

# Acquired versus Non-Acquired Subsidiaries - Which Entry Mode do Parent Firms Prefer?

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## Abstract

Despite the economic importance of international foreign direct investment (FDI) flows, it seems that investment decisions of multinational firms are not well understood. A multinational firm can either establish a subsidiary in a foreign country through greenfield investment or through acquiring an existing firm in the target country. The subsidiary can either be wholly owned or jointly owned. How do those firms organize their international production? Which investment mode serves best domestic/foreign markets? The goal of this paper is to shed some light on the determinants of foreign market entry modes. In particular to analyze the systematic variation in the mode choice of FDI, namely acquisition versus non-acquisition (greenfield) investments. We propose a transparent and general applicable method of data base construction. This database includes information about parent firms and their subsidiaries (majority owned affiliates) in foreign countries. A particular feature is the construction of a variable which indicates how the subsidiaries were established, either by acquisition or not. This variable allows to differentiate the establishment mode of parent firms into foreign markets. For this purpose two databases from the Bureau van Dijk are interlinked: Osiris and Zephyr. We provide evidence that firm heterogeneity is important for U.S. multinational firms in determining their entry mode choice. However, this is not a distinguishing feature for European multinational firms. For both sets of parents the host country characteristics play an important role in deciding on the entry mode. Higher institutional quality increases the likelihood of acquisitions versus greenfield investments

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# 1 Introduction

Despite the economic importance of international foreign direct investment (FDI) flows, it seems that investment decisions of multinational firms are not well understood. A multinational firm can either establish a subsidiary in a foreign country through greenfield investment or through acquiring an existing firm in the target country. The subsidiary can either be wholly owned or jointly owned. How do those firms organize their international production? Which investment mode serves best domestic/foreign markets? What matters more the parent firm characteristics or the characteristics of the target country to be entered? The goal of this paper is to shed some light on the determinants of foreign market investment modes. In particular to analyze the systematic variation in the mode choice of FDI, namely acquisition versus non-acquisition (e.g. greenfield) investments. Such questions have been studied in the international business literature and more recently in the international trade literature. We seek to contribute to the literature in several ways.

First, we propose a transparent and general applicable method of data base construction. This method can overcome the lack of data regarding the entry mode decision of multinational corporations. We use existing empirical studies as a benchmark for the validity of our data base.

Second, using this method we analyze the determinants of the mode of foreign market entry for a sample of U.S. and Western European parent firms. We are the first to report results for so many countries of parent firms. Most studies in the international trade literature base their empirical results on one U.S. data set. We show that results obtained for U.S. parent firms do not necessarily carry over to European parent firms.

Summarizing the key results we find evidence, that profitable U.S. parents prefer greenfield investments as entry mode into foreign markets. We do not find significant variation in the mode choice of Western European parent firm characteristics. Our results imply that empirical evidence regarding the entry mode decision of U.S. parent firms do not necessarily answer questions about the behavior of Western European parent firms. Valid for both sets of parent firms is, that the higher the institutional quality of the subsidiary country, the more

likely will parent firms choose to acquire the subsidiary rather than to undertake a greenfield investment.

The paper is structured as follows. Section 2 gives an overview of the existing research and relevant literature. Section 3 describes the tested hypotheses regarding the determinants of entry mode. Section 4 and section 5 describe the data and estimation methodology. Section 6 shows the empirical results and section 7 concludes with a summary. In the appendix the reader will find a critical and detailed description of the data base construction.

## 2 Literature Review

The literature on the effects of foreign direct investment on acquiring firms is quite large. It comprises contributions from several fields of economic research such as i.e. the international business literature, the international trade literature, the institutional economics literature and the international organizations literature. We are most interested in the following questions: What explains best the behavior of multinational firms either setting up subsidiaries by greenfield investment and/or acquisition investments? Can we observe differences in parents choosing one alternative over the other? We would like to take a look at the literature from different angles and evaluate inspiring contributions from different lines of research.

Markusen (1995) provides an overview of the determinants for multinational economic activities. He describes six macro facts from the aggregate data and six micro facts from industry and firm-level data regarding the activities of multinational firms.<sup>1</sup> The underlying determinants for a firm to enter foreign markets seem to depend on the nature of FDI either being horizontal or vertical. Analysis of horizontal FDI roots its arguments mostly on the

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<sup>1</sup>Macro facts: 1. FDI is growing rapidly around the world. 2. Developed countries are the performers and recipients of FDI. 3. We observe large two-way FDI flows between developed countries. 4. Most FDI seems to be horizontal. 5. 30% of trade is intra-firm trade. 6. There is little evidence that FDI is correlated with differences in factor endowments across countries.

Micro facts: 1. FDI is hugely different across industries. 2. Multinational firms usually have a higher share of R&D/Sales. 3. Multinational firms are tentatively firms with a high ratio of book to market value. 4. There is little evidence that plant level scale economies are negatively correlated with multinationality. 5. There exists a threshold size for multinational firms. 6. Mixed evidence is found to whether FDI is related to trade barriers or transport costs.

proximity-concentration trade off, where transport costs are larger than costs of establishing of a foreign market presence. Arguments for vertical FDI usually compromise rent and market power appropriation as main driving forces. Next to the cost minimization and market failure arguments, the transfer of intangible firm-specific assets (e.g. corporate culture) and comparative advantages seem to be relevant for either type of FDI.<sup>2</sup> A complementary question to the determinants of multinational activity of firms needs to explain why multinationals choose FDI instead of arm's length licensing agreements with a foreign firm. Antras et al. (2009) propose that in the presence of monitoring problems and financial frictions, firms engage rather in FDI than in arm's length technology transfers. An other important line of discussion treats the question if the engagement of multinational firms in a foreign market is a complement or a substitute to domestic economic activities. Paffermayer (2004) analyzes the domestic growth performance of multinational firms with foreign affiliates in the Austrian manufacturing sector. According to the author, firms in the possession of intangible firm specific assets do not substitute their domestic economic activities with foreign economic activities (export/affiliates). Desai et al. (2009) show that expansion of US firms abroad results in higher domestic investment and strengthen the hypothesis that domestic and foreign economic activities are rather complements than substitutes. Only recently a small but constantly growing literature is investigating the impact of different strategies to enter a foreign market (FDI mode choices). The major drawback for empirical applications is the availability of data sources. Usually the entry mode is not registered systematically in most countries an exception is the mandatory survey of the Bureau of Economic Analysis in the USA.<sup>3</sup>

The international business literature provides many empirical applications with different methodologies e.g. focusing on individual industries, individual countries or on multi-country/multi-industry studies. The studies vary quite substantially in data bases, sample sizes and scope.<sup>4</sup> This literature can broadly be divided into two streams. One is the foreign establishment mode literature, distinguishing between foreign market entry types such as acquisition or greenfield investment. Second the management literature, which concentrates

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<sup>2</sup>For horizontal FDI see Helpman et al. (2004). For vertical FDI see Hortacsu and Syverson (2009).

<sup>3</sup>Other examples are survey data for Sweden and Japan.

<sup>4</sup>One needs to distinguish between country variation in one or both regarding host and target countries, correspondingly industry variation in one or both regarding host and target industries.

on the choice of ownership such as wholly owned and joint ownership. The first is called establishment mode and the second entry mode. In the context of the international business literature our contribution lies within establishment mode literature. Slangen and Hennart (2007) provide an overview over the most important studies in the establishment mode literature. Dikova and van Witteloostuijn (2007) are also studying the factors determining the choice between acquisition and greenfield, as well as the establishment of wholly owned or joint owned subsidiary.<sup>5</sup> Equivalent they use the worldwide governance index to evaluate the importance of a country's level of institutional factors and control for firm-specific variables such as experience and technology/advertising intensity. A distinguishing feature to our study is the scope of firm-specific variables, model specification and source of data. The authors use survey collected data of 160 Western European multinational firms investing in a pre-selected set of Central and Eastern European countries over the period 1992-2002. The number of observations is not given, industry specific variables are neglected and the timing of the investment decisions of the parent firms is not clear. Their results show that the institutional environment of the subsidiary country is an important factor for the type of entry and ownership choice. Larimo (2003) has a sample of 3,524 foreign entry mode decisions for parent firms from Denmark, Finland, Norway and Sweden. He controls for firm and target country related variables, though not for industry effects. His results show that the investment behavior regarding the entry type is not identical in all the Nordic countries. Swedish firms' behavior is more determined by target country variables, whereas Finnish and Norwegian firms are influenced by both firm and target country related variables.<sup>6</sup>

The international trade literature developed theoretical models to formalize the investment decisions of multinational firms across countries. Only recently those models incorporate differences in the modes of entry into foreign markets. Helpman et al. (2004) explains that firms within industries will engage differently in FDI according to their cost schedules. By

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<sup>5</sup>The authors present factors simultaneously determining both choices and estimate two different types of models separately for each decision. They essentially test for 2 main hypothesis: 1. Higher institutional development is positively correlated with the likelihood of acquisition and full ownership 2. Higher institutional development results in a more pronounced likelihood for greenfield subsidiaries and joint ownership within technology-intensive industries. Other studies in this field stress the importance of potential sequential decision design Chang and Rosenzweig (2001).

<sup>6</sup>The sample is based on manufacturing firms undertaking foreign acquisitions and greenfield investments during the period 1960-1999.

paying a fixed cost, a firm can move its production facility to where it wants to serve the foreign market and incurs for that reason no trade costs. The most productive firms will engage in FDI, the intermediate productive firms will export and the least productive firms will serve the domestic market. The authors do not yet distinguish the mode choice of FDI but distinguish more traditionally between exporting and FDI. But it seems that the FDI they have in mind is a greenfield investment. Yeaple (2009) suggests a “*pecking order*” of investing firms across countries according to their firm productivity and country specific characteristics. Nocke and Yeaple (2007) explore the nature of firm heterogeneity more closely. They distinguish between mobile and non-mobile capabilities and how those affect the choice of FDI mode. Nocke and Yeaple (2008) provide not only a theory for parent’s investment decision but also an empirical estimation of their model predictions. Their model compromises firm heterogeneity and countries differ by the cost of labor. Using U.S. data from the Bureau of Economic Analysis they confirm three of their model predictions.

First, U.S. multinational firms engaging in greenfield FDI are more efficient than those engaging in cross-border acquisitions. Second, U.S. multinational firms are more likely to choose cross-border acquisition over greenfield FDI the more developed the host country. Third, U.S. multinational firms are more likely to choose cross-border acquisition over greenfield FDI the closer is the geographical proximity of the host country to the U.S.<sup>7</sup>

In their model the two foreign market establishment modes have different set-up costs. The greenfield investment involves set-up costs as a function of the country specific wage rate and the labor productivity in that country. Whereas the acquisition investment is the market price of the target. Cross-border acquisitions allow a multinational firm to combine its asset in an optimal way, whereas greenfield set-ups allow the firm to transfer it’s own capabilities to the foreign market. This difference in motives across the establishment modes is the reason for the here presented empirical study.

Another aspect of this topic are the effects of entry mode on the subsidiary side. Not

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<sup>7</sup>See Nocke and Yeaple (2008).

exhaustively but rather by example we would like to mention studies in this area. One of the first to mention is the literature on firm entry and exit as determinants for market performance. The focus lies on post-entry performance of subsidiaries depending on the entry type. New plant (greenfield) versus acquisition entry are compared within the manufacturing sector in individual countries. For Canada see Baldwin (1995).<sup>8</sup> For USA see Dunne et al. (1988).<sup>9</sup> The key results from this line of research is that not only does entry matters (it does not happen only at the fringe), but the type of entry matters. Greenfield and acquisition entry are both significant and long-lasting, but the types of entry follow quite different post-entry growth patterns.<sup>10</sup> We use this literature as a building stone to hypothesize, that not only the established plants/subsidiaries are affected by the entry type, but most likely also the majority owning parent firms. Still looking at subsidiary performance, Bertrand et al. (2009) provide empirical results using Swedish firm survey data on how the entry mode affects subsidiaries R&D activities. Their findings show that acquired subsidiary have a higher propensity for R&D than greenfield subsidiaries. The authors conclude that ‘asset-seeking’ is the main motive behind the acquisition.<sup>11</sup>

We would like to explore a new path of using data regarding the type of multinational investment decision. The here presented method relies on ownership data and balance-sheet

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<sup>8</sup>The author uses plant-level data of the Canadian Census data for the time 1970-1982. Plants belonging to the same producers can be identified. Entry and exit are measured by examining changes in firm identifiers. Various forms of control changes e.g. purchase of a plant, subsuming of one company under another or integration of two corporate entities into a new one, can not be distinguished and all refer to merger activity. Further he differentiates between outsiders and continuing firms at the industry level. Outsiders classify as firms opening/closing a new plant across industries. Continuous firms are expanding/contracting within the same industry level. This means that new plants can be created by new firms (outsiders) or by existing firms (continuers); Existing plants can be acquired by new firms or by existing firms.

<sup>9</sup>The authors use U.S. data for the manufacturing industry for 5 census years (1963,1967,1972,1977,1982) Three categories of entrants are analyzed. Entry through the construction of a new plant, diversifying firms entering through the construction of a new plant and diversifying firms entering through change in their product mix. The authors do not distinguish entry by acquisition, but the first two categories can be interpreted as greenfield entry.

<sup>10</sup>Greenfield entering firms have a higher infant mortality rate and they tend to fail at higher rates than older firms, but also a significant percentage of them exhibit strong post-entry growth and are still active a decade after their entry. The two entry processes follow different paths in the post-entry growth phase. The average share in terms of value-added for each type (greenfield/acquisition) of entry cohort increases at first for both, the one for greenfield entrants continues to grow, whereas that of acquisition entrants begins to fall. For more information see Baldwin (1995).

<sup>11</sup>In their basic probit estimation they have 2,063 observations of greenfield/acquisition subsidiaries from 5 surveys: 1970,1978,1990,1994,1998. We don't observe enough Swedish firms in our data set to allow comparisons regarding our proposed data methodology.

Regarding entry mode and R&D activities on the parent firms see Stiebale (2010). He estimates the effects of foreign acquisitions on German parent firm R&D level.

data that are compared at different point in times. This method might allow a wider access to entry mode information for firms. The ultimate goal for this paper is to obtain results about the determinants of parents entry mode decision in a given year for a variety of countries.<sup>12</sup> The focus lies on a short-run analysis<sup>13</sup> and compares the establishment of new subsidiaries with acquired subsidiaries in several industries and countries. Comparing acquisition processes to other changes affecting a parent firm such as the establishment of new subsidiaries allows to get a better picture of determinants of investment decisions. Parent firms are continually active multinational firms. New non-acquired subsidiaries are defined as firms that did not previously exist in that industry/country and have not been acquired. New acquired subsidiaries are firms that did exist previously in that industry/country and a transfer of ownership on the parent level took place. One drawback of the here presented analysis is its short-run nature, as acquisition and merger activities come in waves. This implies that the pattern of mode choice through subsidiary creation and acquisition may well differ across time, because of variations in the timing and the intensity of merger and acquisition waves.<sup>14</sup>

### 3 Determinants of entry mode

Only recently the theoretical economic literature regarding trade and FDI is investigating differences in the entry decision of multinational firms. The focus lies on three major lines of arguments. The entry decision for a multinational firm depends on the firm characteristics, but also on the industry and host/target country to be entered. Several studies have discussed how a mix between firm ownership-industry-host country variables are decisive for the entry mode.<sup>15</sup>

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<sup>12</sup>The term entry of a new subsidiary is used here as the establishment of a subsidiary which is either newly build or newly acquired. Entry does not necessarily refer to the *first* establishment within an industry/country.

<sup>13</sup>Theoretically the method can be extended to include several points in time. Due to data limitations we focus on the decision within a one-year horizon.

<sup>14</sup>See Mueller (2003).

<sup>15</sup>See Larimo (2003), Slangen and Hennart (2007), Dikova and van Witteloostuijn (2007), the empirical part of Nocke and Yeaple (2008).



### 3.1 Firm characteristics

*Firm size:* The transaction cost theory argues that an acquisition is initially more capital intense and therefore larger firms, with better access to capital funds, will tend to acquire than to undertake greenfield investments. This leads to the following hypothesis.

*H1: Larger firm will more likely do an acquisition investment than a greenfield investment.*

*Firm R&D intensity:* Firm specific technological knowledge, e.g. marketing knowledge or R&D needs to be protected against unwilling dissemination. Greenfield investments are usually considered to be more appropriate than acquisitions if firm specific assets are sensible. The transaction costs of a greenfield might be lower, as the knowledge can be installed directly. Firms lacking firm specific technology knowledge have an incentive to internalize it through acquisition.<sup>16</sup> The threat of unprotected firm-specific know-how dissemination might be lower in countries with high institutional quality. This leads to the following hypothesis:

*H2: R&D intensive firms will more likely undertake a greenfield investments than acquisition investments.*

*Firm Efficiency:* Nocke and Yeaple (2008) present theoretical and empirical evidence suggesting that firms favoring greenfield investment over cross-border acquisition are systematically more efficient due to differences in their cost structures.<sup>17</sup>

*H3: Efficient firms will more likely undertake greenfield investment than acquisition investments.*

### 3.2 Host country characteristics

*Country institutional development:* Corporate governance theory suggests that more developed countries provide a less risky environment for multinational's investments. According to Caves (1982) less risk is involved in acquiring a firm than setting up a greenfield, because the latter requires more in depth market information, is more time consuming and involves

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<sup>16</sup>See Nocke and Yeaple (2007) and Slangen and Hennart (2007).

<sup>17</sup>The authors use sales and value added per employee to measure the efficiency of U.S. multinational firms.

higher management costs. On the other hand, the higher the institutional environment, the better are investors protected and the more able they are to enforce their rights. Even though Antras et al. (2009) do not distinguish the different types of FDI, they show that in the presence of monitoring problems between inventor and local entrepreneur, and due to financial frictions the necessity for an external investor, leads to more FDI activity the higher the institutional environment. Further strengthening this line of arguments, looking at the empirical evidence of acquisition streams around the world, we observe that the majority of foreign acquisitions are taking place between highly developed countries (e.g. U.S. and Europe). This leads us to the following hypothesis.

*H4: Firms tend to favor acquisition investments the higher developed the host country.*

*Country openness for trade:* The possibility to acquire firms depends on the *openness* of the trade policies and knowledge of the host country. The more open a host country, the more readily available is information about the value of potential target firms. Information asymmetries are more prevailing the less accessible a host country for international trade. A multinational firm may opt for a greenfield investment to internalize those information asymmetries. This strategy helps the multinational firm to avoid having to pay a higher premium on target firms, if the true value of the firm is difficult to assess. This leads to the following hypothesis.

*H5: Firms tend to favor greenfield investment in countries less exposed to international trade.*

*Geographical distance:* Many studies in the establishment mode literature argue that the cultural distance is an important factor for the establishment mode decision, but also regarding the ownership type.<sup>18</sup> Controlling for a distance measure allows to account for differences in

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<sup>18</sup>Kogut and Singh (1988) analyze the effects of firms steaming from a variety of industries and countries entering the USA. They distinguish in the choice of ownership type between joint venture and wholly owned and entry type between acquisition and greenfield establishments. Using an index for cultural distance (based on power distance, risk avoidance, importance of individualism) they conclude that cultural distance matters significantly for the entry mode. The more cultural distance the more likely a firm will choose a joint venture greenfield/acquisition over a wholly owned greenfield/acquisition. Cho and Padmanabhan (2005) analyze differences in the ownership mode between Japanese firms and other host countries. They do not find significant differences regarding cultural distance if one uses a single index for cultural distance. Instead if a measure for firm-specific experience interacted with cultural distance is used, it is positively correlated with full ownership of Japanese foreign manufacturing entities.

the relative costs of the acquisition/greenfield entry modes depending on the geographical proximity of the host country.<sup>19</sup>

*H6: Firms tend to favor acquisition investments the further away the target country.*

## 4 Data

Ideally we would like to use information about the incorporation (birth) of subsidiaries in different host countries for a stable set of parents, for which the mode of incorporation by parent firm can unambiguously be determined. Either the newly incorporated subsidiary has been acquired through an acquisition/merger or built as a greenfield investment by the parent firm. Annual reports do not clearly identify greenfield investments, unlike acquisition and merger activities. Sometimes new investment strategies are outlined, but in most annual reports the information about greenfield investments is held rather general. Merger and acquisition databases are commercially available, but firm-level greenfield databases are not widespread. The very few data sets that exist, which distinguish the incorporation mode between greenfield and acquired subsidiaries are based on firm surveys. The U.S. Bureau of Economic Analysis (BEA) conducts a mandatory survey each year and therefore collects firm-level data about U.S. parents' foreign affiliates and their incorporation mode.<sup>20</sup> The Swedish Research Institute of Industrial Economics sends out a firm-level survey every 4 years to Swedish multinationals to inquire about the incorporation mode of their foreign, majority-owned affiliates.<sup>21</sup> Several studies use a Japanese database, which provides a complete list of firms and countries for Japanese overseas investments.<sup>22</sup> Most empirical studies regarding FDI in the economics literature have used the data set of the BEA, which is not accessible for non-U.S. citizens. It is important to evaluate if results obtained from U.S. multinational firms can directly infer conclusions on the behavior of European multinational firms. European parent firms might

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<sup>19</sup>See Nocke and Yeaple (2008).

<sup>20</sup>See Nocke and Yeaple (2008) and Antras et al. (2009).

<sup>21</sup>The survey is not mandatory for firms to complete and covers all Swedish multinational firms in the manufacturing sector Bertrand et al. (2009).

<sup>22</sup>Cho and Padmanabhan (2005) describe that for the period 1969-1991 the database consists of 1,519 manufacturing FDI's by 402 manufacturing firms in 45 countries.

follow very different investment strategies due to the diversity of legal backgrounds, institutional environments, development of financial markets and corporate structure. We want to explore the applicability of U.S. obtained results for European multinationals.

Various databases provide detailed firm-level, financial and ownership information, which are quite accessible. The idea of this paper is to propose an alternative use of commonly accessible databases to construct a data sample, which allows to investigate determinants of incorporation mode choices for subsidiaries. We choose to concentrate on foreign subsidiaries in order to compare our results to existing research. In the future we plan on extending the analysis to domestic subsidiaries. In order to allow for a tight definition of acquisition and greenfield investment, several criteria have been placed on the parent and the subsidiaries to construct the sample. Implicit in the proposed data construction is the assumption, if the subsidiary is new and has not been acquired, then it is a greenfield subsidiary. We concentrate on listed parent firms and their decision to establish a new subsidiary in a foreign country in 2005.<sup>23</sup> Ownership structures and financial information of parent firms are taken from the Bureau van Dijk Osiris database. Information about merger and acquisition have been provided by Bureau van Dijk Zephyr database. Zephyr includes data on M&A, IPOs, Joint Ventures and private equity transactions. The advantage of Zephyr compared to other M&A databases such as Thompson Financial Securities is that in Zephyr all deals regardless of the deal value are included.<sup>24</sup>

The first step is to determine which subsidiaries are newly established. Incorporation dates for unlisted subsidiary firms are not available.<sup>25</sup> For this reason we are using the ownership structure provided by Osiris at two different points in time and observe subsidiaries entering as being newly established. A critical description of this step can be found in the appendix. We concentrate on listed parent firms in the year 2005 and their decision to establish

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<sup>23</sup>The methodology can potentially be extended to include several years of decision making by the parent firm; For a dynamic entry decision over time, the choice should allow for investment (by acquisition or greenfield) and no investment in a given time period.

<sup>24</sup>Thompson Financial Securities includes only deals above USD 10 million. Stiebale (2010) compares aggregate statistics for Zephyr and Thompson Financial Securities and reports that the coverage of transactions above USD 10 million is very similar.

<sup>25</sup>Amadeus by BvD is a data base of listed and unlisted European firms including incorporation year. We are interested in gathering the effects of multinational parent firms locating subsidiaries across the globe. We especially emphasize the country dimension of subsidiary location. One could concentrate on the European sub-sample of subsidiaries but the research question would be a different one.

a subsidiary in a foreign country. We focus on subsidiaries with a direct ownership percentage of at least 50 percent. To be a foreign subsidiary the subsidiary country needs to be different to the parents origin country. For all parent firms of newly established subsidiaries, which are majority owned, we find the corresponding acquisition activities for the whole time coverage in the Zephyr database.<sup>26</sup> Based on this information we determine which subsidiary has been acquired and which one has not been acquired for each parent-subsidiary pair. For more details on the sample construction see the appendix.

Using this method 1,470 listed parents from a variety of different origin countries have been identified with at least one new subsidiary. Those parent firms include many of the top 500 largest parent firms in the Osiris database in 2006.<sup>27</sup> 1,271 of those parent firms are included in the M&A database and have made an acquiring investment at least once since 1998. A total of 6,631 subsidiaries have been identified as being newly established between 2005 and 2006. For the analysis of determinants of entry mode we will concentrate on U.S. parent firms and European parent firms.

## 5 Estimation Methodology

In general the probability that a firm  $n$  chooses alternative  $i$  over  $j$  depends on the known utility value  $V_{ni}$  and the unknown part  $\epsilon_{ni}$ .

$$P_{ni} = Prob(V_{ni} + \epsilon_{ni} > V_{nj} + \epsilon_{nj}) \quad \forall j \neq i \quad (1)$$

The estimation technique here is a binary logit model of the likelihood of parents to acquire a subsidiary or not, whereby  $V_n$  is linear in parameters with coefficient  $\beta$ , such that the choice

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<sup>26</sup>This step assures that all acquisition activities of a parent firm are accounted for. For example the parent firm acquires 10% of a subsidiary in 2000 and holds 50% of the same subsidiary in 2005, whereby the last acquisition is missing in the data, then the subsidiary is still considered to be acquired.

<sup>27</sup>Not all top 500 largest firms are manufacturing firms.

probability is given as

$$P = G(X\beta) = \frac{1}{1 + e^{-X\beta}} \quad (2)$$

$X$  is a linear combination of variables such as a set of parent characteristics, industry characteristics and host country characteristics and  $G$  is the logistic function.<sup>28</sup> The dependent variable is a binary variable for every subsidiary-parent-industry-country pair being 1 if the subsidiary has been acquired, and 0 otherwise.<sup>29</sup> The parent characteristics include a performance measure such as Tobin's  $Q$  averaged over the years 2003/2004, a firm size determinant such as log of sales averaged over the years 2003/2004 and parent's research and development expenses averaged over the years 2003/2004. Tobin's  $Q$  is defined as market capitalization plus long term debt over total assets.<sup>30</sup> The FDI literature measures the multinational activity by counting the number of foreign subsidiaries or the number of countries with foreign subsidiaries. Regarding the count of subsidiaries we use the status at the beginning of 2004. For the other time varying we are using averages over the years 2003/2004 in order to reflect parent's status prior to the investment decision.<sup>31</sup> The host country characteristics include relevant variables for the location decision of the parent. We evaluate the quality of a subsidiary country's institutions using the worldwide governance index provided by the World Bank. We average the six indicators over the years 2003/2004: (1) voice and accountability (2) political stability (3) government effectiveness (4) regulatory quality (5) rule of law, and (6) control of corruption. The indicators are constructed using the unobserved components methodology described in Kaufmann et al. (2007). The indicators are measured in units ranging from -2.5 to +2.5, with higher values corresponding to better governance. Further we use other country development variables such as the log of GDP, population, import plus export

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<sup>28</sup>See Train (2009).

<sup>29</sup>Note that Dikova and van Witteloostuijn (2007) define the dependent variable as being 1 if greenfield and 0 otherwise. We use the term establishment/entry mode interchangeably, which implies that the decision of ownership is independent to the decision about the entry type. In our setting subsidiaries can either be wholly owned greenfield (100%), majority owned greenfield (> 50% and < 100%), wholly owned acquisitions (100%) or partially owned acquisitions (> 50% and < 100%).

<sup>30</sup>For a discussion on marginal versus average Tobin's  $Q$  see Gugler et al. (2007).

<sup>31</sup>We have experimented with averages over the years 2004/2005 also 2003/2005 and the results are quantitatively the same.

over GDP and distance between parent and host country. Further we are adding colonial past and common language in a later specification. All specifications include parent industry and parent country of origin fixed effects. Our approach follows closely the estimation technique of Nocke and Yeaple (2008) in order to assess if the methodology applied yields similar results for a U.S. sample.

## 6 Results

Unlike any other empirical analysis previously, we use Tobin's Q as a measure for firm efficiency. Nocke and Yeaple (2008) use parent firm sales and value-added per employee as a measure of firm efficiency. Believing that sales is highly correlated with firm's size, we opted for Tobin's Q as an alternative efficiency measure combined with firm's sales. In a second specification we include R&D expenses as a determinant for the entry mode decision. The availability of R&D expenses cuts the sample size roughly in half. Regarding the host country characteristics, geographical distance between home and host country is included to account for entry mode preferences based on proximity. FDI might depend on the ease of access to international trade, therefore a measure for a host country's openness to international trade is included. This is our basic specification, where we control for parent industry and country fixed effects. We try to mirror the model specification used in Nocke and Yeaple (2008) to evaluate the fit of our data base. They relate a parent's mode choice to parent's efficiency and host country characteristics. Beside the difference in the firm efficiency measure, the authors provide additional specifications including more firm characteristics such as a measure for firm's diversification across industries, a measure for vertical integration (the parent's ratio of intra firm imports to total imports) and an experience dummy variable for whether the parent owned a subsidiary prior to the sample period in that country.<sup>32</sup>

Starting with the sample for U.S. parent firms, we are able to reproduce the key results by

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<sup>32</sup>With our data set we can not compute the first two additionally employed variables as we don't have industry information of the subsidiary. We measure multinational experience as the number of majority owned, foreign subsidiaries of a parent at the beginning of the sample period.

Nocke and Yeaple (2008).<sup>33</sup> Comparing the results for the first specification in table 3 to the results of Nocke and Yeaple (2008), where they use sales as a firm efficiency measure and we complement Tobin's Q to it, we find a quantitatively similar effect. With respect to the other coefficients, three out of four have the same sign. The country variables GDP, population and distance are all increasing the likelihood of an acquisition. All of them are significant in our data set. GDP and distance are significant in most specifications of Nocke and Yeaple (2008). The measure for a country's openness to trade is significantly negative in Nocke and Yeaple (2008) but insignificantly positive in our specifications.<sup>34</sup> In short, U.S. efficient parent firms will more likely undertake greenfield investments than acquisition investments (H3). U.S. parent firms tend to favor acquisition investments the higher the development status of the host country (H4). U.S. parent firms are more likely to undertake an acquisition the farther away the host country (H6). It seems that U.S. firms will favor greenfield investments in countries which are less exposed to trade (H5), but this result is not statistically significant. Like in Nocke and Yeaple (2008) the result about the efficiency of firms is robust, when we introduce host country fixed effects (specification (3) of table 3). This is an important result as it provides validity to the constructed database.

We therefore proceed to first narrow down the factors of host country development influencing the entry mode choice, secondly to extend the analysis to European parent firms. In specification (2) we introduce a measure for institutional quality of the host country ranging from -2.5 to +2.5 according to 6 dimensions of institutional governance. We expect that including such a measure will clarify through which channel the development of the host country is influencing the entry mode of the parent. Indeed the institutional quality is an important and significant determinant for the parent's choice. The higher the institutional quality of the host country, the more likely favor U.S. parent firms an acquisition over greenfield investment.

<sup>33</sup>The Bureau of Economic Analysis only includes U.S. firms with foreign subsidiaries above a certain size threshold. Nocke and Yeaple (2008) pool over 5 years of firms together but they aggregate the data such that 'for each firm, a country-industry pair appears at most once', but the number of parent/subsidiary firms is not given for their sample.

<sup>34</sup>Likelihood of acquisition results showing logit coefficients and (se) using U.S. data:

		Sales	GDP	Population	Open	Distance	Obs.	LL
Nocke and Yeaple (2008)		-0.217** (0.076)	0.768** (0.172)	0.049 (0.092)	-0.656** (-0.187)	0.199 (0.130)	856	-487.5
Table 3	Tobin's Q	-0.275* (0.13)	0.083 (0.06)	0.821*** (0.18)	0.543** (0.12)	0.302 (0.22)	1,342	-627.32



The coefficient on GDP becomes surprisingly negative but remains insignificant.<sup>35</sup> All other coefficients remain quantitatively the same. In specification (4) of the same table, we include R&D/sales as a measure for the parent firm research intensity. The sample size becomes much smaller. The country relevant variables do not change much, but the coefficient on firm's efficiency loses its significance. At a later stage we no longer include R&D expenses as a variable due to the small sample size. We could produce a measure for industry level R&D expenses, but we control at the 3-digit level for all industry effects, such that the R&D channel is compromised within those industry effects.

Turning now to the sample of European firms<sup>36</sup> in table 4 we observe a different pattern for the entry mode choice. First the firm efficiency measure remains insignificant varying positively/negatively around zero in the different specifications. GDP, population and openness for trade are still positive and therefore increase the likelihood of acquisition. The distance measure becomes significantly negative, indicating that European parent firms tend to favor greenfield acquisitions the farther away the host country (this result is contradicting H6). Acquisition activities are certainly in a closer range of geographical proximity and many European parent firms have acquired strongly in neighboring Eastern European countries. This can also be seen in the appendix figure 6. Introducing the measure for institutional quality increases the likelihood of acquisition by a European parent firm. Those results imply that results obtained for U.S. multinational firms can not straight forwardly be applied to explain the behavior of European multinational firms.

In our last step we want to concentrate even more on country relevant variables. We introduce a measure for the parent firm multinationality, one for corporate control and an alternative distance measure. An ideal measure regarding the impact of transportation cost differences on the entry mode would be the exact geographical distance between the home and foreign location. In the absence of such a distance measure<sup>37</sup> we experiment using land border dummy instead of geographical country distance from capital to capital. In a large

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<sup>35</sup>The governance index is highly correlated with GDP ( $\rho = 0.88$ ).

<sup>36</sup>The estimation sample includes parents from Belgium (7.62%), Switzerland (5.34%), Germany (12.48%), Spain (2.65%), France (22.67%), UK (11.92%), Italy (22.90%), Netherlands (11.73%), Portugal (0.15%) and Sweden (2.54%).

<sup>37</sup>The main address of parent firm is available but the exact subsidiary location within the host country is not.

country such as the U.S. most industrial firms will not be located close to the capital e.g. Silicon Valley firms will have a greater proximity to Canada or Mexico than to their own capital. The distance measure might in such cases be misleading. To proxy the degree of multinationality of the parent firm we count the majority owned, foreign subsidiaries prior to acquisition/greenfield investment. Corporate control is the degree of ownership a parent has in the subsidiary. Based on the data base construction we allow subsidiaries in either entry mode to have an ownership percentage between 50% and 100%. In table 5 provides results for U.S. parent firms and table 6 for Western European parent firms. For comparison purposes, the first column of the tables is identical to specification (2) of table 3 and respectively table 4.

With respect to characteristics of U.S. parent firms, including the additional variables absorbs the effect of parent firms productivity.<sup>38</sup> The higher the number of foreign subsidiary, the higher the likelihood of acquisition compared to greenfield investment. Both variables are highly significant for U.S. parent firms, which can not be shown for European parent firms. It seems that firm characteristics do not have a distinguishing effect on the mode of entry for European parent firms. Regarding the host country characteristics, not surprisingly the land border dummy is negative and significant for U.S. parent firms. But for European parent firms this variable does not seem to pick up the effect that the distance measure had before. Including common colonial history or language is not a distinguishing feature regarding the entry mode decision neither for U.S. nor Western European parent firms. The worldwide governance index remains significant for both sets of parent firms in all specifications.

In summary, the evidence shows that firm heterogeneity is important for U.S. multinational firms in determining their entry mode choice. This is not a distinguishing feature for European multinational firms. For both sets of parents the host country characteristics play an important role in deciding on the entry mode. Higher institutional quality increases the likelihood of acquisitions versus greenfield investments.

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<sup>38</sup>This result is mainly driven by the ownership percentage of the parent firm in the subsidiary. The tighter the ownership, the higher the probability of an acquisition. This could be explained because the tighter the ownership the less different are the two entry modes as asymmetric information is reduced in both entry modes.

Table 1: Number of firms and regional distribution

<u>Parent home country</u>	USA	Europe
Parents	302	591
Subsidiaries	1,465	3,346
<u>Percentage of Subsidiaries</u>		
Western Europe	33.29	41.64
Eastern Europe	5.74	12.27
North America	10.02	23.63
Middle/South America	19.58	10.77
Asia	20.50	13.49
Africa	2.11	3.12
Arab	2.57	2.45
South Pacific	6.20	2.63

Table 2: Descriptive statistics parent firm and subsidiary country by parent origin

<u>Parent home country</u>	USA		Europe	
	Mean	Std	Mean	Std
<u>Parent firm</u>				
Acquisition	0.26	0.44	0.32	0.46
Sales (1000 mil USD)	9.9	2.4	11.1	1.98
(Profit-loss)/total assets (th USD)	0.044	0.096	0.032	0.067
Market capitalization (mil USD)	22.6	52.7	9.7	21.5
Tobin's Q	2.19	1.45	1.43	0.89
R&D/sales (th USD)	0.125	0.78	0.06	0.35
Ownership percentage	72.6	24.01	87.9	19.99
Number of subsidiaries	79.7	125.4	142.4	192.1
Number of foreign subsidiaries ownership > 45%	44.6	91.5	71.8	106.3
Number of shareholders	16.9	6.4	9.9	13.1
Percentage largest shareholders: Bank	0.29	0.46	0.23	0.42
Percentage largest shareholders: Family	0.13	0.39	0.14	0.35
Percentage largest shareholders: State	0	0	0.04	0.18
Percentage largest shareholders: Industrial Firm	0.05	0.23	0.38	0.48
Percentage largest shareholders: Dispersed	0.52	0.49	0.22	0.41
<u>Host country</u>				
Governance index (GI)	0.78	0.84	0.79	0.84
Distance (th miles) btw. home/host countries	2,729	1,332	2,633	2090
(Import+export)/GDP	93.5	90.1	77.1	66.7
GDP	21,847	12,584	23,173	13,472
Population	1.40e <sup>8</sup>	3.14e <sup>8</sup>	1.77e <sup>8</sup>	3.25e <sup>8</sup>
Land border btw. home/host countries	0.18	0.38	0.14	0.35
Stock market capitalization/GDP	0.78	0.79	0.73	0.59
Private credit/GDP	0.83	0.47	0.97	0.62

## Notes:

All variables represent mean values per firm/country over years 2003/2004. Acquisition is a dummy variable 1 if subsidiary was acquired.

To reflect the status influencing the actual choice of the parent firm. Tobin's Q is market capitalization + depreciation over total assets.

Ownership is the percentage the parent owns of the subsidiary. Number of subsidiaries a parent firm holds regardless of ownership percentage.

Number of foreign subsidiaries a parent firm holds with ownership of at least 45%. Number of shareholders that hold stakes in parent firm.

Percentage of largest shareholder refers to the stake being held in the parent firm. GI is an indicator for institutional quality of country.

Distance is the geographical distance between home/host country. Land border is a dummy variable 1 if common border, 0 otherwise.

Table 3: Likelihood of acquisition of subsidiaries depending on parent firm and host country

	U.S. parent firms			
	(1)	(2)	(3)	(4)
<u>Parent firm characteristics</u>				
Log Sales	0.083 (0.06)	0.087 (0.06)	0.096 (0.06)	-0.081 (0.08)
Tobin's Q	-0.275* (0.13)	-0.278* (0.13)	-0.236* (0.12)	-0.226 (0.12)
Log R&D/Sales				-0.153 (0.15)
<u>Host country characteristics</u>				
Log (Import+Export)/GDP	0.302 (0.22)	0.301 (0.21)		0.255 (0.29)
Log Distance	1.084*** (0.17)	0.970*** (0.17)		1.084*** (0.24)
Log GDP	0.821*** (0.18)	-0.149 (0.28)		-0.709* (0.32)
Log Population	0.543*** (0.12)	0.547*** (0.11)		0.483** (0.16)
GI		0.998*** (0.27)		1.455*** (0.39)
FE: Parent Industry	Yes	Yes	Yes	Yes
FE: Parent Country	Yes	Yes	Yes	Yes
FE: Subsidiary Country	No	No	Yes	No
Nb of Subsidiaries	1,342	1,342	1,252	715
Nb of Parents	271	271	265	156
Log-Likelihood	-627.32	-618.37	-555.29	-332.42
Pseudo- $R^2$	0.21	0.22	0.27	0.23

Notes:

The standard errors are in parentheses, robust to heteroscedasticity, allow for clustering by parent firm.

\* Significance level at 10%, \*\* Significance level at 5%, \*\*\* Significance level at 1%.

*Log Sales* is log sales of parent firm averaged over the years 2003/2004.

*Tobin's Q* is parent's market capitalization plus depreciation over total assets averaged over the years 2003/2004.

*Log R&D/Sales* is the log of parent's R&D expenses over total sales averaged over the years 2003/2004.

*Log (Import+Export)/GDP* is the trade ratio to GDP btw. parent and host country averaged over the years 2003/2004.

*Log Distance* is the geographical distance in miles between parent and host country.

*Log GDP* is the log of real GDP of the host country averaged over the years 2003/2004.

*Log Population* is the log of population of the host country for year 2003/2004.

*GI* is the worldwide governance index averaged per host country over the years 2003/2004.

Table 4: Likelihood of acquisition of subsidiaries depending on parent firm and host country

	European parent firms			
	(1)	(2)	(3)	(4)
<u>Parent firm characteristics</u>				
Log Sales	0.033 (0.05)	0.037 (0.05)	-0.004 (0.05)	0.077 (0.08)
Tobin'S Q	0.047 (0.08)	0.055 (0.08)	-0.011 (0.08)	-0.022 (0.10)
Log R&D/Sales				0.126 (0.17)
<u>Host country characteristics</u>				
Log (Import+Export)/GDP	0.348* (0.16)	0.372* (0.16)		0.245 (0.17)
Log Distance	-0.260*** (0.08)	-0.208** (0.07)		-0.148 (0.10)
Log GDP	0.683*** (0.12)	0.199 (0.21)		0.181 (0.27)
Log Population	0.442*** (0.07)	0.472*** (0.08)		0.454*** (0.08)
GI		0.550* (0.24)		0.583* (0.28)
FE: Parent Industry	Yes	Yes	Yes	Yes
FE: Parent Country	Yes	Yes	Yes	Yes
FE: Subsidiary Country	No	No	Yes	No
Nb of Subsidiaries	2,677	2,677	3,109	1,337
Nb of Parents	433	433	533	198
Log-Likelihood	-1304.94	-1299.69	-1514.10	-726.81
Pseudo- $R^2$	0.21	0.21	0.24	0.17

## Notes:

The standard errors are in parentheses, robust to heteroscedasticity, allow for clustering by parent firm.

\* Significance level at 10%, \*\* Significance level at 5%, \*\*\* Significance level at 1%.

*Log Sales* is log sales of parent firm averaged over the years 2003/2004.

*Tobin's Q* is parent's market capitalization plus depreciation over total assets averaged over the years 2003/2004.

*Log R&D/Sales* is the log of parent's R&D expenses over total sales averaged over the years 2003/2004.

*Log (Import+Export)/GDP* is the trade ratio to GDP btw. parent and host country averaged over the years 2003/2004.

*Log Distance* is the geographical distance in miles between parent and host country.

*Log GDP* is the log of real GDP of the host country averaged over the years 2003/2004.

*Log Population* is the log of population of the host country for year 2003/2004.

*GI* is the worldwide governance index averaged per host country over the years 2003/2004.

Table 5: Likelihood of acquisition of subsidiaries additional ownership and country variables

	U.S. parent firms		
	(1)	(2)	(3)
<u>Parent firm characteristics</u>			
Log Sales	0.087 (0.06)	-0.087 (0.10)	-0.089 (0.10)
Tobin's Q	-0.278* (0.13)	-0.146 (0.12)	-0.133 (0.12)
Foreign Subsidiaries		0.007*** (0.00)	0.007*** (0.00)
Ownership		0.050*** (0.01)	0.049*** (0.01)
<u>Host country characteristics</u>			
Log (Import+Export)/GDP	0.301 (0.21)	-0.204 (0.23)	-0.098 (0.27)
Log Distance	0.970*** (0.17)		0.502** (0.21)
Land Border		-0.589* (0.28)	
Log GDP	-0.149 (0.28)	-0.199 (0.32)	-0.109 (0.36)
Log Population	0.547*** (0.11)	0.232* (0.10)	0.292** (0.12)
GI	0.998*** (0.27)	0.895** (0.29)	0.660* (0.32)
Colony			0.213 (0.33)
Language			0.048 (0.23)
FE: Parent Industry	Yes	Yes	Yes
FE: Parent Country	Yes	Yes	Yes
FE: Subsidiary Country	No	No	No
Nb of Subsidiaries	1,342	1,165	1,165
Nb of Parents	271	219	219
Log-Likelihood	-627.32	-469.52	-467.92
Pseudo- $R^2$	0.21	0.31	0.31

The standard errors are in parentheses, robust to heteroscedasticity, allow for clustering by parent firm.

*Foreign Subsidiaries* is the number of foreign subsidiaries of parent firm with ownership > 49% in 2004.

*Ownership* is ownership percentage of parent firm in the subsidiary.

*Land Border* is a dummy variable indicating 1 for a common land border btw. parent/subsidiary countries.

*Colony* is a dummy variable indicating 1 if parent and subsidiary have a common colonial past.

*Language* is a dummy variable indicating 1 if parent and subsidiary share a common language.

Table 6: Likelihood of acquisition of subsidiaries additional ownership and country variables

	European parent firms		
	(1)	(2)	(3)
<u>Parent firm characteristics</u>			
Log Sales	0.037 (0.05)	0.026 (0.06)	0.035 (0.06)
Tobin's Q	0.055 (0.08)	0.051 (0.08)	0.042 (0.08)
Foreign Subsidiaries		-0.001 (0.00)	-0.001 (0.00)
Ownership		0.003 (0.00)	0.002 (0.00)
<u>Host country characteristics</u>			
Log (Import+Export)/GDP	0.372* (0.16)	0.484** (0.18)	0.410** (0.18)
Log Distance	-0.208** (0.07)		-0.213** (0.08)
Land Border		-0.098 (0.24)	
Log GDP	0.199 (0.21)	0.051 (0.23)	0.211 (0.23)
Log Population	0.472*** (0.08)	0.475*** (0.08)	0.501*** (0.09)
GI	0.550* (0.24)	0.860** (0.29)	0.605** (0.27)
Colony			-0.0003 (0.32)
Language			0.283 (0.25)
<hr/>			
FE: Parent Industry	Yes	Yes	Yes
FE: Parent Country	Yes	Yes	Yes
FE: Subsidiary Country	No	No	No
<hr/>			
Nb of Subsidiaries	2,677	2,590	2,587
Nb of Parents	422	429	429
Log-Likelihood	-1304.94	1224.76	1218.63
Pseudo- $R^2$	0.21	0.21	0.21

The standard errors are in parentheses, robust to heteroscedasticity, allow for clustering by parent firm.

*Foreign Subsidiaries* is the number of foreign subsidiaries of parent firm with ownership > 49% in 2004.

*Ownership* is ownership percentage of parent firm in the subsidiary.

*Land Border* is a dummy variable indicating 1 for a common land border btw. parent/subsidiary countries.

*Colony* is a dummy variable indicating 1 if parent and subsidiary have a common colonial past.

*Language* is a dummy variable indicating 1 if parent and subsidiary share a common language.



## 7 Conclusion

The decision on how to enter a foreign market - by acquiring an existing subsidiary or by establishing a new subsidiary - gives important insights about the workings of multinational firms. This area of research still offers an amplitude of possibilities for theoretical and empirical studies. The empirical evidence is quite heterogenous and replicability of estimates is difficult due to data limitations. We propose a transparent and replicable method to construct a data base. This method allows to compare the investment behavior of U.S. based multinationals to the one of Western European based multinationals. Our key results show, that profitable U.S. parents prefer greenfield investments as entry mode into foreign markets. Firm specific characteristics of Western European parent firms do not have a significant effect with respect to variation in the mode choice. Our results imply that empirical evidence regarding the entry mode decision of U.S. parent firms do not necessarily answer questions about the behavior of Western European parent firms. But for both sets of parent firms it shows, that the higher the institutional quality of the subsidiary country to be entered, the more likely will parent firms choose to acquire the subsidiary rather than to do a greenfield investment.

# Appendices

This section provides detailed information regarding the sample construction and underlying assumptions. We present a unique approach to construct a database to differentiate the establishment mode of parents entering a foreign market. We combine several different databases to obtain such database. First, we present an overview of the different data sources, see table 7. The main data sources are an ownership (Osiris) and an acquisition (Zephyr) data base from the Bureau van Dijk (BvD). We complement those with information for country related variables. We use a three step procedure to combine the data bases and present empirical evidence on each of the three steps.

Step one is to select a sample of parents, which have established new subsidiaries domestically and/or abroad. We define a parent-subsiidiary pair as being new if the subsidiary was not observed in  $t$  but is observed in  $t+1$ . Parent-subsiidiary pairs being observed at both points in time,  $t$  and  $t+1$ , are called matched subsidiaries. Parent-subsiidiary pairs that are observed in  $t$  and no longer in  $t+1$  are called divested subsidiaries. The term divestiture usually means the disposal of an asset through sale or closure. Another reason here could be that a parent firm changes the direct ownership structure within its business conglomerate. E.g. parent firm holds 100% of both subsidiaries B and C in  $t$ . The parent firm changes the corporate control structure such that in  $t+1$  B owns C with 100% and the parent holds only an ultimate 100% ownership in C. In this sense divested subsidiaries are the result of either a sale, closure or change of corporate control structure.<sup>39</sup>

Step two involves the merger and acquisition data base. We use the same parents identified in the first step and find all acquisition activities corresponding to that parent. A dummy variable indicates, if the new and foreign subsidiaries can be matched to an acquisition activity. This results in the final sample (the third step).

In the next section, we present the criteria that we applied to the data to select the firms at each step. In figure 1 we show how the different data sources, together with the selection criteria that have been applied to obtain the final data sample. Table 8 presents the number

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<sup>39</sup>Throughout the text we do not refer to the classical term of 'divestiture', but rather to the one described above.

of observations corresponding to each of the selection criteria. In the last two sections, we present descriptive statistics regarding the first and second step of the data base construction. Our goal is to provide a transparent and replicable guide for this database. The summary statistics presented in the main part of the paper refer to the final sample.

## A Data sources

Table 7 provides an overview of the data sources used to create the data sample.

Table 7: Data Sources

Variables	Source	Provider
Ownership	Osiris disc 45, 53, 62	BvD
Financial variables listed firms	Osiris disc 45, 53, 62	BvD
Financial variables unlisted firms	Amadeus disc 128	BvD
Governance indicators (GI)	Kaufmann et al. (2007)	Worldbank
GDP, Population	Penn World Tables 6.3	webpage (2010a)
Country distance, colony and Country language, border	Rose (2005)	webpage (2010b)
Country (import+export)/GDP	Rose (2007) Rose and Spiegel (2010)	webpage (2010b) webpage (2010b)

## B Criteria for samples selection

Selection criteria for firms in the ownership data base.

- Parent firms need to be observable for at least 2 consecutive years (that means to be included in three consecutive Osiris data disks, namely 45, 53, 62;)
- Parent firms main industry is in the tradable good sector. This implies all industries within SIC 100 to 399.
- Parent firms have a direct ownership stake in the subsidiary of at least 50%.

- Subsidiary firms must be classified as industrial companies (in order to exclude pure financial investment e.g. fund participation).

For this selection, we determine all subsidiaries that can be matched based on the same firm identifier or by the same name. The subsidiary name match requires that the subsidiary with an identical name needs to be located in the same country. In a second step we determine the subsidiaries disappearing and newly appearing by comparing the ownership structure in 2005 (Osiris BvD disk 53) to the one in 2006 (Osiris BvD disk 62). In a third step we want to ensure that we correctly identify the newly appearing subsidiaries. If a subsidiary newly appears and one with an almost identical name in the same country disappears, we do not consider this subsidiary as being new (but rather mismatched). This is a precautionary step in order to avoid miss-categorization due to spelling mistakes.

Selection criteria for firms in the acquisition data base.

- Acquiring firms must have at least one M&A activity since 1995 to be included in the Zephyr data base.
- Acquiring firm main industry activity lies within SIC 100 to 399.
- First we match the deals to new subsidiaries using all completed deal types.
- Second we augment the database with deals, where we don't find a matching new subsidiary, if the deal type has a final stake of more than 50% and the acquiring country is not equal to the target country.<sup>40</sup>

Osiris and Zephyr are offered by the same database provider Bureau van Dijk (BvD). Each firm is assigned a unique firm identifier, which is then used for both databases. Unfortunately firm identifiers for identical firms do not seem to match in all cases. We relied not only on matching firm identifiers but also resorted to name matching. From all the parent firms

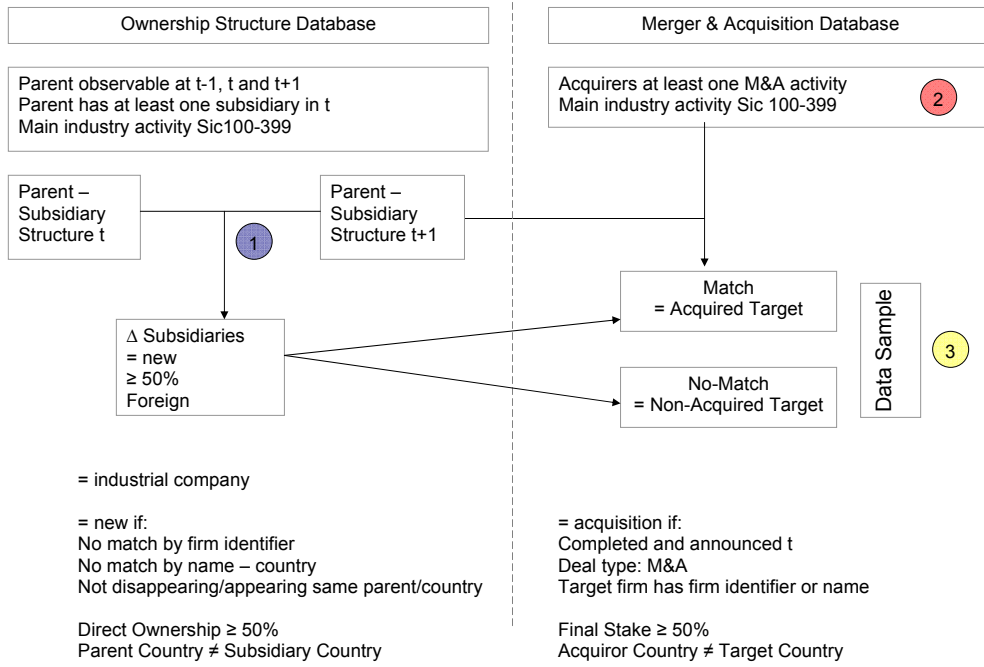
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<sup>40</sup>This step makes sure that *all* relevant merger & acquisition deals of a parent are included, even if for some reason we do not find a 'new' subsidiary using the ownership structure between the two points of time. Less than 5% of all acquired subsidiaries account to this procedure.

having newly established subsidiaries only 5% cannot be linked to the merger and acquisition database. 10 firms have been selected randomly and their online annual reports have been searched to find indication if those firms should have been included in the merger database. The random sample for parent firms showed that those firms are indeed not acquiring firms. For those parent firms that have been matched between Osiris and Zephyr, all acquisition activities for targets are matched against the subsidiaries. This match has been performed by target/subsidiary firm identifier, target/subsidiary name and hand selection to account for spelling differences.

Figure 1 and table 8 provide a scheme of the selection rules and how the different data sources have been combined. The encircled numbers in the figure refer to the three different steps on how we have constructed the database. Step 1 refers to the raw data on ownership structure. Step 2 refers to the raw data from the merger and acquisition data base. Finally step 3 applies the selection rules to the ownership and acquisition data and results in the data sample that we base our estimations on. The table 8 shows the number of parent/subsidiary firms by parent home country at each step of the selection.

Figure 1: Construction of data base



Notes:

Figure shows the combination of different data sources. The encircled numbers correspond to the different steps.

## C Analysis of ownership structure (step 1)

### C.1 Descriptive statistics

Figure 2 looks at the ownership data before selection rules are applied and gives answers to the question how many subsidiaries do firms from Europe/USA have in general, how many domestic and how many foreign ones. How many of those subsidiaries do not observe an ownership change for the same parent, how many do observe an ownership change from within the year 2005. We observe that European parent firms have more than a third more subsidiaries than U.S. parent firms. The distribution of matched, new and divested subsidiaries is quite heterogenous across parent countries. Figure 3 seeks to answer the question concentrating on European/US parents, in which world region are their subsidiaries located? Do we observe regional differences with respect to the change in ownership of subsidiaries within the year 2005. European parent firms have most subsidiaries in Western Europe. Compared to

Table 8: Number of firms from different data sources

	Parent/ Acquirer	Subsidiary/ Target	Parent/ Acquirer	Subsidiary/ Target
<u>Parent home country</u>		USA		Europe
Ownership data step 1	2,250	37,045	1,920	62,743
new entry	757	4,224	1,130	10,482
industrial firm	752	4,102	1,115	10,207
> 50% & not missing	701	3,613	917	5,077
Cross-country	378	1,518	667	3,576
Acquisition data step 2	1,583	2,765	2,555	3,881
Cross-country	492	721	1,068	1,736
Sample data step 3	302	1,465	591	3,346

Notes:

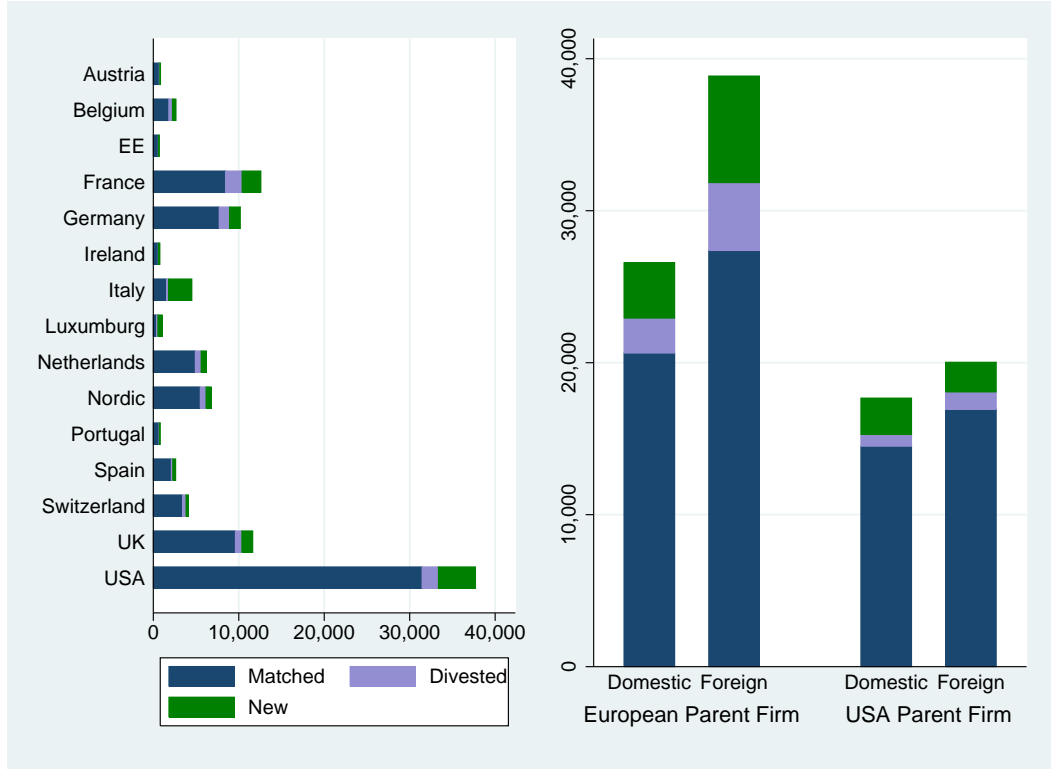
The tables indicates each step of the data base construction.

Step 1: Basic ownership structure. Step 2: Basic acquisition structure.

Step 3: Selection rules applied to basic ownership and acquisition structure.

U.S. parents, European parents have more subsidiaries in Eastern Europe. Surprisingly U.S. parent firms are not more engaged in Middle/South America than European multinationals.

Figure 2: Where do parent firms with subsidiaries come from?



Notes:

Panel left shows subsidiaries matched, divested and new by parent origin country.

E.g. US parent firms have approx. 38,000 subsidiaries. Approx. 1/7 are new subsidiaries.

Panel right shows domestic/foreign subsidiaries matched, divested and new by parent origin country.

E.g. European parent firms have more than 39,000 foreign subsidiaries. 1/5 are new subsidiaries.

Matched subsidiary means that the subsidiary belongs in  $t$  and  $t+1$  to the same parent.

Divested subsidiary means that the subsidiary belongs in  $t$  but not in  $t+1$  to the same parent.

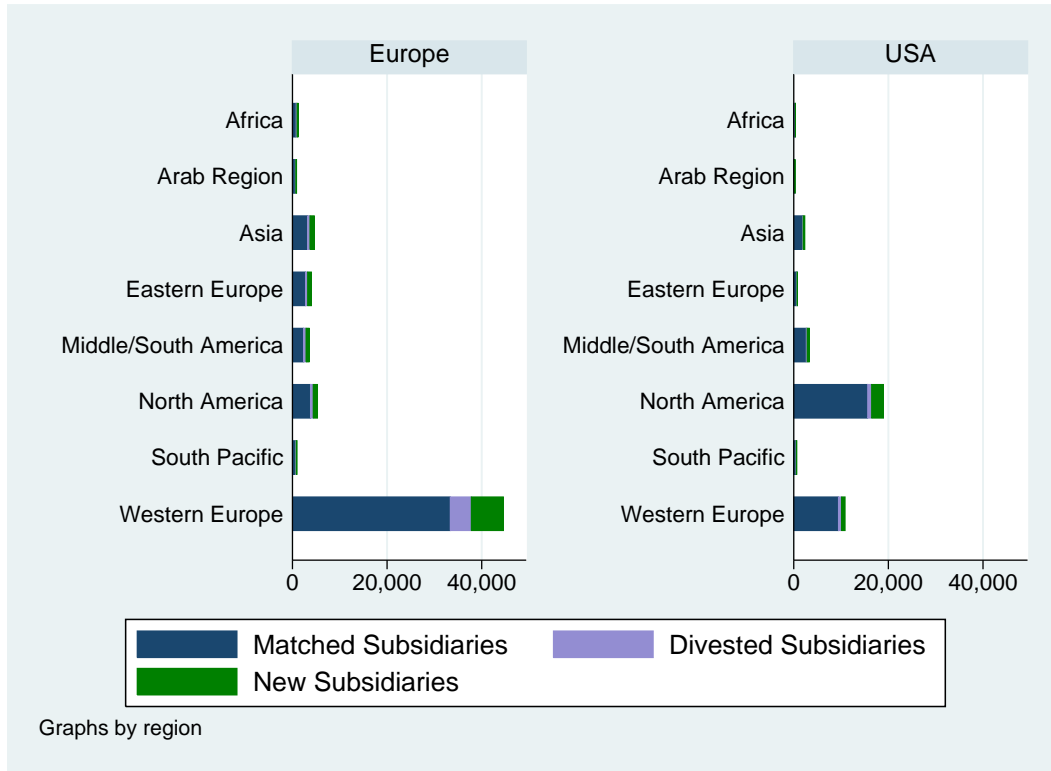
New subsidiary means that the subsidiary belongs in  $t+1$  but not in  $t$  to the same parent.

## C.2 Miss-classification of subsidiaries

Due to the lack of data on the incorporation date of subsidiary firms we resort to comparing the parent-subsidary structure at two different point in time, to assess which subsidiary was newly established. One might be concerned that miss-matching of parent-subsidary pairs between  $t$  and  $t+1$  is an issue e.g. subsidiary B in a particular country is present in  $t$  and not in  $t+1$ . Therefore we classify B as a divested subsidiary. Subsidiary C of the same parent in the same country is not present in  $t$  but appears in  $t+1$ . We classify C as a new subsidiary. Unobserved to us - a name change/change in firm identifier causes B and C to be the same



Figure 3: Where do European/US parent firms have their subsidiaries?



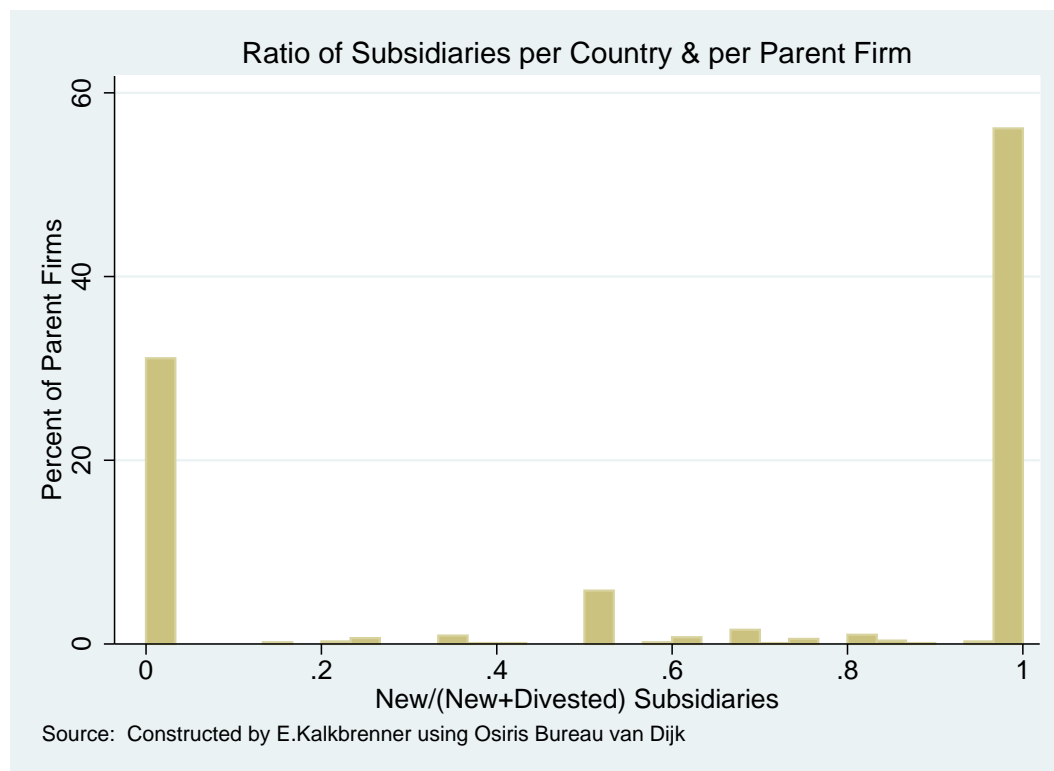
Notes:

The figure shows the regional distribution of all subsidiaries by parent origin country. E.g. European parents have ca. 45,000 subsidiaries in Western Europe. Only 1/6 are new subsidiaries. Matched subsidiary means that the subsidiary belongs in  $t$  and  $t+1$  to the same parent. Divested subsidiary means that the subsidiary belongs in  $t$  but not in  $t+1$  to the same parent. New subsidiary means that the subsidiary belongs in  $t+1$  but not in  $t$  to the same parent.

subsidiary. If such cases are frequently observed in the data then the ratio of new over the sum of new and divested subsidiaries per country and parent firm would show an accumulation around the midpoint of the distribution (possibly bell shaped). We plot the ratio in figure 4 and find that most cases occur at the opposing ends of the distribution. We are not able to resolve the issue of renaming of subsidiaries as such, but conclude that miss-matching between new and divested subsidiaries within the same country and parent firm does not seem to be frequent.

Another concern is the classification of subsidiaries being acquired or a greenfield investment. A greenfield investment is a newly established subsidiary, which has not been acquired.

Figure 4: Are new subsidiaries in reality divested subsidiaries due to miss-matching?



Notes:

The figure shows the ratio of new/(new+divested) subsidiaries per country and parent firm. Divested subsidiary means that the subsidiary belongs in t but not in t+1 to the same parent. New subsidiary means that the subsidiary belongs in t+1 but not in t to the same parent.

How can it be verified if a subsidiary, which has not been acquired (according to the here presented methodology) is indeed a greenfield subsidiary? With respect to greenfield investments annual reports and business journals usually report investment expansions e.g. creating a new plant or increasing investment in a particular region. Such an investment might or might not go hand in hand with incorporating a new subsidiary. This makes it very difficult to verify if a subsidiary, which is a new subsidiary in the organizational structure of the firm (according to the Osiris ownership structure) is indeed a greenfield investment.<sup>41</sup> Not being acquired,

<sup>41</sup>Harsco announces 2004/2005 to expand its division line MultiServ in several regions such as in Guatemala, Mexico, United Kingdom and Spain. Using the here presented methodology, we find newly established greenfield subsidiaries belonging to the MultiServ division line in Guatemala, Mexico and Spain. Although quite likely that increased investment in a region is correlated with incorporating a new establishment in the region, we don't know for certain that those subsidiaries are indeed incorporated as greenfield start-ups.

means that for the same parent, we are not able to find a match in the merger database based on the subsidiaries name or firm identifier.

What - if not a greenfield investment - could those subsidiary mistakenly represent?

(a) The subsidiary is not new:

We observe approximately 25 parent firms for which more than 20 subsidiaries are newly established within the year period. This could either be a firm heavily expanding or a data entry problem in the ownership structure. Whereas the latter occurs in the case that the ownership structure of Osiris does not provide an exact account of the subsidiaries belonging to each parent at a particular point in time. Example: The ownership structure reveals that a parent firm, Harsco Corporation, has no subsidiary in Guatemala by the end of fiscal year 2004; but by the end of fiscal year 2005, Harsco owns a subsidiary in Guatemala called *Multiserv Guatemala SA*. According to the SEC 10-K filing of Harsco *Multiserv Guatemala SA* is a 100% owned subsidiary already by the end of fiscal year 2002. This results in a false classification of Harsco corporation subsidiaries as greenfield investments in 2005. If this is due to a data entry problem of the ownership structure of the parent firm, then several subsidiaries will appear to be newly established, when in reality they are not. Although such a database mistake is potentially observable, there is no reason to believe that such a database error is the result of a systematic pattern. Knowing the exact incorporation date of a subsidiary would certainly help. Due to the lack of this data, we resort to other data sources. The U.S. Securities and Exchange Commission requires publicly traded firms to disclose information among other things about their ownership structure (Ex.21 of the K-10 form to be filed); A list of subsidiaries/affiliates from the end of fiscal year 2004 was compared to the list from the end of fiscal year 2005. This allows us for a sample of US firms to verify if a subsidiary is indeed newly established within the applicable time period. Securities and Commission (2010) <sup>42</sup> The Amadeus database contains unlisted and listed

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<sup>42</sup>U.S. parent firms sample background check:

Arch Chemicals Inc: none of the 4 new subsidiaries appear in SEC filings 31.12.2003. All subsidiaries can be found in the SEC filing of 31.12.2005.

Conocophilllis: only 4 of the 25 new subsidiaries appear in SEC filings 31.12.2003 and have been dropped from the sample.

Federal Mogul Corp: none of the 42 new subsidiaries appear in SEC filings 31.12.2003. All subsidiaries can be

firms in Europe. Further it includes the incorporation year of firms. The last available Amadeus database to us (Amadeus disc 128) includes firms up to incorporation year 2004 (mostly up to 2003). As an additional consistency check we would expect a poor match of the subsidiaries in our sample to the Amadeus disc 128, as the firms in our sample should be incorporated after 2004. If we find the majority of subsidiaries matching the firms in the Amadeus disc 128, it would be an indicator that subsidiaries have been incorporated at a prior time and are therefore not newly established subsidiaries. Indeed we don't find a high percentage of matches (approximately 10%), suggesting that most of the European subsidiaries in our sample are not incorporated prior to 2004. The ones for which we found a positive match were then not included in the final sample.

(b) The 'greenfield' subsidiary is in fact an acquired subsidiary:

It is important to define what a greenfield investment really represents. The empirical applications in the literature differ with respect to the definition of greenfield investment. For the US, the Bureau of Economic Analysis provides firm-level survey data about all U.S. foreign affiliates above a certain size threshold detailing the mode choice of the affiliate Nocke and Yeaple (2008). Larimo (2003) defines greenfield investment as a start-up investment involving a new facility. He uses data drawn from annual reports, business journals and direct contacts with the firms. The exact definition was not provided. Bertrand et al. (2009) do not provide an explicit definition of greenfield investment but distinguish them from acquired affiliates using survey data on Swedish multinational firms. According to our definition a greenfield subsidiary is a subsidiary, for which we can not find a match in the acquisition data base. It is although possible not to find a match with an acquisition due to the fact that a re-arrangement of ownership hierarchy takes place. E.g. Firm A acquires firm B

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found in the SEC filing of 31.12.2005.

Hewlett Packard: none of the 7 new subsidiaries appear in SEC filings 31.12.2003. 5 subsidiaries can be found in the SEC filing of 31.12.2005, 2 in SEC filing 31.12.2006.

European Parent firms background check:

Henkel KGAA: about one third of new 99 subsidiaries appear in SEC filings 31.12.2003 and have therefore been dropped from the sample.

UCB NV SA: none of the subsidiaries appear in SEC filings 31.12.2003. All subsidiaries can be found in the SEC filing of 31.12.2005. But one subsidiary was not recognized as being an acquired subsidiary (UCB NV SA (BE) acquires Celltech (GB) all new subsidiaries from the Celltech acquisition are coded as *acquired* but one subsidiary Medeva Pharma Suisse AG not.

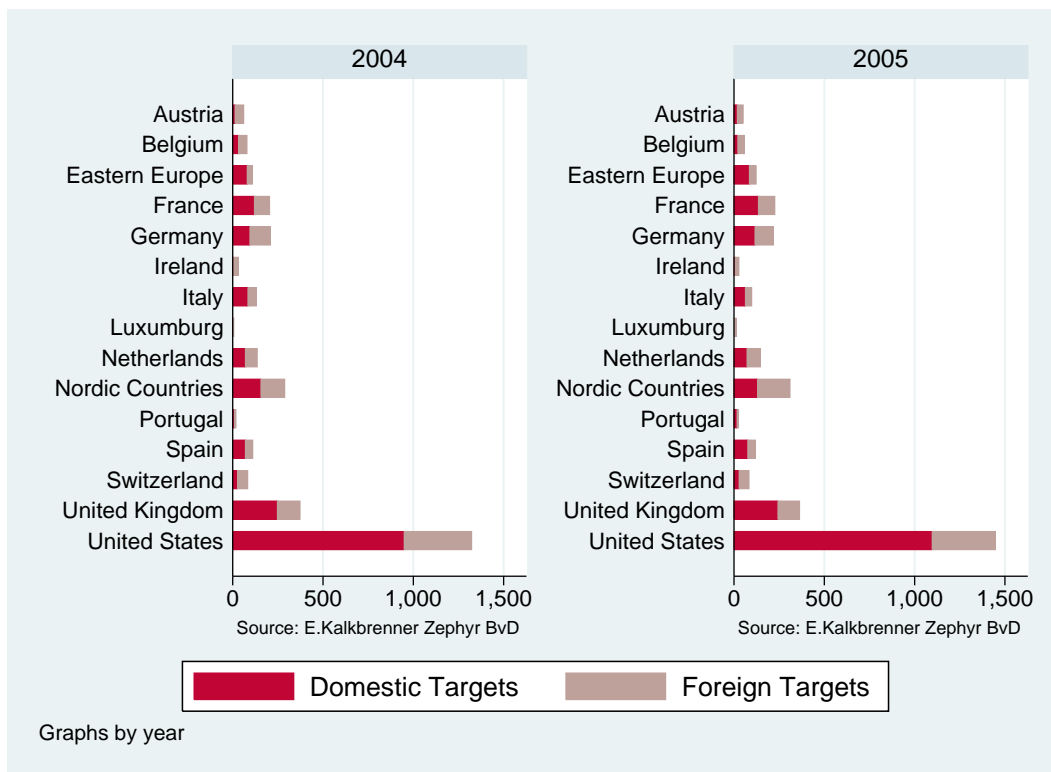
and firm C is a 100% subsidiary of firm B. After the acquisition Firm A changes the total ownership structure of the corporation and A now owns C directly. C does not show up for the acquisition of B by A. We would falsely classify C as a new subsidiary, which has not been acquired. This is indeed problematic, but we believe that on average corporations do not immediately after acquisitions change the ownership hierarchy and therefore don't believe in a systematic pattern creating such observations.

## **D Descriptive analysis of acquisition structure (step 2)**

We use the Zephyr data base and select acquiring firms active in the tradable good industry and acquisition deals with a final stake of at least 50% in the year 2004 and 2005. We can observe the domestic and foreign acquisitions per parent country in figure 5. U.S. parent firms account for the majority of acquisition deals. Approximately two-thirds of acquisitions by U.S. parent firms are domestic, an indication that for future research domestic subsidiaries should not be neglected. With respect to European parent firms not surprisingly the UK shows the highest frequency of acquisition deals, whereby only a third involves a foreign target. Parent firms from Germanic and Nordic countries exhibit half of their acquisition deals being foreign targets.

If we are interested in the question where are the target firms of U.S. and European parent firms located, figure 6 provides the answer. It shows that European parent firms acquire heavily in Eastern Europe domestically and foreign, in North America and predominantly in Western Europe. U.S. parent firms acquired predominantly in North America and to a much smaller extend in Western Europe. Surprisingly small is the acquisition frequency in Middle/South America and Asia.

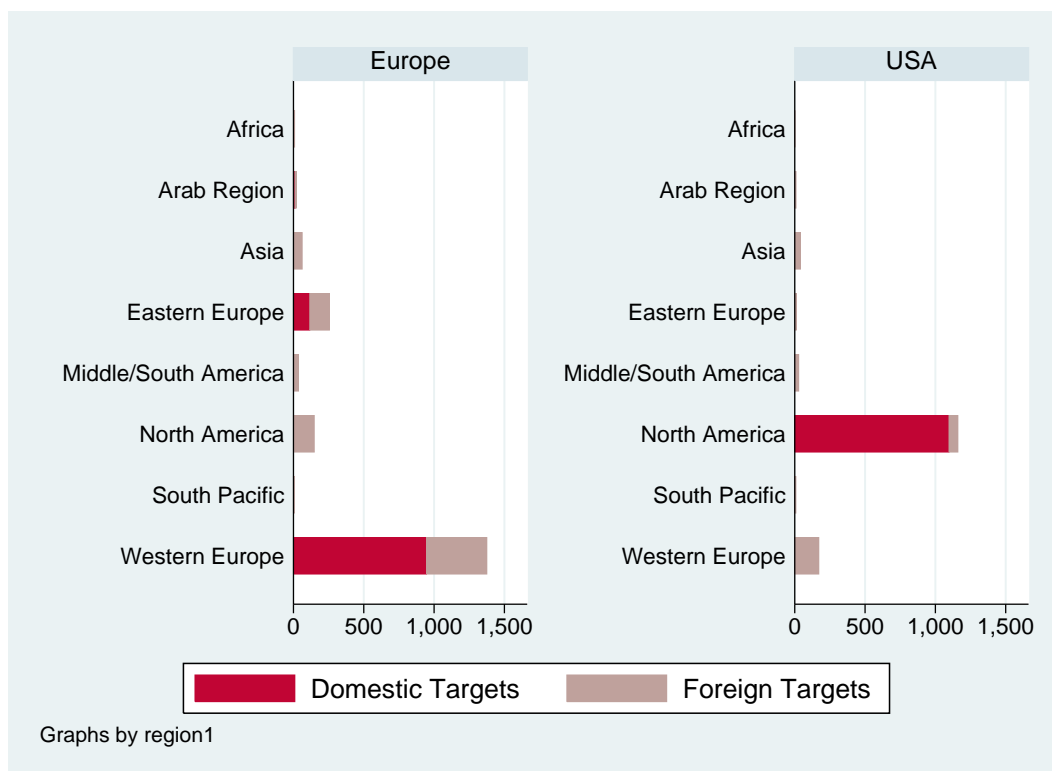
Figure 5: How many domestic/foreign acquisitions do we observe per parent country?



Notes:

The figure shows the number of majority acquiring merger and acquisitions within 2004/2005 for parents from the manufacturing industry. We differentiate between domestic and foreign targets; e.g. In 2005 US parent firms have acquired approx. 1,500 targets, 1/3 of it are foreign acquisitions.

Figure 6: What are the target regions of European/US acquiring parents?



Notes:

The figure shows the number of majority acquiring merger and acquisitions in 2005 for parents from the manufacturing industry by target region, differentiating by domestic/foreign acquisitions. E.g. European parents acquired approx. 1,400 Western European targets. 1/3 are foreign acquisitions.

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