risk and uncertainty. These cheap channels of capital primarily originate from high levels of domestic stock market capitalization and the ensuing low-cost capital available to overvalued parents in the home countries (Baker et al, 2009; Di Giovanni, 2005) and the degree of credit provisions by banks and other financial institutions in the home country (Di Giovanni, 2005). In this, it is at least remarkable that small countries (the Netherlands, Switzerland) with a large number of outgoing connections are also host to large stock markets (Amsterdam, Zurich).

3 Research design
3.1 Data on corporate connections
In our analysis we use the total number of corporate connections between a home (headquarter) country and host (subsidiary) country as an indication of the strength of the corporate connection between two countries. More specifically, the data used in this study are similar to those used by Godfrey and Zhou (1999) and Alderson and Beckfield (2004), as they concern the 2005 *Fortune* Global 100 multinationals. These 100 companies accounted for 27% of OECD revenue in 2005, indicating the economic importance of these firms. If the revenues of their subsidiaries were included, this would amount to roughly 50% of OECD revenue. Next, the subsidiaries of these companies and their different levels of ownership were extracted from the LexisNexis *Directory of Corporate Affiliations* (2005).[5] This resulted in a dataset of 9243 ownership relations, of which 4638 proved to be domestic linkages and 4605 were transnational. By strictly focusing only on transnational corporate connections and excluding linkages to host countries for which one or more important independent variables were missing, a dataset of 4321 relations remained.[6] By aggregating the data to the national level, a global corporate network between countries was constructed between 43 home countries with at least one outgoing corporate connection and 110 host countries which have at least one incoming corporate connection, listed in the appendix. Excluding domestic connections between countries, there are 4687 $[(43 \times 110) - 43]$ country pairs in the global corporate network. A more elaborate description of the data construction can be found in Wall (2009).

As indicated in the introduction, the global corporate network is disproportionate. First, the majority of outgoing corporate connections are held by only a few (rich) home countries. Here, the United States (1192 outgoing connections), Germany (850), France (457), Japan (448), Switzerland (365), the United Kingdom (351), and the Netherlands (330) are the most prominent. Overall, these countries hold about 93% of all outgoing connections, indicating that MNCs are particular about their headquarters localities. A similar, yet less disproportionate, pattern is seen with respect to host-country connectivity, where the top ten countries (United States, United Kingdom,

[5] This database covers more than 180 000 of the most important companies in the world and their respective subsidiaries (see http://www.lexisnexis.com/dca), organized at different levels of corporate ownership, but also including information on their industrial sectors and country/city locations.
[6] These mainly included islands in the Caribbean, Indian Ocean, and South Pacific, and some countries in Sub-Saharan Africa, with only a few connections in total.

Canada, Germany, France, China, Netherlands, Spain, Australia, and Italy) hold approximately 50% of all incoming relationships. In general, African and South American countries are underrepresented in the network.[7] Yet, disproportionality does not only exist between rich and poor countries; it is also found within the group of rich countries, creating a division between the rich and the happy few.

With respect to bilateral connections, the global corporate network reveals similar unevenness, as just 1% of the country pairs holds roughly 45% of all corporate connections. With regard to the top five strongest transnational connections, the United States always is involved, either as a home or host country: Germany – United States (150 corporate connections), United States – Canada (136), United States – United Kingdom (112), Japan – United States (106), and United States – Germany (84). Strikingly, there is no corporate connectivity between over 85% of the country pairs.

3.2 Count data models and modified Poisson estimation

The number of connections between countries in the MNC network can be perceived as count data, as these variables 'count' the number of times something has occurred. Although count data are often treated as if it where continuous, estimation by ordinary least squares (OLS) in a linear regression framework often results in inefficient and biased estimates of the parameters (Long, 1997). A more extensive discussion of this issue can be found in Burger et al (2009).

Hence, the use of alternative regression techniques would be more appropriate. Probably the most common regression model applied to count data is the Poisson regression. Applying a Poisson regression, it can be conjectured that the number of corporate connections C_{ij} between home country i and host country j has a Poisson distribution with a conditional mean that is a function of a number of independent variables [equation (1)]. As C_{ij} is assumed to have a nonnegative integer value, the exponential of the independent variables is taken—which must be zero or positive. More formally,

$$\Pr\left(C_{ij}\right) = \frac{\exp(-\mu_{ij})\mu_{ij}^{C_{ij}}}{C_{ij}}, \qquad C_{ij} = 0, \ldots, \tag{1}$$

in which the conditional mean, μ_{ij}, is linked to an exponential function of a set of explanatory variables

$$\mu_{ij} = \exp\left(\alpha_0 + \boldsymbol{\beta}^{\mathrm{T}}X_i + \boldsymbol{\gamma}^{\mathrm{T}}X_j + \boldsymbol{\varphi}^{\mathrm{T}}X_{ij}\right), \tag{2}$$

where α_0 is a proportionality constant, X_i, X_j, and X_{ij}—with corresponding parameters $\boldsymbol{\beta}$, $\boldsymbol{\gamma}$, $\boldsymbol{\varphi}$—are $1 \times k$ row vectors of explanatory variables related to the home-country characteristics, host-country characteristics, and bilateral relationships between home and host countries, respectively.

An important condition of the Poisson regression model is that it assumes equi-dispersion; that is, the conditional variance should be equal to the conditional mean. However, most often the conditional variance is higher than the conditional mean, which suggests that the dependent variable is overdispersed. In a Poisson model, standard errors are typically biased downward, which results in an increased risk of finding significant relationships where in fact no significant relationships exist

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[7] Even when focusing on the top 500 instead of the top 100 MNCs, it is found that of the bottom 400 firms only 27 are found in developing countries, representing only 3% of the total revenue of the top 500 firms. Because countries in the developing world proved to be strongly underrepresented across the entire top 500 companies, by using only the top 100 firms we would not unfairly favor countries in the developed world.

(Gourieroux et al, 1984). In order to correct for this, a negative binomial regression model can be employed.[8] In contrast to the Poisson model, the negative binomial model includes an additional parameter which captures the degree of overdispersion. More technical discussions of the negative binomial regression model can be found in Greene (1994) and Long (1997).

3.3 Covariates

To explain the geography of global corporate networks, we include variables measured at the level of the home country and host country as well as bilateral variables, as discussed in section 2.2. Table 1 provides summary statistics of the variables included in the models and their expected sign. Note that all variables are in natural logs, except for dummy variables, quality of institutions, corporate taxes, and sectoral complementarities.

Table 1. Summary statistics of variables and expected effects ($N = 4687$).

Variable	Mean	Standard deviation	Minimum	Maximum	Expected sign
Home country					
GDP (ln)	26.00	1.49	22.94	29.90	+
GDP per worker (ln)	10.13	1.28	6.69	11.68	+
Remoteness (ln)	8.66	0.39	8.15	9.48	−
Openness (ln)	−0.55	0.59	−1.60	1.16	+
Technology exports (ln)	−2.30	0.95	−4.60	−0.60	+
Stock market capitalization (ln)	−1.27	1.39	−4.27	0.82	+
Credit provision (ln)	−0.28	0.76	−2.04	0.80	+
Host country					
GDP (ln)	24.25	2.00	19.85	29.91	+
GDP per worker (ln)	9.08	1.57	5.28	11.68	+/−
Remoteness (ln)	8.66	0.40	8.02	9.52	+
Openness (ln)	−0.50	0.49	−1.61	1.15	+
Technology exports (ln)	−2.67	0.95	−4.61	−0.52	+
Fuels exports (ln)	−2.71	1.33	−4.52	−0.02	+
Quality of institutions (ln)	0.17	0.88	−1.71	1.86	+
Corporate taxes (ln)	0.20	0.11	0.00	0.73	−
Bilateral					
Physical distance (ln)	8.66	0.84	4.01	9.89	+/−
RIA dummy	0.10	0.30	0.00	1.00	+/−
Common language dummy	0.11	0.31	0.00	1.00	+
Common history dummy	0.03	0.18	0.00	1.00	+
Sectoral distance	1.48	1.21	0.00	9.60	+/−
GDP difference (ln)	2.50	1.76	0.00	10.05	+

At the home-country level we include variables related to the home-country-specific ownership and internalization advantages available to firms in that country. The gross domestic product (GDP) and GDP per worker in a home country measure the potential pool of investors and the abundance of capital present. Remoteness is measured as the average distance of a country from all other countries in the world and indicates the geographical position of a home country. In this, it is expected that home countries which are more remote have more difficulties generating outward corporate connections. The technological abundance of a host country is measured by the average share of high-technology exports (technology exports) in the volume of manufacturing

[8] In this, the likelihood ratio test of overdispersion (Cameron and Trivedi, 1986) can be used to test whether the negative binomial specification is favored over the Poisson specification.

exports over the period 2000 – 06 and is obtained from the World Development Indicators Database. With respect to the financial depth and climate of the home country, we introduce three variables: the size of the stock market relative to GDP, which we term 'stock market capitalization', and the domestic credit provided to the private sector relative to GDP, which we label 'credit provision' (Di Giovanni, 2005). For both these variables the average of the period 2000 – 06 is taken. We control for the fact that some home countries are more protectionist and domestically oriented than others, by including a variable for the openness of the national economy. This variable is measured by a home country's exports and imports divided by its GDP.

At the host-country level we include variables related to the motivations to invest abroad and the quality of institutions in the host country. Related to market-seeking motives, we include market size and remoteness. In line with the market seeking FDI hypothesis, larger countries in terms of GDP tend to be more attractive to MNCs as MNCs are able to serve a larger market there. In this, remoteness is included to control for the geographical position of countries, and it can be expected that countries which are more remote will receive more incoming connections, as they have to compete with fewer countries. Related to efficiency seeking motives, we include GDP per worker and corporate taxes as covariates, where corporate taxes are measured as the total tax rate as percentage of the profit. In this, it should be noted that GDP per worker reflects both the level of development as well as the wage costs in a country and, hence, the expected sign is left undetermined. Natural resource seeking motives are captured by fuels exports as percentage of total exports (Bond and Malik, 2009); asset-seeking motives are measured by high-technology exports (technology exports) divided by total manufacturing exports. We control for the institutional environment by taking in the openness of a host country and the quality of institutions in the host country. In this, the quality of institutions is based on Kaufmann's six dimensions of governance quality (Kaufmann et al, 2004). These dimensions include voice and accountability, political stability, effectiveness of government, quality of regulation, rule of law, and control of corruption. All these indicators are constructed on the basis of factor analysis and reflect different aspects of the quality of governance. A more detailed description of these dimensions can be found in Kaufmann et al (2004).

Finally, we include bilateral variables related to tangible and intangible barriers to the formation of corporate connections. Physical distance between home and host country creates transactions costs in terms of transportation, communication, and time costs. Here, physical distance is measured as the straight-line distance between countries ('as the crow flies'), using the capital city of each country as the centre of gravity. The Regional Integration Agreement (RIA) dummy indicates whether the countries are both members of the same regional integration agreement and is determined on the basis of OECD data on major regional trade agreements. Note that, if corporate connections between countries are predominantly horizontal, we expect a negative effect of the RIA dummy. In contrast, if the corporate connections are predominantly vertical, we expect a positive effect of the RIA dummy. The cultural – historical distance between countries is measured by whether countries have the same official language and a historical relationship. To assess whether countries have the same official language, we use a database collected by Haveman that distinguishes between fourteen languages. The language dummy variable reflects whether or not two countries have a common official language. Similarly, the history dummy variable takes the value of one if two countries had, or have, a colonial relationship, or even if they were once part of the same country. This variable is constructed on the basis of CEPII data (http://www.cepii.org). Finally, we also include variables related to the difference in size and production structure between countries. The size difference

between countries is measured as the difference in GDP between the countries. Differences in production structure, which we label 'sectoral distance' are measured using a Kogut – Singh (Kogut and Singh, 1988) index. In this, we use the share differences from six broad sectors (agriculture, manufacturing, construction, wholesale, transport, and services) in the total economy of the home and host countries. Information on the production structure is obtained from the UNCTAD database (http://www.unctad.org). In case of horizontal motives to invest abroad, corporate relationships will be disproportionally present between countries which are relatively similar in size and relative endowments.

4 Empirical results
4.1 Determinants of the structure of global corporate networks

Regarding the analysis of corporate connectivity between countries, the negative binomial regression model proved to be more appropriate than its Poisson counterpart. All regression models are calculated using the White estimator (robust standard errors) to account for heteroskedasticity (Santos Silva and Tenreyro, 2006).

Models 1 – 4 in table 2 present the estimates for the negative binomial regression model on corporate connectivity. In this, we estimate models including observed home-country and host-country variables and models including home-country and/or host-country fixed effects. We estimate fixed-effects models to account for unobserved host-country-specific and/or home-country-specific characteristics that may have an impact on the remaining parameters. In particular, the bilateral variables may erroneously pick up the effect of the omitted host-country and/or home-country variables, resulting in biased parameter estimates (Andersen and Van Wincoop, 2003). Moreover, these fixed-effects models also satisfy the constraints on total host-country outflows and home-country inflows (Bröcker, 1989).

Turning to the main results, it can be inferred that home-country-specific ownership advantages (models 1 and 2) play an important role in explaining the geography of corporate networks. First, the size and wealth of the home country have positive and significant effects on the corporate connectivity between countries. An increase in home-country GDP of 1% increases the expected corporate connectivity by over 1.3%; an increase in GDP per worker of 1% increases the expected corporate connectivity by about 0.23%. This not only signifies that the size of the pool of potential investors is an important determinant of the geography of global corporate networks, but also that the availability of economic resources matters. Besides size and wealth, other home-country-specific ownership advantages appear to be important, such as a home country's degree of openness, remoteness, level of technology, and stock market capitalization. In this, the expected number of connections originating from countries that are less remote, more open, and more financially developed, are generally higher. However, the effect of home-country's credit provision on the number of bilateral relations appears to be insignificant.

With respect to the host-country effects (models 1 and 3), it can be observed that market size, GDP per worker, remoteness, openness, level of technology, and quality of institutions have statistically significant effects on the expected corporate connectivity. This signifies that a mixture of market-seeking, efficiency-seeking, and strategic-asset-seeking motivations of firms shape the geography of global corporate networks. In this, the expected corporate connectivity increases with market size, openness, and quality of the institutional environment of the host country, and decreases with the wage level of the host country. In addition, host countries that are more remote have a higher than expected number of incoming connections. This can be explained by the fact that more remote countries (eg Australia, New Zealand)

Table 2. Negative binomial pseudo maximum likelihood regression, with robust standards errors shown in parentheses, on the number of corporate connections between countries.

Variable[a]	Model (1)—C_{ij}	Model (2)—C_{ij}	Model (3)—C_{ij}	Model (4)—C_{ij}
Home country				
GDP	1.34 (0.069)**	1.36 (0.076)**		
GDP per worker	0.23 (0.076)**	0.24 (0.074)**		
Remoteness	−1.56 (0.154)**	−1.52 (0.146)**		
Openness	0.99 (0.198)**	1.04 (0.141)**		
Technology exports	0.37 (0.102)**	0.39 (0.100)**		
Stock market capitalization	0.59 (0.103)**	0.59 (0.097)**		
Credit provision	0.34 (0.181)	0.35 (0.175)*		
Host country				
GDP	0.62 (0.047)**		0.60 (0.035)**	
GDP per worker	−0.22 (0.055)**		−0.23 (0.047)**	
Remoteness	1.31 (0.161)**		0.95 (0.129)**	
Openness	0.35 (0.104)**		0.32 (0.080)**	
Technology exports	0.05 (0.056)		0.05 (0.046)	
Fuels exports	0.02 (0.037)		0.02 (0.031)	
Quality of institutions	0.45 (0.091)**		0.46 (0.078)**	
Corporate taxes	−0.49 (0.451)		−0.73 (0.380)	
Bilateral				
Physical distance	−0.70 (0.073)**	−0.71 (0.073)**	−0.48 (0.064)**	−0.41 (0.059)**
RIA dummy	−0.13 (0.108)	−0.31 (0.115)**	0.23 (0.101)*	0.15 (0.099)
Common-language dummy	0.32 (0.106)**	0.34 (0.175)**	0.35 (0.098)**	0.36 (0.098)**
Common-history dummy	0.22 (0.146)	0.14 (0.133)	0.70 (0.157)**	0.54 (0.134)**
Sectoral distance	−0.02 (0.050)	0.06 (0.110)	−0.03 (0.047)	0.06 (0.133)
GDP difference	−0.15 (0.046)**	−0.15 (0.066)*	−0.17 (0.033)**	−0.19 (0.036)**
Observations	4687	4687	4687	4687
Home-country fixed effects	no	no	yes	yes
Host-country fixed effects	no	yes	no	yes
Log pseudolikelihood	−2251	−2170	−1921	−1809
AIC	4547	4587	3957	3936
LR test of overdispersion	1028.2**	685.4**	402.9**	142.8**

**$p < 0.01$, *$p < 0.05$. [a] All variables are in natural logs, except for dummy variables, quality of institutions, and corporate taxes.

face less competition from other countries when serving as subsidiary locations of MNCs which wish to serve their local markets. From the perspective of export-platform FDI it can be argued that countries that are part of a smaller set of alternatives will receive more FDI.

Comparing the host-country and home-country determinants, two important observations can be made. First, the estimated effect sizes of host-country character-istics appear to be much larger than those of the home country. This underlines the fact that the distribution of outward connections is more uneven than the distribution of incoming connections, and provides an indication that MNCs are much more demanding with respect to the characteristics of their headquarters location than with respect to the location of their subsidiaries.

With respect to the bilateral variables (model 4), we find that physical distance, cultural proximity, and difference in GDP all have statistically significant effects on the expected number of corporate connections, whereas we do not find an effect of having an RIA on the expected corporate connectivity.

Taking the effects of the host country and bilateral variables together, it can be inferred that most FDI is indeed horizontal and not vertical. First, the market-seeking and strategic-asset-seeking motives (exemplified by GDP, remoteness, openness, and technology-exports variables) appear to be more important than the efficiency-seeking and natural-resource-seeking motives (mainly exemplified by the GDP per worker and fuel-exports variables). Second, the expected number of connections is higher in country pairs in which countries are similar in size; having an RIA does not negatively affect the expected number of corporate connections between countries.

4.2 The poor, the rich, and the happy few countries

Models 5–15 in tables 3–5 present the estimates for the negative binomial regression model on corporate connectivity for different subsamples of the dataset. In our anal-yses we divided the sample into the richest countries (20%) and the poorest countries (80%—which also include countries with intermediate GDP per capita levels) and estimated models including host-country fixed effects (models 5–7, table 3), home country fixed effects (models 8–11, table 4), and home-country and host-country fixed effects (models 12–15, table 5).[9]

Models 5–7 (table 3) analyze the determinants of the corporate connectivity between countries, restricted to corporate connections which originate from rich countries. In contrast to the models including rich and poor home countries (models 1–4), here both the home country's degree of stock market capitalization and the degree of credit provision to the private sector have a positive and significant effect on the number of connections. Moreover, the effect of the home country's stock market capitalization on connectivity is significantly larger within the subset of corporate connections origi-nating from rich countries compared with the total sample ($\chi^2 = 49.9$, $p < 0.01$).[10] Within the subset of rich home countries, an increase of 1% in the home country's stock market capitalization increased the corporate connectivity between two coun-tries by 1.06%. Likewise, an increase in the degree of domestic credit provision to the private sector in the home country of 1% increased the corporate connectivity between two countries by 0.56%. In this, there are no significant differences between

[9] The 20% richest countries in the sample include Australia, Austria, Belgium-Luxembourg, Canada, Denmark, Finland, France, Germany, Ireland, Israel, Italy, Japan, Kuwait, the Nether-lands, Norway, Qatar, Singapore, Sweden, Switzerland, the United Arabian Emirates, the United Kingdom, and the United States. In all these countries, the GDP per capita in 2000 was higher than US$17 500. Number 23 (Spain) had a GDP per capita of less than US$14 500 in 2000.
[10] This was assessed on the basis of a seemingly unrelated estimation and adjoining χ^2 test.

Table 3. Host-country constrained negative binomial pseudomaximum likelihood regression on the number of corporate connections between countries, with robust standard errors shown in parentheses.

Variable[a]	Model (5)—C_{ij} from rich countries		Model (6)—C_{ij} rich → rich		Model (7)—C_{ij} rich → poor	
Home country						
GDP	1.60	(0.066)**	1.66	(0.92)**	1.50	(0.105)**
GDP per worker	0.58	(0.119)**	0.73	(0.198)**	0.48	(0.153)**
Remoteness	−1.12	(0.161)**	−0.69	(0.337)*	−1.54	(0.203)**
Openness	1.62	(0.257)**	1.50	(0.226)**	1.73	(0.204)**
Technology exports	−0.19	(0.109)	0.04	(0.190)	−0.37	(0.126)*
Stock market capitalization	1.06	(0.090)**	0.88	(0.133)**	1.16	(0.121)**
Credit provision	0.56	(0.208)**	0.51	(0.311)	0.62	(0.265)*
Bilateral						
Physical distance	−0.65	(0.074)**	−0.94	(0.146)**	−0.66	(0.095)**
RIA dummy	−0.22	(0.117)	−0.80	(0.163)**	0.48	(0.191)**
Common language dummy	0.09	(0.116)	−0.22	(0.179)	0.14	(0.165)
Common history dummy	0.23	(0.134)	0.03	(0.153)	0.52	(0.178)**
Sectoral complementarities	0.50	(0.137)**	0.35	(0.224)	0.61	(0.162)**
GDP difference	−0.31	(0.051)**	−0.27	(0.065)**	−0.19	(0.092)*
Observations	2180		420		1760	
Home-country fixed effects	no		no		no	
Host-country fixed effects	yes		yes		yes	
Log pseudolikelihood	−1785		−639		−1114	
AIC	3818		1350		2433	
LR test of overdispersion	674.7**		432.8**		184.8**	

**$p < 0.01$, *$p < 0.05$.
[a]All variables are in natural logs, except for dummy variables.

corporate connections from rich to rich countries and corporate connections from rich to poor countries. Hence, the degree of financial development is a very important factor separating the rich from the happy few countries in the global corporate network. In contrast, the degree of technological abundance in the home country appears to be a less important determinant of the corporate connectivity between countries. This can be explained by the fact that rich countries do not differ much in their levels of technological sophistication.

When the subset of corporate connections into rich countries is compared with the subset of corporate connections into poor countries (models 8–11, table 4), a number of important differences can be observed with respect to the host-country determinants of corporate connectivity. First, the number of connections targeted at poor countries is driven more by low wage costs ($\chi^2 = 3.82$, $p = 0.05$), whereas the number of connections targeted at rich countries is driven more by low corporate taxes ($\chi^2 = 14.48$, $p < 0.01$). Second, the host country's market-size access is more important for connections targeted at rich countries than for connections targeted at poor countries ($\chi^2 = 3.84$, $p = 0.05$). Similar results are obtained when comparing corporate connections among rich countries with corporate connections between rich and poor countries. These findings can be linked to the differences in the nature of the economic activities conducted by MNCs in rich and poor countries: whereas FDI into poor countries is related more often to labor-intensive activities, such as manufacturing, FDI into rich countries is targeted more at services (Blonigen and Wang, 2004).

Table 4. Home-country constrained negative binomial pseudo maximum likelihood regression, on the number of corporate connections between countries, with robust standards errors shown in parentheses.

Variable[a]	Model (8)—C_{ij} into rich countries	Model (9)—C_{ij} rich → rich	Model (10)—C_{ij} into poor countries	Model (11)—C_{ij} rich → poor
Host country				
GDP	0.80 (0.052)**	0.76 (0.051)**	0.63 (0.068)**	0.61 (0.087)**
GDP per worker	0.10 (0.122)	0.07 (0.124)	−0.17 (0.065)**	−0.17 (0.66)**
Remoteness	0.75 (0.223)**	0.80 (0.237)**	1.15 (0.167)**	1.04 (0.170)**
Openness	0.52 (0.123)**	0.48 (0.125)**	0.33 (0.110)**	0.36 (0.113)**
Technology exports	0.12 (0.090)	0.12 (0.090)	0.02 (0.054)	0.04 (0.056)
Fuels exports	0.13 (0.052)*	0.12 (0.054)*	0.03 (0.045)	0.03 (0.047)
Quality of institutions	0.75 (0.176)**	0.75 (0.171)**	0.36 (0.110)**	0.40 (0.113)**
Corporate taxes	−2.80 (0.716)**	−2.85 (0.751)**	0.40 (0.440)	0.55 (0.447)
Bilateral				
Physical distance	−0.41 (0.111)**	−0.43 (0.110)**	−0.60 (0.077)**	−0.55 (0.079)**
RIA dummy	0.01 (0.134)	−0.07 (0.122)	0.59 (0.136)**	0.49 (0.133)**
Common language dummy	0.29 (0.130)*	0.24 (0.125)	0.47 (0.141)**	0.42 (0.142)**
Common history dummy	0.28 (0.166)	0.35 (0.173)*	0.71 (0.225)**	0.56 (0.223)*
Sectoral complementarities	−0.03 (0.144)	−0.05 (0.142)	−0.06 (0.050)	−0.04 (0.049)
GDP difference	−0.15 (0.048)**	−0.16 (0.049)**	−0.12 (0.069)	−0.15 (0.088)
Observations	926	420	3761	1760
Home-country fixed effects	yes	yes	yes	yes
Host-country fixed effects	no	no	no	no
Log pseudolikelihood	−653	−639	−1183	−1051
AIC	1422	1213	2482	2164
LR test of overdispersion	131.9**	126.8**	103.1**	86.8**

**$p < 0.01$, *$p < 0.05$.
[a]All variables are in natural logs, except for dummy variables, quality of institutions, and corporate taxes.

Table 5. Home-country and host-country constrained negative binomial pseudo maximum likelihood regression, on the number of corporate connections between countries, with robust standards errors shown in parentheses.

Variable[a]	Model (12)—C_{ij} into rich countries	Model (13)—C_{ij} rich $\rightarrow$ rich	Model (14)—C_{ij} into poor countries	Model (15)—C_{ij} rich $\rightarrow$ poor
Bilateral				
Physical distance	−0.41 (0.089)**	−0.40 (0.083)**	−0.55 (0.073)**	−0.51 (0.071)**
RIA dummy	−0.04 (0.128)	−0.09 (0.119)	0.51 (0.139)**	0.41 (0.129)**
Common language dummy	0.24 (0.118)*	0.22 (0.116)	0.66 (0.148)**	0.57 (0.151)**
Common history dummy	0.29 (0.139)	0.32 (0.149)*	0.54 (0.178)**	0.41 (0.162)*
Sectoral complementarities	0.16 (0.254)	0.10 (0.246)	0.13 (0.134)	0.15 (0.182)
GDP difference	−0.14 (0.043)**	−0.15 (0.044)**	−0.09 (0.074)	−0.12 (0.086)
Observations	926	420	3761	1760
Home-country fixed effects	yes	yes	yes	yes
Host-country fixed effects	yes	yes	yes	yes
Log pseudolikelihood	−630	−551	−1183	−975
AIC	1402	1199	2482	2168
LR test of overdispersion	42.8**	40.5**	103.1**	27.9**

**$p < 0.01$, *$p < 0.05$.
[a] All variables are in natural logs, except for dummy variables.

However, these findings do necessarily imply that corporate connections into poor countries are more efficiency seeking than are corporate connections into rich countries. Yet, when comparing the bilateral determinants for the subsets of corporate connections into rich countries and corporate connections into poor countries (models 12–15, table 5), we find that the effect of a regional trade agreement on the number of bilateral connections targeted at poor countries is significantly higher than the effect of a regional trade agreement on the number of bilateral connections targeted at rich countries ($\chi^2 = 8.58$, $p < 0.01$). This suggests that corporate connections into poor countries are more vertical, in that lower trade costs stimulate linkage formation. This observation is supported by the lower coefficients for physical and cultural distances for the subset of rich host countries. Moreover, whereas the difference in GDP has a negative and significant effect on the number of bilateral connections targeted at rich countries, it has no effect on the number of bilateral connections targeted at poor countries.

5 Conclusion

In contrast to the work of authors advocating the convergence of the world economy (Cairncross, 1997; Friedman, 2005; O'Brien, 1992), this study shows that the world economy, at the start of the 21st century, remains strongly disproportionate—forming a complex organization of activities at different geographic scales. However, not only are there vast differences in connectivity to the global corporate network between rich and poor countries, but also within the group of rich countries. This unevenness can be explained by various home-country, host-country, and bilateral determinants, analyzing the overall configuration of the MNC network and different cross-sections of country pairs within the network.

Using negative binomial estimations on the number of corporate connections between countries, we found that MNCs particularly prefer to locate their headquarters and subsidiaries close to production and consumer markets. In this, MNCs are more particular about the location of their headquarters than about the location of their subsidiaries. In addition, transactional distance between countries, in the form of physical and cultural distance, still keeps countries apart in the global playing field.

Our results are also in line with the empirical literature on FDI, in which it is shown that most FDI is horizontal, market seeking, and strategic asset seeking, rather than of vertical, natural resource seeking, and efficiency seeking (Barba Navaretti and Venables, 2004; Brakman and Van Marrewijk, 2008).

However, the determinants of connectivity to the global corporate network vary systematically across rich and poor countries, and the factors which distinguish the poor from the rich countries are different from those which distinguish the rich from the happy few countries. Analyzing the subset of corporate connections originating from rich countries, it was found in particular that the effect of the home country's stock market capitalization on connectivity is significantly larger within the subsample of corporate connections originating from rich countries compared with the total sample of corporate connections. Hence, the degree of financial development is an essential factor separating the rich from the happy few countries.

It was also shown that the number of connections targeted at poor countries, is driven by low wage costs in these countries, whereas those targeted at rich countries are driven by low corporate taxes. Also, a country's market size is more important for connections targeted at rich countries than those targeted at poor countries. These findings reveal differences in economic activities conducted between countries, where connections into poor countries are primarily related to labor-intensive activities, and FDI into rich countries is mainly targeted at services. In addition, FDI into poor countries is more natural resource seeking and efficiency seeking than is FDI into rich countries.

Our structural findings of the global corporate network indicate that the world has not changed much since Hymer postulated, in 1972, the corporate unevenness of nations—and in which today the same handful of persistent headquarters still tend to dominate the global arena—from which can be inferred that the structure of global corporate power reinforces core dominance. In this light, some developed nations still serve as the command and control centers of the global economic network, in which the majority of all corporate connections remain active between these fortunate countries. These happy few have everything, which makes them both an attractive home and host country for FDI: from a large consumer and producer market to a high degree of stock market capitalization and credit provision to finance activities overseas. It will be interesting to see, in the light of the current financial crisis, whether the happy few countries will retain their position in the global corporate network in the near future.

References
Alderson A, Beckfield J, 2004, "Power and position in the world city system" *American Journal of Sociology* **109** 811 – 851
Amin A, 2002, "Spatialities of globalization" *Environment and Planning A* **34** 385 – 399
Andersen J E, Van Wincoop E, 2003, "Gravity with gravitas: a solution to the border puzzle" *American Economic Review* **93** 170 – 192
Andersen J E, Van Wincoop E, 2004, "Trade costs" *Journal of Economic Literature* **17** 691 – 751
Baker M, Foley C F, Wurgler J, 2009, "Multinationals as arbitrageurs: the effects of stock market valuations on foreign direct investment" *Review of Financial Studies* **22** 337 – 369
Barba Navaretti G, Venables A J, 2004 *Multinational Firms in the World Economy* (Princeton University Press, Princeton, NJ)
Benassy-Quéré A, Coupet M, Mayer T, 2007, "Institutional determinants of foreign direct investment" *The World Economy* **30** 764 – 782
Bergstrand J H, Egger P, 2007, "A knowledge-and-physical capital model of international trade flows, foreign direct investment, and multinational enterprises" *Journal of International Economics* **73** 278 – 308
Bernard A B, Jensen J B, Redding S J, Schott P, 2007, "Firms in international trade" *Journal of Economic Perspectives* **21** 105 – 130
Blonigen B A, Wang M, 2004, "Inappropriate pooling of wealth and poor countries in empirical FDI studies", in *Does Foreign Direct Investment Promote Development?* Eds T Moran, E Graham, M Blomstrom (Institute for International Economics, Washington, DC) pp 221 – 243
Bond S R, Malik A, 2009, "Natural resources, export structure, and investment" *Oxford Economic Papers* **61** 675 – 702
Bordo M, Taylor M, Williamson J, 2005 *Globalization in Historical Perspective* (University of Chicago Press, Chicago, IL)
Brakman S, Garretsen H, 2008, "Foreign direct investment and the multinational enterprise: an introduction", in *Foreign Direct Investment and the Multinational Enterprise* Eds S Brakman, H Garretsen (MIT Press, Cambridge, MA) pp 1 – 10
Brakman S, Van Marrewijk C, 2008, "It's a big world after all: on the economic impact of location and distance" *Cambridge Journal of Regions, Economy and Society* **1** 411 – 437
Brakman S, Garretsen H, Van Marrewijk C, 2006, "Comparative advantage, cross-border mergers and merger waves: international economics meets industrial organization" *CESifo Forum* **1** 22 – 26
Bröcker J, 1989, "Partial equilibrium theory of interregional trade and the gravity model" *Papers in Regional Science* **66** 7 – 18
Buckley P J, Casson M C, 1976 *The Future of the Multinational Enterprise* (Holmes and Meier, London)
Burger M J, Van Oort F G, Linders G J M, 2009, "On the specification of the gravity model of trade: zeros, excess zeros and zero-inflated estimation" *Spatial Economic Analysis* **4** 167 – 190
Cairncross F, 1997 *The Death of Distance: How the Communications Revolution Will Change Our Lives* (Harvard Business School Publishing, Cambridge, MA)

Cameron A C, Trivedi P K, 1986, "Econometric models based on count data: comparisons and applications of some estimators and tests" *Journal of Applied Econometrics* **1** 29 – 53

Carroll W K, 2007, "Global cities in the global corporate network" *Environment and Planning A* **39** 2297 – 2323

Carroll W K, 2009, "Transnationalists and national networkers in the global corporate elite" *Global Networks* **9** 289 – 314

Collier P, 2006 *The Bottom Billion* (Oxford University Press, Oxford)

Daude C, Stein E, 2007, "The quality of institutions and foreign direct investment" *Economics and Politics* **19** 317 – 344

Defever F, 2005, "Functional fragmentation and the location of multinational firms in an enlarged Europe" *Regional Science and Urban Economics* **36** 658 – 677

Dicken P, 2003 *Global Shift: Reshaping the Global Economic Map in the Twenty-first Century* (Sage, London)

Dicken P, Thrift N, 1992, "The organization of production and the production of organization: why business enterprises matter in the study of geographical industrialization" *Transactions of the Institute of British Geographers, New Series* **17** 279 – 291

Di Giovanni J, 2005, "What drives capital flows? The case of cross-border M&A activity and financial deepening" *Journal of International Economics* **65** 127 – 149

Driffield N, Love J H, 2005, "Intra-industry foreign direct investment, uneven development and globalisation: the legacy of Stephen Hymer" *Contributions to Political Economy* **24** 55 – 78

Dunning J H, 1977, "Trade, location of economic activity and the MNE: a search from an eclectic approach", in *The International Allocation of Economic Activity* Eds B Ohlin, P O Hesselborn, P M Wijkman (Macmillan, London) pp 395 – 418

Dunning J H, 1993 *Multinational Enterprises in the Global Economy* (Addison-Wesley, Wokingham, Berks)

Dunning J H, 1998, "Location and the multinational enterprise: a neglected factor?" *Journal of International Business Studies* **29** 45 – 66

Dunning J H, 2003, "Determinants of foreign direct investment: globalisation-induced changes and the role of policies", in *Proceedings of Annual World Bank Conference on Development Economics* Ed. World Bank (World Bank, Washington, DC) pp 279 – 290

Dunning J H, Lundan S M, 2008 *Multinational Enterprises and the Global Economy* (Edward Elgar, Cheltenham, Glos)

Dunning J H, Kim C, Park D, 2008, "Old wine in new bottles: a comparison of emerging market TNCs today and developed country TNCs thirty years ago", WP II, SLPTMD, Department of International Development, University of Oxford

Faeth I, 2009, "Determinants of foreign direct investment—a tale of nine theoretical models" *Journal of Economic Surveys* **23** 165 – 196

Friedman T L, 2005 *The World is Flat: A Brief History of the Twenty-first Century* (Farrar, Straus and Giroux, New York)

Gabaix X, Ibragimov R, 2010, "Rank—1/2: a simple way to improve the OLS estimation of tail exponents" *Journal of Business Economics and Statistics* **29** 24 – 39

Gereffi G, 1994, "The organization of buyer-driven commodity chains: how the US retailers shape overseas production", in *Commodity Chains and Global Capitalism* Eds G Gereffi, M Korzeniewicz (Praeger, Westport, CT) pp 95 – 122

Ghoshal S, Bartlett C A, 1990, "The multinational corporation as an interorganizational network" *The Academy of Management Review* **15** 603 – 625

Globerman S, Shapiro D, 2003, "Governance infrastructure and US foreign direct investment" *Journal of International Business Studies* **34** 19 – 39

Godfrey B J, Zhou Y, 1999, "Ranking world cities: multinational corporations and the global urban hierarchy" *Urban Geography* **20** 268 – 281

Gourieroux C, Montfort A, Trognon A, 1984, "Pseudo maximum likelihood methods: applications to Poisson models" *Econometrica* **52** 701 – 720

Greene W H, 1994, "Accounting for excess zeros and sample selection in Poisson and negative binomial models", WP 94-10, Stern School of Business, New York University

Harvey D, 1982 *The Limits to Capital* (Blackwell, Oxford)

Head K, Ries J, 2008, "FDI as an outcome of the market for corporate control: theory and evidence" *Journal of International Economics* **74** 2 – 20

Henderson J, Dicken P, Hess M, Coe N, Yeung H W-C, 2002, "Global production networks and the analysis of economic development" *Review of International Political Economy* **9** 436 – 464

Hymer S H, 1972, "The multinational corporation and the law of uneven development", in *Economics and World Order from the 1970s to the 1990s* Ed. J N Bhagwati (Collier-Macmillan, London) pp 113 – 140

Hymer S H, 1976 *The International Operations of National Firms: A Study of Foreign Direct Investment* (MIT Press, Cambridge, MA)

Kaufmann D, Kraay A, Mastruzzi M, 2004, "Governance matters III: governance indicators for 1996, 1998, 2000, and 2002" *World Bank Economic Review* **18** 253 – 287

Kogut B, Singh H, 1988, "The effect of national culture on the choice of entry mode" *Journal of International Business Studies* **19** 411 – 432

Kyrkilis D, Pantelidis P, 2003, "Macroeconomic determinants of outward foreign direct investment" *International Journal of Social Economics* **30** 827 – 836

Linders G J M, Burger M J, Van Oort F G, 2008, "A rather empty world: the many faces of distance and the persistent resistance to international trade" *Cambridge Journal of Regions, Economy and Society* **1** 439 – 458

Long J S, 1997 *Regression Models for Categorical and Limited Dependent Variables* (Sage, Thousand Oaks, CA)

Loungani P, Mody A, Razin A, 2002, "The global disconnect: the role of transactional distance and scale economies in gravity equations" *Scottish Journal of Political Economy* **49** 526 – 543

McCann P, 2008, "Globalization and economic geography: the world is curved, not flat" *Cambridge Journal of Regions, Economy and Society* **1** 351 – 370

McCann P, Mudambi R, 2004, "The location behavior of the multinational enterprise: some analytical issues" *Growth and Change* **25** 491 – 524

McCann P, Mudambi R, 2005, "Analytical differences in the economics of geography: the case of the multinational firm" *Environment and Planning A* **37** 1857 – 1876

Markusen J R, 1995, "The boundaries of multinational enterprises and the theory of international trade" *Journal of Economic Perspectives* **9** 169 – 190

Markusen J R, Maskus K, 2001, "General-equilibrium approaches to the multinational firm: a review of theory and evidence", WP 8334, National Bureau of Economic Research, Cambridge, MA

Mayer T, Ottaviano G, 2007, "The happy few: new facts on the internationalisation of European firms", Bruegel – CEPR EFIM 2007 Report, Bruegel Blueprint Series, Bruegel, 1210 Brussels

Narula R, Dunning J H, 2000, "Industrial development, globalization and multinational enterprises: new realities for developing countries" *Oxford Development Studies* **28** 141 – 167

Narula R, Wakelin K, 1998, "Technological competitiveness, trade and foreign direct investment" *Structural Change and Economic Dynamics* **9** 373 – 387

Neary J P, 2002, "Foreign direct investment and the single market" *Manchester School* **70** 291 – 314

O'Brien R, 1992 *Global Financial Integration: The End of Geography* (Royal Institute of International Affairs, London)

Obstfeld V I, Rogoff K, 2000, "The six major puzzles in international macroeconomics: is there a common cause?" *NBER Macroeconomics Annual* **15** 339 – 390

Porter M E, 1990 *The Competitive Advantage of Nations* (Free Press, New York)

Rauch J E, 2001, "Business and social networks in international trade" *Journal of Economic Literature* **39** 1177 – 1203

Razin A, Rubinstein Y, Sadka E, 2004, "Which countries export FDI, and how much?", WP 15/2004, Hong Kong Institute for Monetary Research

Rugman A, 2005 *The Regional Multinationals* (Cambridge University Press, Cambridge)

Santos Silva J C M, Tenreyro S, 2006, "The log of gravity" *The Review of Economics and Statistics* **88** 641 – 658

Taylor P J, 2004 *World City Network: A Global Urban Analysis* (Routledge, London)

Yeaple S R, 2006, "Offshoring, foreign direct investment, and the structure of U.S. trade" *Journal of the European Economic Association* **4** 602 – 611

Wall R S, 2009 *Netscape: Cities and Global Corporate Networks* (Haveka, Rotterdam)

Wall R S, van der Knaap G A, 2010, "Centrality and structure within contemporary worldwide corporate networks" *Economic Geography*

Appendix

Table A1. Countries included in the analysis and their number of outgoing connections and incoming connections.

Country	Home and/or host country	Outgoing connections	Incoming connections
Albana	host	0	1
Algeria	host	0	4
Angola	host	0	3
Argentina	home and host	4	59
Australia	home and host	6	134
Austria	home and host	14	65
Azerbaijan	host	0	1
Bahrain	host	0	3
Bangladesh	host	0	3
Barbados	host	0	3
Belgium	home and host	83	132
Bolivia	host	0	3
Bosnia and Herzegovina	host	0	2
Brazil	home and host	7	93
Bulgaria	host	0	6
Burkina Faso	host	0	1
Burundi	host	0	2
Cameroon	host	0	7
Canada	home and host	11	245
Chad	host	0	2
Chile	host	0	20
China	home and host	12	167
Colombia	host	0	26
Costa Rica	host	0	4
Croatia	host	0	5
Cyprus	host	0	3
Czech Republic	home and host	4	40
Denmark	home and host	2	41
Dominican Republic	host	0	7
Ecuador	host	0	12
Egypt	host	0	21
El Salvador	host	0	5
Estonia	host	0	3
Ethiopia	host	0	2
Finland	host	0	30
France	home and host	457	206
Gambia	host	0	1
Germany	home and host	850	230
Greece	host	0	34
Guatamala	host	0	7
Honduras	host	0	3
Hungary	home and host	1	37
India	host	0	44
Indonesia	host	0	52
Ireland	home and host	12	70
Israel	home and host	1	8
Italy	home and host	78	132
Jamaica	host	0	3
Japan	home and host	365	99
Jordan	host	0	3
Kazakhstan	host	0	2
Kenya	host	0	10
Kuwait	host	0	1
Latvia	host	0	5

Table A1 (continued).

Lithuania	host	0	1
Libya	host	0	2
Madagascar	host	0	1
Malawi	host	0	1
Malaysia	host	0	61
Mali	host	0	2
Malta	host	0	2
Mauritania	host	0	1
Mauritius	host	0	3
Mexico	host	4	89
Moldova	host	0	1
Morocco	host	0	14
Mozambique	host	0	3
New Zealand	host	0	39
Nicaragua	host	0	2
Nigeria	host	0	15
Norway	home and host	21	44
Oman	host	0	4
Pakistan	host	0	15
Panama	host	0	15
Paraguay	host	0	4
Peru	host	0	19
Philippines	host	0	33
Poland	host	0	38
Portugal	home and host	2	51
Qatar	host	0	3
Romania	host	0	10
Russia	host	0	26
Saudi Arabia	host	0	16
Senegal	host	0	4
Singapore	home and host	16	100
Slovakia	host	0	17
Slovenia	host	0	4
South Africa	home and host	2	45
South Korea	home and host	18	40
Spain	home and host	27	146
Sri Lanka	host	0	7
Suriname	host	0	2
Sweden	home and host	8	61
Switzerland	home and host	448	119
Syria	host	0	2
Tanzania	host	0	2
Thailand	home and host	2	59
The Netherlands	home and host	330	153
Tunisia	home and host	13	10
Turkey	host	0	35
Uganda	host	0	2
Ukraine	host	0	3
United Arab Emirates	home and host	1	22
United Kingdom	home and host	351	311
United States	home and host	1172	499
Uruguay	host	0	10
Venezuela	host	0	31
Vietnam	host	0	13
Zambia	host	0	2
Zimbabwe	host	0	5