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# Table of Contents

# Table of Contents (continued)



# Table of Figures



# Table of Formulae

# Table of Tables

# 0 General Introduction

"*The main business is not to see what lies dimly at a distance but to do what lies clearly at hand.*"
*(Thomas Carlyle, Scottish Historian and Essayist)*

Geographic proximity is one of the most important factors of human and business interaction. It ranges from close one-to-one business contacts between persons up to the thousands of kilometers between firms in transcontinental financial relationships. As firms interact in a multitude of different relationships with spatially distributed stakeholders, proximity to stakeholders does not only influence how firms produce, transport and distribute their physical goods. More important, it also affects knowledge transfer, cash flows, the frequency of personal exchange, and the intensity of monitoring activities. Hence, it intensifies the magnitude and improves the quality of relational ties and essentially shapes how firms make their most fundamental corporate business decisions. Even more severe, geographic remoteness between stakeholders could inhibit potentially promising business relationships.

However, the actual effects of stakeholder proximity on the financial policy of firms are still an open research question as two opposing recent developments can be observed. On the one hand, there are apparent trends of globalization of trade as firms operate in different spatially distributed international markets. Lower communication costs as well sophisticated transportation technologies enable easy business interactions with even very remote stakeholders (Lerner 1995). On the other hand, a spatial focus of firms on geographically close economical entities has been documented. For example, phenomena like "home-biased" investors that hold portfolios of geographically close located assets (Ivkovic and Weisbenner 2005, Dvorák 2005, and Seasholes and Zhu 2010) and firm agglomerations in highly concentrated industry clusters (see Delgado et al. 2012) seem to countervail this striving for international connectivity. Thus, firms must find the optimal set of distances to their stakeholders in order to cope with the growing demands on them.

This thesis contributes to the questions why and how geographic distances to stakeholders influence firms´ business activities and performance. Firms are embedded in a network of various business interactions to stakeholders. That is to say, they order raw materials from their suppliers, co-operate in research alliances, sell to local and foreign customers, or are monitored

by their shareholders. Although these interactions are different in nature and purpose, spatial remoteness affects all of them in terms of higher informational asymmetries leading to lower levels of trust. Furthermore, spatial remoteness to stakeholders imposes distance-related costs on the firm in form of increased costs for communication, knowledge transfer, and transportation of goods (e.g., Chhaochharia et al. 2012 and Alcacer 2006).

A major emphasis of this work is on corporate headquarters (and not plants) as the main spatial representation of the firm. Headquarters represent the administrative and communication centre of the firm and serve as nexus for the most essential business interactions with stakeholders. In addition, this approach mitigates potential endogeneity problems as changing headquarters is a very rare and expensive event (Pirinsky and Wang 2006 and Strauss-Kahn and Vives 2005).

In this thesis, we empirically analyze the actual impact of stakeholder closeness on the firm´s financial policy and firm value. In the three main chapters, we highlight different aspects of how spatial proximity influences expenditures for research and development, firm´s capital structure, CEO compensation as well as firm performance. By doing so, we focus on spatial proximity and refrain from analyzing effects of cultural, lingual, technological or psychic proximity (Knoben and Oerlemans 2006).

The first chapter analyzes the impact of stakeholders´ proximity on firm financial performance. In order to obtain a comprehensive picture of distance-related stakeholder effects, we include a variety of different economic entities that possibly affect the firm (i.e., customers, suppliers, shareholders, distributors, alliance partners, and competitors). To accomplish this, we use a cross-section of U.S. public firms and calculate median distances to the headquarters of the mentioned stakeholder groups. First and foremost, our empirical results specifically show that closeness to customers and distance to competitors has a significant positive impact on firm performance, while no similar effects can be found for other stakeholders. Second, we analyze three different distance-related mechanisms (informational asymmetries, social networks, and transportation costs) that are predominant in certain industries and present evidence that they have an impact on the performance of firms.

The second chapter takes a more in-depth view on the remoteness between suppliers and customers. Customers are considered to be among the most important stakeholders of the firm (Mitchell et al. 1997). This chapter takes up on this relation and examines the impact of principal customers' geographical proximity on supplying firms' use of debt. The literature suggests that the costs of information acquisition, communication, and monitoring increase with distance (Chhaocharia et al. 2012 and Alam et al. 2011). Hence, we investigate whether suppliers'

uncertainty regarding customers' business, particularly with respect to the stability of their contribution to suppliers' sales, increases with distance. Accordingly, by analyzing a data set of U.S. public firms and their principal customers we report a significant inverse relation between supplier leverage and the geographic distance to customers. This suggests that firms react to increases in business risk by lowering their risk in the balance sheet.

The third chapter expands on the proximity concept. As we cover distances to locally fixed economic entities in the first chapters, we focus on the spatial closeness of CEOs to their firm in this third chapter. More specifically, we analyze the effect of CEO proximity to their firm and pre-job mobility on firm performance and CEO compensation. Thus, we examine paths of life of European and U.S. CEOs by specifying place of birth, locations of educational institutions, and recent residence (see also Alam et al. 2011). Our findings document that managers who are geographically closer connected to their firms enhance corporate performance. We interpret this as result of a higher level of specialized local knowledge that can represent a valuable personal characteristic for managing core activities of the firm. We further find that CEOs with more international knowledge receive significantly higher salaries, while no comparable result can be found for CEOs with local knowledge. We close with a general conclusion in our fourth chapter.

In sum, we document a significant influence of geographic proximity to stakeholders on the firms´ business. Especially in a globalized business environment, spatial closeness still yields essential benefits for firms in terms of reduced business uncertainties, higher degrees of local knowledge, and lower informational asymmetries towards stakeholders. Our results indicate that the spatial distribution of stakeholders has an important impact on firm value and should be considered as an essential driver of firm´s financial policy as it affects leverage, expenditures for research and development, and CEO compensation. Hence, these findings especially have implications for the localization of corporate headquarters and subsidiaries, geographic diversification strategies, capital structure consideration, and the CEO selection process. As we focus on geographic proximity, a more comprehensive approach including psychic, lingual, and perceived proximity measures could yield interesting results and help to refine the understanding of stakeholder proximity effects.

# 1 Effects of Geographical Proximity of Stakeholders on Firm Performance

## 1.1 Introduction[1]

Firms are deeply embedded in a network of interactions to their stakeholders. The nature of these relations is strongly rooted in and influenced by geographical proximity to respective business partners. On the one hand, firms have to cope with the omnipresent striving for globalization. Efficient new technologies make it possible to communicate, learn, control, and steer transport flows via long distances (Lane and Milesi-Ferretti 2008, Klepper 2007, and Fujita and Thisse 2006). Firms face the challenge of worldwide competition and consequently have to build up global business relations in order to act on international markets. On the other hand, firms are locally fixed entities with a close connection to specific national laws and corporate governance codices, facing regional taxes and regulations as well as unique customer markets with local preferences. As Porter (2003) states:

*"The competitiveness of a company is strongly influenced not just by the decisions it makes and the assets inside the company, but also by the surrounding business environment in the locations at which the company operates."*

Therefore, firms tend to settle down in "industrial clusters" in order to reduce information and communication costs, build up networks, and enable innovative processes (Alcacer 2006, Kakulis 2010, and Delgado et al. 2012). Taking these two possible aspects into account, only little research has been done in the finance literature to explain and measure how spatial distances to other economic entities affect the firm´s business.

Our cross-sectional study in this chapter documents how geographical proximity of stakeholders influences financial performance of U.S. public firms. To our knowledge, we are the first study that takes multilateral relations to a variety of stakeholders into account. As relations to stakeholders differ in nature and function (e.g., interactions with alliance partners are based on cooperation, while shareholder interaction is based on monitoring), we investigate if certain forms of business functions are especially sensitive to spatial distances. In order to analyze the structure of business networks en detail, we calculate geographical distances to the headquarters of suppliers, customers, competitors, distributors, alliance partners, and shareholders of a firm. By subsuming the influence of different stakeholder groups, we are able to identify the most essential impacts of geographical proximity on firm financial performance. We focus on

[1] This chapter is based on a working paper with the same title: "Effects of geographical proximity of stakeholders on firm performance", see Göttner (2012).

headquarters (and not on plants) as they are the business and organizational nucleus of the firm and represent the linchpin of long-term relationships towards stakeholders. In addition, headquarter relocations are a very rare and costly event (Pirinsky and Wang 2006 and Strauss-Kahn and Vives 2005), so that location of headquarters can be regarded as rather stable over time. First, our results indicate that spatial closeness to major customer and competitors has a significant effect on firm performance measured as return on sales. While there is a significant and negative effect of competitor´s proximity, we find a significant and positive effect for customer proximity. Distances to other stakeholders turn out to exhibit no significant influence.

Second, we identify three main mechanisms that are connected with geographical proximity between firms and stakeholders (informational asymmetries, social networks, and transportation costs). By using different industry classifications and assuming a predominance of one of these mechanisms in specific industries, we determine the relevance of the underlying mechanisms on firm performance.

Thus, we find that spatial proximity to customers in industries with high transportation costs and relationship industries has a positive effect on firm performance. While we document a similar relation for firms operating in low-tech, non-knowledge intensive industries, we find no significant effect in knowledge or high technology industries that should assumingly face more severe distance-related costs due to informational asymmetries. We attribute this finding to potential advantages that these firms have by producing differentiated, research intensive goods that help them to adapt to remote customer demands. Furthermore, we expect these firms to have more sophisticated knowledge and information transfer systems that counterbalance negative effects of interactions with distant customers.

Finally, we contribute to the question how competitor proximity affects firm performance. Our findings indicate that the performance of firms operating in non-relationship industries is positively and significantly related to the remoteness of competitors. In contrast, we cannot find comparable evidence for firms in relationship industries, which we attribute to the existence of personal networks between business partners that attenuate potential effects of spatially close competitors. Additionally, we show that distance to competitors is positively and significantly related to performance of firms operating in manufacturing industries (due to transportation costs that handicap remote competitors to compete in local markets) or non-knowledge (low technology) industries.

The remaining chapter is organized as follows. In Section 1.2, we give an overview over the literature and provide the main concepts of geographic proximity and their effects on firm financial policy. Section 1.3 shows our data and applied methodology. Section 1.4 presents our results and robustness tests. Finally, Section 1.5 closes this chapter with concluding remarks.

## 1.2 Literature Review

*Stakeholders*

A firm can be seen as "a set of multilateral contracts among stakeholders" (Freeman and Evan 1990), where stakeholders are groups that have interest in the course of the firm (Letza et al. 2004 and Freeman 1983). Every stakeholder has its unique tie and specific demand towards the firm. For example, firms have to minimize communication costs to their customers and suppliers, facilitate personal exchanges and meetings with their alliance partners, and adapt to strategies of their competitors. As argued by Jiao (2010), meeting these demands and increasing stakeholder welfare can, at the same time, result in performance gains for the firm.

*Proximity aspects*

Relations to other institutions on the surroundings of the firms are all based on the overlapping of organizational structures and on intensive interchange of personal, goods, as well as knowledge, though to a different degree. The nature of these interactions is strongly shaped by the distance between a firm and its stakeholders. In this section, we shortly present the main concepts identified in the literature that explain how geographic proximity potentially affects firm performance. We differentiate between three major concepts:

i) information asymmetries; ii) existence of social networks; and iii) transportation costs.

We introduce each concept and determine the importance of each one with regard to performance later in section 1.4.

*Information asymmetries*

Firms can learn things more easily by being "on the ground" and, thus, receive more detailed knowledge of the local economy (e.g., specific information about firm´s reputation and product quality through word-of-mouth referrals as argued by Rob and Fishman (2005)). Spatial closeness makes institutions share circumstances (e.g., labor costs, regulations, state taxes, as well as local market conditions) and, hence, information collection costs and information asymmetries are smaller (Lerner 1995). A higher amount of coverage in local media (e.g., newspapers) builds the base for higher information density and perceived familiarity (Gurun and Butler 2012 and Engelberg and Parsons 2011). This improved information gathering and interpretation process is directly connected with lower costs for monitoring and can help to

mitigate agency problems (Porter 2000). The work of Chhaochharia et al. (2012) shows that proximity between firms and shareholders makes monitoring activities from large institutions more effectively. Further, because of geographical proximity, local institutions are more likely to inspect managerial activities more directly and attend shareholder meetings to impact firm decisions. These relational governance mechanisms can help to reduce monitoring costs and potentially complement further more formal contracts (Yu et al. 2006).

There is a growing literature on investors´ preferences for closely located assets in their portfolio ("home bias") due to lower (perceived) information asymmetries. Grinblatt and Keloharju (2001) document that Finnish investors prefer nearby investments, while Franks et al. (2009) point to the same argument looking at geographic proximity of UK investors to their portfolio firms. Other papers concerning portfolio decisions of individual investors come to similar conclusions (e.g., Huberman 2001, Zhu 2002, Ivkovic and Weisbenner 2005, Pirinsky and Wang 2006, Feng and Seasholes 2005, Dvorák 2005, and Seasholes and Zhu 2010). This relation between proximity and trust (e.g., perceived familiarity) is extensively shown in the literature for a wide range of business activities, financial contracts, and managerial decisions. Several studies document the importance for block share acquisitions (Kang and Kim 2008), hedge fund activities (Teo 2009), equity analysis (Malloy 2005), retail investors (Bailey et al. 2008), and stock option plans (Kedia and Rajgopal 2009). Similarly, Lerner (1995) also shows that venture capitalists exhibit local preferences, and Coval and Moskowitz (1999, 2001) provide further evidence that mutual fund managers do better stock picking for geographically closer firms than for stocks of distant firms. Analogously, Petersen and Rajan (2002) and Degryse and Ongena (2004) document the role of distance in information resolution for bank lending. Improved accumulation of explicit knowledge through physical proximity ought to improve lending and lead to better financing decisions (as argued also by Corvoisier and Gropp 2001 and Buch 2002). Overall, costs of explicit knowledge transfer and informational asymmetries should rise with spatial distance between stakeholders.

*Social networks*

Albeit the creation of new and easy communication technologies dense social networks play an important role in transmitting knowledge (Cohen et al. 2010). For example, Fracassi (2012) argues that social peers from professional and social networks (e.g., clubs) influence managerial actions. Zaheer et al. (1998) argue that it is harder and more costly to build up new network ties, establish social structures, and maintain existing relations from afar (e.g., due to a lower frequency of face-to-face interactions). These networks need strong personal ties that rely on proximity between humans that facilitates the transfer of knowledge (Peterson 2004). This is

especially true for "tacit knowledge" that is not easily transferrable or storable in electronic knowledge management systems (see, e.g., Polanyi 1966, Nonaka 1994, Audretsch and Feldman 1996, and Davenport and Prusak 1999). Hence, the effectiveness of (tacit) knowledge transfers through social networks declines with spatial distance.[2] For simplification, we argue that the aforementioned information asymmetries refer to different levels of explicit knowledge, while social networks are used to transfer tacit knowledge. We acknowledge that, due to the nature of knowledge, there is no harsh separation between these two terms possible.

*Transportation costs*

Lower distances enable firms to deliver a better service, plan their logistic material flows much easier, and reduce delaying and shortfall risks (Narsimhan and Nair 2005 and Cannon and Homburg 2001). Especially for certain types of goods (e.g., fragile, non-durable, and bulky products) transportation to remote customers can pose sophisticated logistic challenges on the firm (Ghemawat 2001). As transportation of goods and employees represents an important distance-related cost factor for firms (Combes and Lafourcade 2005 and Hotelling 1929), we include transportation costs into our analysis.

Since all these three concepts are difficult to approximate and measure otherwise, we use geographic proximity as concept to compare them. In this chapter, we examine which of these mechanisms are the main drivers for distance related costs and, hence, influence firm performance. Informational asymmetries and transportation costs increase with distance, while the density of social networks decreases. All of these concepts influence the nature of relations between stakeholders (e.g., the frequency, the costs, or the quality). These interactions can include knowledge and cash flows as well as the interchange of goods and employees. We refrain from making statements on these channels in more detail as we only can measure aggregated effects on firm performance. In *Figure 1.1*, we provide an overview over distance related factors and the possible channels of influence on firm performance.

[2] In contrast, explicit knowledge can be verbalized, communicated in formalized language, and consists, for example, of process details, product specifications, internal operations, or firm strategies.

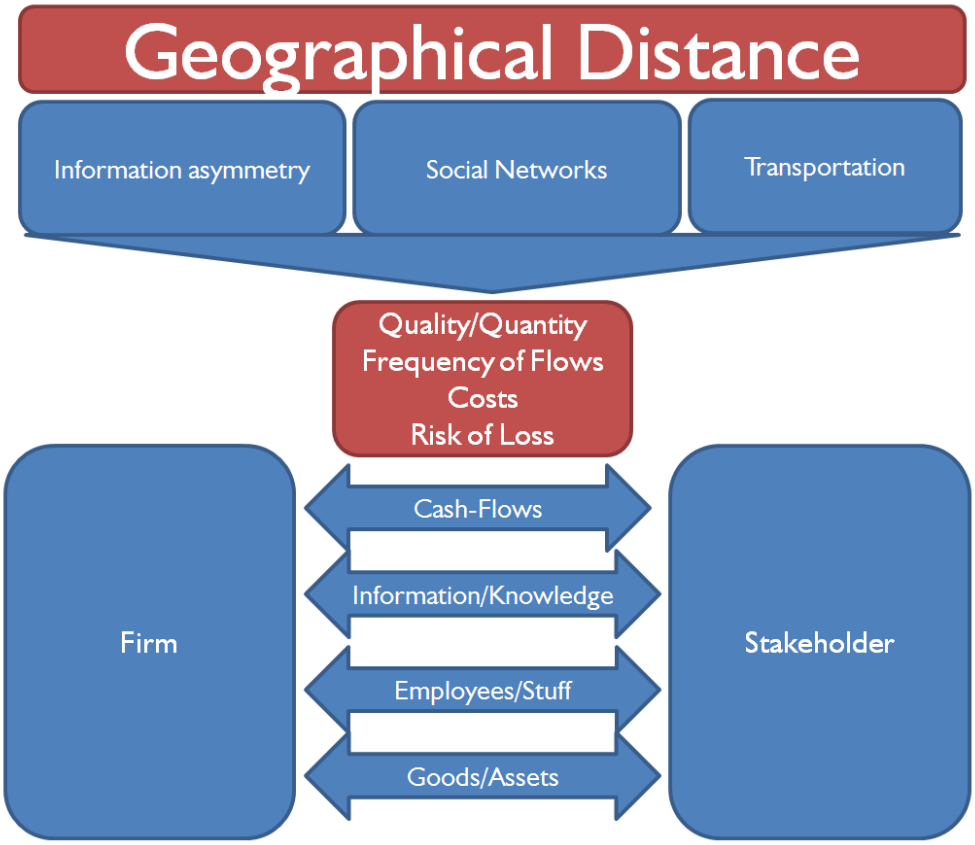


Figure 1.1: Interaction between Geographical Proximity and Firm´s Processes

## 1.3 Data and Empirical Strategy

### 1.3.1 Data

Our data consists of all public and operating U.S. firms with total revenues larger than 10 million dollars. This cross-section of firms including fundamental data and headquarter locations is gathered from the Capital IQ (CIQ) database for the year 2010.[3] We focus on corporate headquarters as they can be seen as main nexus of business activities of the firm (Coval and Moskowitz 1999). This is essential as all important business communication in long-term relationships between stakeholders is processed via corporate headquarters and not via plants. We exclude utilities companies and financial firms with Standard Industrial Classification (SIC)

[3] The database only provides data on recent customer relations (entirely updated every two years) and historical data (going back to 2005). We use recent customer data in our analyses and only use the historical data to analyze if distances changes in the customer base affect performance in our robustness section.

codes ranging from 4900-4999 and 6000-6999. First, these firms are eliminated from the sample because they are not generally subject to segment reporting requirements. Second, they are normally heavily regulated and use deviating performance measures (see Ellis et al. 2009). Additionally, we remove small OTC-traded firms from our sample due to missing financial information and further firms with incomplete stakeholder information in our database. We are left with a final sample of 2,158 firms with a total market capitalization of 9.65 trillion U.S. dollars. That represents more than 56% of total U.S. market capitalization in 2010 as reported by the Worldbank.[4]

Names of stakeholders (including customers, suppliers, alliance partners, distributors, competitors, and shareholders) are also provided by CIQ. Subsequently, to identify stakeholders, we use a text-based approach that matches the first seven letters of a stakeholder´s name to a list of more than 60,000 public firms worldwide. Doing so, we are able to identify industry, size, addresses, and country of respective stakeholders as well. In cases where no specific geographic location is provided, we consult corporate web sites, the Compustat data base, and annual reports to add missing stakeholder address data.

We focus on corporate stakeholders and, thus, exclude federal agencies, governments, and further institutions like universities, foundations, associations, and private hospitals from our analyses. Results are validated and checked manually. The respective identification rates are presented in *Table 1.2*. These are comparable to identification rates by Banerjee et al. (2008) who apply a similar stakeholder identification approach.

### 1.3.2 Empirical Strategy

In this section, we present our empirical strategy. We start with a univariate analysis by separating our sample firms into four quantiles according to their median distance to principal customers. Then, we calculate sample mean differences regarding leverage and other attributes between the first and the fourth quartile of firms. We continue with a multivariate analysis including all relevant stakeholders into our initial ordinary least squares (OLS) model in order to examine the aggregated effects on firm performance.[5] In the following, we narrow down our analyses to proximity effects of customers and competitors. We argue that, in general, firms can favor specific attributes of alliance partners, distributors, and suppliers (e.g., quality, low costs, or key positions in preferred markets). Hence, we admit that these preferences can, to a certain

[4] The data can be found at http://data.worldbank.org/indicator/cm.mkt.lcap.cd.

[5] In total, we focus on stakeholders that have a fixed representation in space (i.e., corporate headquarters) because it is easier to approximate communication and monitoring costs for stakeholders like suppliers, customers, alliance partners or distributors than for geographically dispersed stakeholder groups like employees or societal groups.

extent, indirectly influence the location of a stakeholder (e.g., a region with low wages or high research output). Consequently, in the following, we especially focus on proximity to competitors and major customers as the respective pairs (i.e., firm-customer and firm-competitor) are exogenously given and not impaired by adjacent firm decisions. In our subsequent analyses, we apply different segmentation strategies for industries and goods to capture product-market influences in more detail and identify industries where specific proximity concepts should be predominant. We expound our segmentation strategies in the following paragraphs.

*Industry variables*

Different products shape the nature of the relationship between firm and stakeholders in specific ways (see, e.g., Giannetti et al. (2011) for supplier and customer relationships). For example, transportation costs should be more severe for the automotive industry than the software industry.

**Social Networks:** Following Cremers and Nair (2008)[6], we construct a variable *RELATIONSHIP INDUSTRY* that has a value of one if the company operates in a relationship industry, and zero otherwise. Firms in relationship industries should have stronger levels of interaction with their stakeholders as stated by Cremers and Nair (2008): *"The presence of long relationships could mean that the business depends on personal relationship between its sales force or key employees and its customers."*

We assume that firms in relationship industries strongly rely on personal networks and the interchange of tacit knowledge via face-to-face interactions and, hence, geographic distance should especially affect the existence and density of supplier-customer social networks.

**Information Asymmetries:** We use an approach of Legler and Frietsch (2006) who classify industries according to research intensities and ratios of academic employees to total employees. We construct an indicator variable (*KNOWLEDGE INTENSIVE*) applying their classification to split up our sample in firms operating in knowledge-intensive industries (indicated by a value of one) and non-knowledge intensive industries. A list of the corresponding industries can be found in *Appendix B*. As alternative approach, we use an industry classification from the OECD that divides manufacturing firms into high-technology (*HIGH TECH*) and low-technology firms

[6] Cremers and Neir (2008) classify the following two-digit-SIC industries as relationship industries including mainly durable goods and long-term service industries: 15-17, 34-39, 42, 47, 50-51, 55, 60-65, 67, 75-76, 87.

using levels of R&D intensity as classification criteria (OECD 2009).[7] We expect firms that operate in knowledge-intensive (and accordingly high-technology) industries to face less severe information asymmetries with remote customers as they are focused on and specialized in transmitting explicit knowledge and technology.

**Transportation Costs:** Furthermore, as classified by Yogo (2006) and Beck et al. (2005), we use a separating variable to capture if firms operate in *SERVICE* or non-service (i.e., manufacturing) industries. In contrast to firms in service industries, we expect firms producing physical goods to face substantial transportation costs that should increase with spatial distance.[8]

In the following sections, we illustrate our main variables that are applied throughout all our models.

*Dependent variable*

We use return on sales measured as net income to total revenues (*RoS*) as dependent performance variable (see Fich and Shivdasani 2006 and D´Souza and Megginson 1999). As we investigate a multitude of different stakeholder relations, we use this measure as adequate approximation for the aggregated operational efficiency.
In addition, we calculate the median return on sales for each three-digit SIC industry and subtract it from the firm´s return on sales to receive an industry-adjusted performance measure. In our robustness section, we apply alternative measures for firm performance like return on assets (*RoA*) and industry-adjusted return on assets (see Daines 2001 and Bebchuk and Cohen 2005).

*Distance related variables*

As our main explanatory variables we use several proxies for proximity. In order to calculate distances between firms, we use the location of corporate headquarters (provided by Capital IQ). For this purpose, we assign geographical coordinates measured in longitude and latitude to each firm (using the mapping software GoogleMaps) and identify the respective distance to stakeholders' headquarters. The following equation (1) is used to calculate distances:

[7] We modify the original classification slightly by grouping "high and medium-high technology" under the term "high technology" and "low and medium-low technology" under the term "low technology" An overview of respective industries can be found in *Appendix C.*

[8] We acknowledge that a certain amount of knowledge or product exchange (e.g., material flows in the manufacturing industry) could be processed directly between subsidiaries. Nevertheless, we would still argue that headquarters are the main reference point for long-term communication and monitoring interactions, perceived trust, major business negotiations and meetings between stakeholders.

(1) $$L = arccos(sin(\emptyset_A) * sin(\emptyset_B) + cos(\emptyset_A) * cos(\emptyset_B) * cos(\lambda_B - \lambda_A)) * r$$

with $Ø_A$ = geographical latitude of firm, $Ø_B$ = geographical latitude of stakeholder, $\lambda_A$ = geographical longitude of firm, $\lambda_B$ = geographical longitude of stakeholder, and r= 6371km as the mean radius of the earth.

Variables named *LOG MEDIAN DISTANCE STAKEHOLDER "X"* represent logarithms of median distances to stakeholders, with "X" standing for the respective stakeholder. As applied by Grinblatt and Keloharju (2001), Keloharju et al. (2012), and Degryse and Ongena (2004), we use the logarithm of our distance variables in the regressions and assume that the marginal impact on firm performance decreases with distance.[9]

*Localization variables*

In order to account for regional effects, we construct the following localization variables for our robustness tests. We take into account if the firm is incorporated in Indiana or Pennsylvania (*DUMMY STAKEHOLDER STATE*) as laws in these states explicitly say that claims of shareholders should not be held above those of stakeholders (Pinnell 2000). To control for regulatory effects of different state laws on corporate performance, we apply an indicator variable *DUMMY DELAWARE* for firms that are listed in the state of Delaware (Gompers et al. 2003, Gillan et al. 2007, and Daines 2001). In order to account for cluster effects (see Delgado et al. 2012), we introduce two indicator variables in our robustness tests indicating if the firm´s headquarter is either located in California or the New York metropolitan area (*DUMMY CA* and *DUMMY NY*, respectively).

*Control variables*

We apply the following independent variables. In the first step, we use number of stakeholders in our analysis, while we focus on customers and competitors in our second step. The findings of Galbraith and Stiles (1983), Ruffle (2005), and Inderst and Wey (2007) among others indicate that a high concentration of the customer industry (i.e., high buyer and negotiation power) has a negative impact on firm profitability. Thus, we expect a high number of major customers (i.e., a low number of total customers ) to have a positive effect on firm performance (indicated by the variable *NUMBER CUSTOMERS*). In contrast, we assume that higher levels of competition (as

[9] In our robustness section, we use alternative distance measures like the linear form, minimum distance and average distance. Though in all model specifications, our results stay virtually the same.

measured by number of competitors (*NUMBER COMPETITORS*)) should have a negative effect on firm performance.

With regard to Titman and Wessels (1988), Harris and Raviv (1991), Myers (2001), and Fama and French (2002), there is mixed evidence concerning the influence of capital structure on firm performance. Thus, we include the usage of debt (*LEVERAGE*) into our models but refrain from predicting the sign of the actual effect. In addition, we test for the following exogenous control variables. We control for diversification as measured by number of business segments (*DIVERSIFICATION*)[10] and an indicator variable for NYSE listing (*DUMMY NYSE*) (see Gillan et al. 2007, Fich and Shivdasani 2006, and Gompers et al. 2003).

As further independent variables widely recognized by the literature (see, e.g., Yermack 1996 and Anderson and Reeb 2003), we use *SIZE* (as measured by logarithm of total assets), *FIRM AGE* (measured in logarithm of years since listing), and *LIQUIDITY* (total current assets divided by total assets). Additionally, we include a variable denoted as *SALES GROWTH* (measured as 3-year compound annual growth rate of total sales) and an indicator variable that has a value of one if the firm pays dividends (*DUMMY DIVIDENDS*) and zero otherwise.

As good corporate governance is associated with enhanced firm performance (see, e.g., Hermalin and Weisbach 1991 and Gompers et al. 2003), we incorporate several standard corporate governance measures into our robustness regressions: insider ownership (*INSIDERS OWNED*), board size (*BOARD SIZE*), percentage of outside directors (*EXTERNAL DIRECTORS*), and number of analysts (*ANALYST COVERAGE*) as used by Gillan et al. (2007), Palia (2001), and Yermack (1996) among many others.

We mainly apply standard OLS methodology to execute our regressions:

$$(2) \qquad Y = b_0 + b_1 * x_1 + b_2 * x_2 + \cdots + b_n * x_n + \varepsilon_i$$

where Y is the dependent variable, $b_0$ is the intercept, the b´s are regression coefficients, the x´s are independent variables, and $\varepsilon_i$ is an error term.

In total, this leads us to equation (3):

[10] In alternative, not-reported regression we substitute number of business segments with Berry-Index for diversification, calculated by using a modified Herfindahl index approach (Berry 1971). We do the same calculation for geographical segments. Our main results, though, remain virtually unchanged.

$$
\begin{aligned}
(3)\quad & FIRM\ PERFORMANCE \\
& = b_0 + b_1\ DISTANCE\ VARIABLES + b_2\ NUMBER\ STAKEHOLDERS \\
& + b_3\ LEVERAGE + b_4 SALES\ GROWTH + b_5\ SIZE + b_6 FIRM\ AGE \\
& + b_7\ DIVERSIFICATION + b_8\ LIQUIDITY + b_9\ VOLATILITY \\
& + b_{10}\ DUMMY\ DIVIDENDS + b_{11}\ DUMMY\ NYSE \\
& + b_{12}\ DUMMY\ STAKEHOLDER\ STATE + b_{13}\ DUMMY\ DELAWARE \\
& + b_n INDUSTRY\ CONTROLS + \varepsilon
\end{aligned}
$$

An overview of our variables is provided in *Table 1.1.* We present the Pearson correlation coefficients of our variables in *Table 1.2* and check for possible inter-correlations of independent variables to avoid biased results. As distances to transport hubs (harbors, big cities, and airports) show relatively strong correlations, we do not include them in the same model specifications in our robustness tests.

**Table 1.1: Description of Key Analyses Variables**

| Variable | Definition |
|---|---|
| Analyst Coverage | Number of analysts covering the firm´s stock. |
| Average Distance Customers | Average distance to firm´s customers. |
| Board Size | Logarithm of number of directors in corporate board of directors. |
| Cash/TA | Cash and cash equivalents relative to the firm's total assets of the same fiscal year. |
| Diversification | Number of business segments as provided by CIQ. |
| Dummy CA | Indicator variable that has a value of one if firm´s headquarter is located in California. |
| Dummy Delaware | Indicator variable that has a value of one if firm is incorporated in the state of Delaware (see Daines 2001). |
| Dummy Dividends | Indicator variable that has a value of one for firms that pay a dividend and zero otherwise. |
| Dummy NY | Indicator variable that has a value of one if firm´s headquarter is located in New York Metropolitan Area. |
| Dummy NYSE | Indicator variable that obtains a value of one if the firm is listed on the New York Stock Exchange (NYSE). |
| Dummy Stakeholder State | Indicator variable that has a value of one if firm is located in Pennsylvania or Indiana (see Pinnell 2000). |
| External Directors | Percentage of outside board members. |
| Firm Age | Logarithm of number of years since founding. |
| Geographic Segments | Number of geographic segments as reported by CIQ. |
| Growing Median Distance | Distance changes between median distance to historic customers and median distance to recent customers. |
| High Tech | Indicator variable that has a value of one if a firm is operating in a high-tech industry as classified by OECD (2009). |
| Industry- adjusted Return on Sales | Return on sales of the firm minus the industry median of return of sales. |
| Insiders Owned | Percentage of firm´s equity held by insiders (CEO plus members of board of directors). |
| Knowledge Intensive | Indicator variable that obtains a value of one if firm is operating in a knowledge intensive industry according to Legler and Frietsch (2006). |
| Leverage | Total debt relative to the firm´s total assets. |
| Liquidity | Total current assets divided by total current liabilities. |
| Log Median Distance Competitors | Logarithm of median distance to firm´s competitors. |
| Log Median Distance Customers | Logarithm of median distance to firm´s customers. |
| Log Median Distance Stakeholder „X“ | Logarithm of median distance to firm´s stakeholders where an “X” indicates alliance partners, distributors, customers, competitors, shareholders and suppliers. |

**Table 1.1 Description of Key Analyses Variables (continued)**

| Variable | Definition |
|---|---|
| Median Distance Customers | Median distance to firm´s customers. |
| Minimum Distance Customers | Minimum distance to firm´s closest customer. |
| Number Competitors | Number of competitors as reported by CIQ. |
| Number Customers | Number of firm´s major customer as provided by CIQ. |
| Number Stakeholder „X“ | Number of respective stakeholder where “X” indicates alliance partners, distributors, customers, competitors, shareholders, and suppliers. |
| Prox Distance Airport | Indicator variable that has a value of one if a firm is located less than 100 kilometers away from one of the 20 biggest seaports (in total cargo) as classified by the American Association of Port Authorities. |
| Prox Distance Harbor | Indicator variable that has a value of one if firm´s headquarter is located within a 100km radius of the biggest 50 airports in the U.S. as indicated by the Federal Aviation Administration. |
| R&D Intensity | Expenditures for research and development divided by total assets. |
| Relationship Industry | Indicator variable that has a value of one if firm operates in a relationship industry according to Cremers and Nair (2008). |
| Remote City | Indicator variable that has a value of one if a firm´s headquarter is located more than 250 kilometers away from one of the 21 major cities of the United States as obtained by the U.S. Census Bureau. |
| Return on Assets (RoA) | Net income to total assets of the firm. |
| Return on Sales (RoS) | Net income to total revenues of firm. |
| Sales Growth | 3-year compound annual growth rate of total revenues (in %). |
| Same SIC | Number of customers that operate in the same 3-digit SIC industry as the firm. |
| Service | Indicator variable that has a value of one if a firm is operating in the service industry as classified by Yogo (2006). |
| SG&A Margin | Selling, general and administrative expenses to total revenues. |
| Size | Logarithm of total assets of firm. |
| Stock Listed | Ratio of stock listed customers to total customers. |
| Tobin´s Q | Market value of assets divided by the book value of assets, whereas the market value of assets is calculated as book value of assets plus the market value of common stock less book value of common stock. |
| Volatility | 3-year standard deviation of stock returns. |

**Table 1.2: Pearson Correlation Coefficient Matrix**

Asterisks denote statistical significance at the 0.01(***)-, 0.05(**)-, and 0.10(*)-level.

| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Median Distance Customer | 1 | | | | | | | | | | | | | | | |
| 2 | Median Distance Distributors | 0.144** | 1 | | | | | | | | | | | | | | |
| 3 | Median Distance Supplier | 0.182** | 0.070 | 1 | | | | | | | | | | | | | |
| 4 | Median Distance Competitor | 0.217** | 0.215** | 0.118** | 1 | | | | | | | | | | | | |
| 5 | Median Distance Alliance Partners | 0.094 | 0.069 | 0.111* | 0.109* | 1 | | | | | | | | | | | |
| 6 | Median Distance Shareholder | 0.116** | 0.070 | 0.135** | 0.194** | 0.016 | 1 | | | | | | | | | | |
| 7 | Return on Sales (RoS) | -0.075** | -0.015 | -0.034 | -0.037 | -0.024 | -0.045* | 1 | | | | | | | | | |
| 8 | Total Assets | -0.028 | 0.060 | -0.033 | -0.007 | -0.002 | -0.011 | 0.048* | 1 | | | | | | | | |
| 9 | Leverage | -0.092** | -0.009 | -0.032 | -0.059* | 0.044 | -0.062** | -0.063** | 0.058** | 1 | | | | | | | |
| 10 | Tobin´s Q | 0.039 | 0.039 | 0.015 | 0.010 | 0.048 | 0.051* | -0.257** | -0.041 | 0.007 | 1 | | | | | | |
| 11 | Cash/TA | 0.121** | -0.027 | 0.085** | 0.090** | -0.007 | 0.141** | -0.087** | -0.089** | -0.276** | 0.260** | 1 | | | | | |
| 12 | Diversification | -0.018 | 0.099* | -0.051 | -0.030 | 0.059 | -0.110** | 0.103** | 0.211** | 0.071** | -0.144** | -0.212** | 1 | | | | |
| 13 | Sales Growth | 0.005 | 0.071 | 0.020 | 0.031 | -0.094* | 0.031 | -0.105** | -0.018 | 0.084** | 0.101** | 0.071** | -0.065** | 1 | | | |
| 14 | Costs of Goods Sold/Total Assets | -0.029 | -0.034 | -0.018 | 0.027 | 0.035 | -0.101** | -0.106** | -0.026 | 0.028 | -0.181** | -0.252** | 0.156** | -0.078** | 1 | | |
| 15 | Prox Distance Harbor | 0.156** | 0.145** | 0.149** | 0.240** | -0.048 | 0.629** | -0.041 | -0.021 | -0.121** | 0.111** | 0.184** | -0.102** | 0.053* | -0.168** | 1 | |
| 16 | Prox Distance Airport | 0.150** | 0.117* | 0.141** | 0.237** | -0.037 | 0.684** | -0.050* | -0.031 | -0.086** | 0.113** | 0.163** | -0.112** | 0.054* | -0.157** | 0.951** | 1 |
| 17 | Remote City | -0.044 | 0.061 | 0.061* | 0.071** | -0.082 | 0.277** | -0.016 | -0.016 | 0.004 | 0.052* | -0.032 | 0.030 | 0.018 | 0.003 | 0.558** | 0.597 |

### 1.3.3 Descriptive Statistics

*Firm characteristics*

The following *Table 1.3* illustrates the descriptive statistics of U.S. public firms.[11]

**Table 1.3: Descriptive Statistics of U.S. Public Firms**

| U.S. – Firms | N | Min | Max | Median | Average | Standard Deviation |
|---|---|---|---|---|---|---|
| Total Assets (mm$) | 2,158 | 0.90 | 751,216 | 415 | 4,213 | 21,732 |
| Employees | 2,154 | 5 | 2,100,000 | 1,352 | 11,501 | 56,069 |
| Total Revenues (mm$) | 2,158 | 10 | 408,085 | 382 | 3,500 | 14,293 |
| Firm Age | 2,023 | 1.00 | 251.00 | 30.00 | 43.80 | 36.84 |
| Leverage | 2,157 | 0.00 | 4.78 | 0.14 | 0.21 | 0.28 |
| Tobin´s Q | 2,158 | 0.08 | 41.12 | 1.51 | 2.04 | 1.91 |
| Return on Assets (RoA) | 2,158 | -2.12 | 1.02 | 0.04 | 0.03 | 0.12 |
| Net Income(mm$) | 2,158 | -3,465 | 19,864 | 11 | 241 | 1,202 |
| Suppliers | 1,786 | 0 | 16 | 1 | 1.82 | 2.33 |
| Alliance Partners | 560 | 0 | 9 | 1 | 1.36 | 0.91 |
| Customers | 1,477 | 0 | 17 | 1 | 2.65 | 3.29 |
| Distributors | 460 | 0 | 11 | 1 | 1.88 | 1.37 |
| Competitors | 1,946 | 0 | 121 | 6 | 8.29 | 10.11 |
| Offices | 362 | 0 | 19 | 1 | 1.96 | 2.81 |
| Shareholders | 2,125 | 0 | 10 | 10 | 8.96 | 2.32 |

Firms in our sample have $4.2 billion of total assets and 11,501 employees on average. Median (mean) total revenues are $0.38 billion ($3.5 billion) and median (mean) Tobin´s Q is 1.51 (2.04). The median (average) firm of our sample has 2 (2.96) major suppliers, 1 (2.65) major customer(s), and 1 (1.88) major distributor(s). Firms have on average nearly ten competitors and nine designated major shareholders with more than 1% of shares. Only for 362 firms office locations are specified.[12]

[11] Number of firms (N) indicates number of firms that have at least one of the respective stakeholders.
[12] We rerun all of our analyses and exclude outliers and extreme values. De facto, results remain stable and seem not to be driven by outliers.

*Distances to stakeholders*

*Table 1.4* shows descriptive statistics on distances between U.S. firms and major stakeholders as well as distances to offices. Distances are presented in kilometers.

**Table 1.4: Descriptive Statistics of Distances from U.S. Public Firms to Stakeholders**

| U.S. – Firms | N | Min | Max | Median | Average | Standard Deviation |
|---|---|---|---|---|---|---|
| Customers | 1,477 | 0.12 | 16,928.19 | 1,707.18 | 2,652.75 | 3,061.61 |
| Distributors | 460 | 1.48 | 16,956.83 | 4,347.93 | 4,525.56 | 3,286.50 |
| Suppliers | 1,786 | 0.19 | 17,836.56 | 3,908.48 | 3,279.90 | 3,152.12 |
| Alliance Partners | 560 | 2.11 | 19,865.54 | 5,268.41 | 5,278.87 | 4,759.69 |
| Competitors | 1,946 | 0.88 | 18,760.54 | 2,004.06 | 3,239.39 | 2,664.05 |
| Shareholders | 2,125 | 0.05 | 19,599.56 | 2,066.58 | 2,939.12 | 1,393.33 |
| Offices | 362 | 0.47 | 18,700.55 | 2,546.91 | 4,620.31 | 5,004.59 |

It is apparent that customers with a mean distance of 2,653 kilometers are located on average closer to the firm than competitors (3,239 km) and suppliers (3,280 km). This statement also holds for general relations concerning median distances to respective stakeholders. Alliance partners are on average the most remote stakeholders with an average distance of 5,278 kilometers and a median distance of 5,268 kilometers, followed by distributors (4,525 km on average and a median distance of 4,348 km). Though, as firms can favor specific alliance partners and distributors, we would argue that they prefer stakeholders that provide special advantages and counterbalance potentially negative spatial remoteness effects.

We present the industry distribution of firms in our sample in *Table 1.5*.

**Table 1.5: Industry Distribution of U.S. Public Firms**

| | Absolute Numbers | Percentage of Total Sample |
|---|---|---|
| Relationship Industries | 958 | 44% |
| Non-Relationship Industries | 1,200 | 56% |
| Non-Durable Goods | 451 | 23% |
| Durable Goods | 489 | 21% |
| Service Industries | 1,218 | 56% |
| Knowledge Intensive | 702 | 33% |
| Non-knowledge Intensive | 1,456 | 67% |
| High-Technology Manufacturing | 301 | 14% |
| Low-Technology Manufacturing | 758 | 35% |
| Non-manufacturing | 999 | 51% |

In our sample, we have 56% of firms being classified as operating in relationship industries. This is comparable to the sample of Cremers and Nair (2008) who report that 46% of total firms operate in relationship industries. 23% of firms from our sample are in a non-durable goods industry and 21% of total firms produce durable goods, while 56% operate in the service industry. One third of firms in our sample is classified as operating in knowledge-intensive industries (according to the classification of Legler and Frietsch 2006). Applying a different classification for manufacturing firms from the OECD (2009), we have 14% of total firms in high-knowledge and 35% of total firms in low-knowledge manufacturing industries.

*Location of headquarters*

A distribution of headquarters across the United States is shown in *Figure 1.2.*

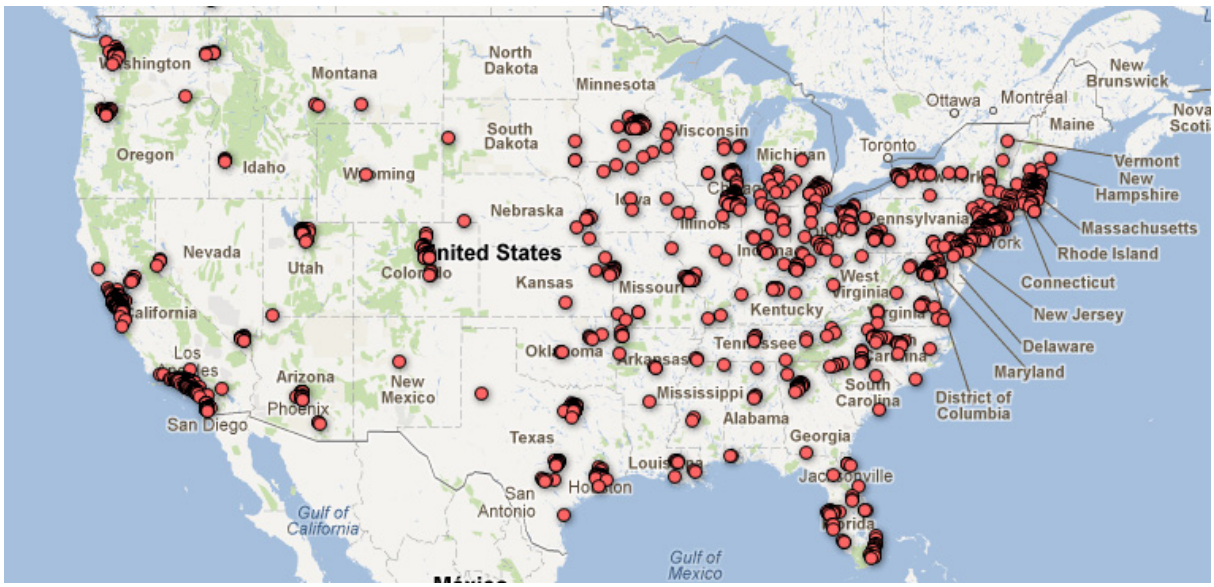


Figure 1.2: Location of Corporate Headquarters

A massive firm clustering for the New York metropolitan area as well for the Los Angeles area can be observed (see also Delgado et al. 2012 and Coval and Moskowitz 1999 for similar clusters). We calculate a Gini coefficient for firms of our sample. A Gini Index measures the distribution of headquarters among states. A value of "0" would mean that all firms are equally dispersed among federal states, a Gini Index of "1" would indicate that all headquarters are located in one single state. We obtain a Gini Index of 0.641, which confirms that firms in our sample are relatively concentrated. A detailed geographic distribution of headquarters among states in the U.S. can be found in *Appendix A*.

*Location of stakeholders*

*Table 1.6* shows identification quotes, number of total identified stakeholders, and location of stakeholders.

**Table 1.6: Identification Quotes and Stakeholder Locations**

| | Quote of Identification | Identified Stakeholder | U.S. Firms | European Firms | Asian Firms | Rest of World |
|---|---|---|---|---|---|---|
| Customers | 46.34% | 2,807 | 60.49% | 14.68% | 18.63% | 6.20% |
| Suppliers | 58.72% | 4,337 | 61.27% | 17.41% | 17.81% | 3.50% |
| Alliance Partners | 38.36% | 761 | 61.03% | 16.54% | 15.10% | 7.35% |
| Competitors | 63.03% | 17,867 | 75.85% | 12.61% | 11.16% | 0.37% |
| Distributors | 45.82% | 867 | 60.81% | 13.86% | 13.15% | 12.18% |
| Shareholder | 93.01% | 20,061 | 84.99% | 9.06% | 3.43% | 2.51% |

In total, 2,807 customers and 4,337 suppliers as well as 761 alliance partners can be determined by our identification approach. The identification rates are similar or even better in comparison to Banerjee et al. (2008) who report a rate of 37% regarding identified public firm customers with a similar approach. Nearly two third of all stakeholders are located within the United States. The remaining stakeholders are mainly from Europe and Asia, while only a small part (between 0.37% and 12.18%) is from the rest of the world. Majority of shareholders (~85%) is located domestically, which shows parallels to the data of Chhaochharia et al. (2012) indicating a home bias of investors.

## 1.4 Results and Robustness Tests

### 1.4.1 Empirical Analyses

Our results are presented in the following section. We start our analysis by examining which firm characteristics vary with distance to stakeholders. Thus, we divide our sample in four distance quartiles for every specific stakeholder in order to conduct a univariate analysis.

Results for the extreme quartiles are presented in *Table 1.7*, showing the firms with the nearest ($1^{st}$ quartile) and the most remote ($4^{th}$ quartile) stakeholder, respectively. In addition, we report differences in means.

Firms in the first quartile (with closely located stakeholders) have on average lower cash levels, higher leverage levels, as well as lower R&D intensities than firms in the fourth quartile. This is especially true and highly significant for stakeholders whose location cannot be indirectly influenced by certain firm preferences (customers, shareholders and competitors).

The finding that firms with geographically close alliance partners have a significantly higher growth rate (15.2%) than firms with remote alliance partners (6.5%) points to the existence of a cluster effect that facilitates knowledge transfers and business co-operations. Nevertheless, no other distance effects of alliance partners can be found. It is apparent that firms with close competitors and shareholders are on average smaller (with a difference of $2.3 billion in total assets for competitors and $1.7 billion for shareholders) and older (roughly 9 (15) years for competitors (shareholders)) than firms of the last quartile. Total compensation of CEOs tends to be significantly higher for firms with most remote customers, alliance partners, and competitors. Managers in firms with remote customers and alliance partners earn round about $1 million more, while managers in firms with remote competitors earn an extra of $4.73 million in terms of total compensation.

## Table 1.7: Comparison of Means

This table contains comparison of means. Firms are divided into quartiles with respect to the median distance to their respective stakeholders. First quartile (1st) includes firms with the closest stakeholders, 4th percentile includes firms with most remote stakeholders. Difference of means is reported for every group of stakeholders. All variables are defined as explained in *Table 1.1*. A constant term, whose value is not reported, is included in all regressions. Asterisks denote statistical significance at the 0.01(***), 0.05(**), and 0.10(*)- level.

| | Customers | | | Distributors | | | Suppliers | | | Competitors | | | Alliance Partners | | | Shareholders | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **1st** | **4th** | **Diff.** | **1st** | **4th** | **Diff.** | **1st** | **4th** | **Diff.** | **1st** | **4th** | **Diff.** | **1st** | **4th** | **Diff.** | **1st** | **4th** | **Diff.** |
| Leverage | 0.224 | 0.157 | 0.067*** | 0.175 | 0.163 | 0.012 | 0.207 | 0.197 | 0.010 | 0.240 | 0.180 | 0.060*** | 0.159 | 0.190 | -0.031 | 0.232 | 0.175 | 0.058*** |
| Total Assets (mm$) | 3,932 | 3,689 | 243 | 8,543 | 14,461 | -5,918 | 3,717 | 5,155 | -1,438 | 2,192 | 4,530 | -2,338*** | 3,286 | 5,579 | -2,292* | 1,938 | 3,677 | -1,738*** |
| Firm Age | 49.17 | 41.31 | 7.85*** | 44.41 | 45.65 | -1.24 | 50.29 | 39.33 | 10.96*** | 50.10 | 40.93 | 9.17*** | 47.74 | 49.70 | -1.96 | 49.61 | 34.15 | 15.46*** |
| Return on Sales | 0.02 | -0.08 | 0.10** | 0.03 | 0.01 | 0.02 | 0.01 | -0.04 | 0.05 | -0.07 | 0.05 | 0.12*** | -0.02 | -0.05 | 0.03 | -0.02 | -0.04 | 0.02 |
| Tobin´s Q | 1.958 | 2.090 | -0.132 | 1.986 | 2.333 | -0.347* | 1.953 | 2.114 | -0.161 | 1.861 | 1.970 | -0.109 | 2.271 | 2.571 | -0.301 | 2.102 | 2.213 | -0.112 |
| Return on Assets (RoA) | 0.038 | 0.029 | 0.009 | 0.041 | 0.041 | 0.000 | 0.037 | 0.024 | 0.012 | 0.042 | 0.028 | 0.015 | 0.034 | 0.022 | 0.012 | 0.035 | 0.028 | 0.006 |
| SG&A Margin | 0.252 | 0.277 | -0.025 | 0.262 | 0.303 | -0.042 | 0.255 | 0.278 | -0.023 | 0.243 | 0.242 | 0.001 | 0.259 | 0.292 | -0.033 | 0.259 | 0.293 | -0.035** |
| Sales Growth | 0.082 | 0.109 | -0.027 | 0.109 | 0.277 | -0.169 | 0.098 | 0.130 | -0.032 | 0.070 | 0.104 | -0.034 | 0.152 | 0.065 | 0.086** | 0.120 | 0.186 | -0.065 |
| Diversification | 0.242 | 0.218 | 0.024 | 0.236 | 0.235 | 0.001 | 0.212 | 0.246 | -0.034 | 0.208 | 0.231 | -0.023 | 0.189 | 0.241 | -0.051 | 0.220 | 0.239 | -0.019 |
| Cash/TA | 0.137 | 0.193 | -0.056*** | 0.169 | 0.176 | -0.006 | 0.146 | 0.177 | -0.031*** | 0.133 | 0.175 | -0.042*** | 0.185 | 0.176 | 0.009 | 0.143 | 0.200 | -0.057*** |
| R&D Intensity | 0.027 | 0.072 | -0.045*** | 0.048 | 0.061 | -0.013 | 0.036 | 0.068 | -0.032*** | 0.028 | 0.060 | -0.032*** | 0.059 | 0.061 | -0.002 | 0.040 | 0.065 | -0.025*** |
| Insiders Owned | 0.174 | 0.087 | 0.087*** | 0.078 | 0.069 | 0.008 | 0.115 | 0.096 | 0.020 | 0.132 | 0.093 | 0.039*** | 0.085 | 0.085 | 0.001 | 0.130 | 0.111 | 0.019* |
| Payout Ratio | 0.19 | 0.13 | 0.06 | 0.22 | 0.15 | 0.07 | 0.27 | 0.14 | 0.13** | 0.14 | 0.14 | 0.00 | 0.16 | 0.11 | 0.05 | 0.16 | 0.09 | 0.07** |
| CEO Total compensation (in mm$) | 3.56 | 4.56 | -1.00** | 5.17 | 6.65 | -1.48 | 4.25 | 4.27 | -0.02 | 2.17 | 6.90 | -4.73*** | 4.07 | 5.23 | -1.16* | 3.44 | 3.71 | -0.27 |

We continue our analysis with multivariate regressions on firm performance. *Table 1.8* shows our regressions with return on sales (RoS) calculated as net income to total revenues as dependent variable and distances to a variety of stakeholders as explanatory variables.

Our results point to the fact that only proximity to major customers and competitors has a significant impact on firm performance. While return on sales decreases (significantly at the 5 percent level) with distance to major customers, proximity to competitors has a reverse effect. We find that performance increases very significantly (at the 1 percent level) with distance to competitors. Other stakeholders do not show any significant influences on our dependent variable. Though not significant, we find a slightly negative coefficient regarding distance to shareholders. This is in line with the argumentation by Chhaochharia et al. (2012) who point out that close shareholders exhibit better monitoring and, thus, increase firm performance. In addition, we find weakly significant indication that the number of major shareholders decreases firm performance. Similar to Laeven and Levine (2008), we would interpret this as result of rent extraction and free-rider problems of multiple blockholders.[13]

In the following, we focus on customer and competitors and use several different industry classifications to analyze the impact of our three main proximity concepts on corporate performance. *Table 1.9* shows our regressions with return on sales as dependent variable and customer related explanatory variables.

[13] In contrast, Edmans and Manso (2011) document that the presence of multiple blockholders (with more than 5% of total shares) can lead to enhanced corporate governance by disciplinary trading. Using the CIQ classification that lists all shareholders with more than "1% of total shares" as major shareholders, we would argue that the free rider problems outweigh the disciplinary trading argument in our sample.

**Table 1.8: Regressions Results - Stakeholder Proximity and Return on Sales**

This table contains regressions with *return on sales (net income to total revenues)* as dependent variable. In case of the variables *Number Stakeholder"X"* and *Log Median Distance Stakeholder "X"* the "X" refers to the stakeholder in the respective column. All other variables are defined as explained in *Table 1.1*. A constant term, whose value is not reported, is included in all regressions. T-statistics are reported in parentheses. Asterisks denote statistical significance at the 0.01(***), 0.05(**) and 0.10(*)-level.

| "X"=... | Customers | Distributors | Suppliers | Alliance Partners | Competitors | Shareholders |
|---|---|---|---|---|---|---|
| Log Median Distance Stakeholder "X" | -0.072** | -0.050 | -0.025 | -0.014 | 0.082*** | -0.026 |
| | (-2.447) | (-0.990) | (-0.811) | (-0.317) | (3.189) | (-1.062) |
| Number Stakeholder "X" | 0.067** | -0.026 | 0.009 | 0.019 | 0.014 | -0.052* |
| | (2.282) | (-0.503) | (0.268) | (0.416) | (0.468) | (-1.924) |
| Leverage | -0.052 | -0.036 | -0.039 | -0.309*** | -0.081*** | -0.088*** |
| | (-1.623) | (-0.587) | (-1.094) | (-6.036) | (-2.905) | (-3.266) |
| Sales Growth | -0.040 | -0.179*** | 0.005 | -0.242*** | -0.038 | -0.054** |
| | (-1.389) | (-3.399) | (0.153) | (-4.828) | (-1.479) | (-2.205) |
| Size | 0.083** | 0.215*** | 0.122*** | 0.362*** | 0.122*** | 0.148*** |
| | (2.415) | (3.267) | (3.185) | (6.177) | (3.519) | (4.833) |
| Firm Age | 0.097*** | 0.085 | 0.091** | 0.045 | 0.076** | 0.078*** |
| | (2.837) | (1.385) | (2.456) | (0.766) | (2.536) | (2.792) |
| Diversification | 0.022 | 0.045 | -0.038 | -0.010 | -0.010 | -0.007 |
| | (0.748) | (0.882) | (-1.245) | (-0.227) | (-0.413) | (-0.307) |
| Cash/TA | -0.021 | 0.020 | 0.001 | -0.053 | -0.039 | -0.062** |
| | (-0.655) | (0.358) | (0.033) | (-1.053) | (-1.394) | (-2.338) |
| Volatility | -0.150*** | -0.066 | -0.164*** | 0.023 | -0.104*** | -0.109*** |
| | (-4.750) | (-1.203) | (-4.967) | (0.450) | (-3.797) | (-4.249) |
| Dummy Dividends | -0.028 | -0.011 | -0.054* | -0.055 | -0.033 | -0.044* |
| | (-0.927) | (-0.214) | (-1.695) | (-1.158) | (-1.259) | (-1.746) |
| Industry Controls | Yes | Yes | Yes | Yes | Yes | Yes |
| N | 1,132 | 369 | 1,003 | 403 | 1,474 | 1,628 |
| $R^2$ | 0.084 | 0.131 | 0.091 | 0.253 | 0.077 | 0.085 |
| F-Stat. (p-Value) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

## Table 1.9: Regressions Results - Return on Sales

This table contains regressions with *return on sales* (*net income to total revenues). Rel1 (Rel0)* indicates firms in (non) relationship industries. *Know1 (Know0)* indicates firms in (non) knowledge-intensive industries. *HighTech (LowTech)* indicates firms in high (low) technology industries. *Service (Non-service)* indicates firms in service (manufacturing) industries. All variables are defined as explained in *Table 1.1*. A constant term, whose value is not reported, is included in all regressions. T-statistics are reported in parentheses. Asterisks denote statistical significance at the 0.01(***), 0.05(**) and 0.10(*)-level.

| | (1) All | (2) Rel1 | (3) Rel0 | (4) Know1 | (5) Know0 | (6) High Tech | (7) Low Tech | (8) Non-service | (9)Service |
|---|---|---|---|---|---|---|---|---|---|
| Log Median Distance Customers | -0.073** | -0.095** | -0.023 | -0.002 | -0.095** | -0.062 | -0.093** | -0.089** | -0.037 |
| | (-2.447) | (-2.289) | (-1.448) | (-0.043) | (-2.609) | (-0.798) | (-1.996) | (-2.093) | (-0.911) |
| Number Customers | 0.065** | 0.076** | -0.023 | -0.021 | 0.082** | 0.067 | 0.077 | 0.088** | 0.040 |
| | (2.196) | (1.832) | (1.042) | (-0.411) | (2.225) | (0.850) | (1.576) | (1.991) | (0.988) |
| Leverage | -0.054* | -0.169*** | -0.028 | -0.065 | -0.040 | -0.008 | -0.025 | -0.035 | -0.074* |
| | (-1.702) | (-3.914) | (0.663) | (-1.286) | (-0.964) | (-0.096) | (-0.502) | (-0.770) | (-1.714) |
| Sales Growth | -0.043 | -0.059 | -0.004 | -0.041 | -0.042 | -0.023 | -0.089* | -0.088** | 0.034 |
| | (-1.447) | (-1.439) | (-0.868) | (-0.779) | (-1.156) | (-0.295) | (-1.884) | (-2.057) | (0.831) |
| Size | 0.066 | 0.153*** | -0.049 | 0.400*** | 0.003 | 0.354*** | 0.027 | 0.016 | 0.150*** |
| | (1.597) | (2.641) | (-0.274) | (6.184) | (0.056) | (3.666) | (0.410) | (0.267) | (2.892) |
| Firm Age | 0.080** | 0.123** | 0.092 | 0.001 | 0.092** | 0.070 | 0.033 | 0.039 | 0.156*** |
| | (2.143) | (2.366) | (1.042) | (0.013) | (2.076) | (0.697) | (0.567) | (0.753) | (3.049) |
| Diversification | 0.017 | 0.019 | -0.052 | -0.068 | 0.033 | 0.007 | 0.027 | 0.020 | 0.037 |
| | (0.494) | (0.377) | (0.455) | (-1.108) | (0.759) | (0.090) | (0.583) | (0.481) | (0.930) |
| Volatility | -0.154*** | -0.016 | -0.091*** | 0.020 | -0.206 | 0.038 | -0.301*** | -0.284*** | 0.021 |
| | (-4.804) | (-0.352) | (-6.672) | (0.390) | (-5.053) | (0.471) | (-5.811) | (-6.009) | (0.471) |
| Dummy Dividends | 0.000 | 0.002** | 0.030 | 0.044 | -0.010 | -0.016 | -0.001 | -0.004 | 0.002 |
| | (-0.008) | (0.043) | (-0.577) | (0.729) | (-0.212) | (-0.165) | (-0.023) | (-0.070) | (0.050) |
| Dummy NYSE | 0.020 | -0.001** | (0.084 | -.095 | 0.047 | -0.040 | 0.044 | 0.045 | -0.007 |
| | (0.514) | (-.025) | (0.572) | (-1.414) | (0.950) | (-0.383) | (0.664) | (0.778) | (-0.133) |
| Dummy Stakeholder State | -0.018 | -0.040 | -0.062 | -0.026 | -0.016 | -0.019 | -0.024 | -0.016 | -0.018 |
| | (-0.609) | (-0.954) | (0.107) | (-0.504) | (-0.435) | (-0.234) | (-0.504) | (-0.374) | (-0.444) |
| Dummy Delaware | -0.041 | -0.072 | -0.730 | -0.100* | -0.047 | -0.014 | -0.060 | -0.059 | -0.032 |
| | (-1.324) | (-1.658) | (-0.267) | (-1.838) | (-1.255) | (-0.167) | (-1.211) | (-1.306) | (-0.752) |
| Industry Controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| N | 1,126 | 566 | 557 | 379 | 746 | 175 | 428 | 519 | 612 |
| $R^2$ | 0.082 | 0.113 | 0.119 | 0.141 | 0.101 | 0.129 | 0.145 | 0.134 | 0.076 |
| F-Stat. (p-Values) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.040 | 0.000 | 0.000 | 0.000 |

In our main model with the full sample (M1), distance to customers is negatively and significantly (at the 5 percent level) connected to firm performance. As expected, a higher number of major customers provides the firm with more stable cash-flows and leads to an increased firm performance. With regard to our control variables, we find that volatility exhibits a negative impact on firm performance, while firm size is positively connected to firm performance (see Capon et al. 1990 and Masulis et al. 2009). In our second model specification, we acknowledge a significant (at the 5 percent level) and negative relation of our main proximity variable to firm performance in relationship industries in contrast to the insignificant effect in non-relationship industries. In contrast to our initial expectations, we find a significant (at the 5 percent level) and negative effect of customer distance in non-knowledge intensive (M5) and low-technology (M7) industries. Additionally, we find an inverse and significant relation of customer proximity on firm performance for firms in non-service (i.e., manufacturing) industries (M8) that are supposed to have high transportation costs. Contrarily, we do not find any significant distance-related effect for firms in service industries. Overall, while social networks and transportation costs seem to play a major role in explaining proximity effects of customers on firm performance, we find no significant effect for knowledge intensive or high-tech industries. We suggest the following interpretations. First, firms operating in high-tech/knowledge-intensive industries are acquainted to the handling, storage, and transfer of complex data. In contrast to their counterparts in low-tech industries, they could have established more efficient ways to coordinate as well as steer processes over long distances and communicate with remote customers. Second, as firms in high tech industries spend large amounts of money for research and development, they are able to develop differentiated products that are suited for geographically remote markets. Thus, they possibly adapt more easily to demands of spatially remote customers and counterbalance potential disadvantages. Finally, we assume that firms with specialized products can pass on distance-related costs to their customer so that firm performance remains unaffected.

In *Table 1.10* we show the results of our regressions with industry-adjusted return on sales (defined as net income to total revenues minus the industry median of return on sales) as dependent variable. We receive nearly identical figures for this alternative dependent variable and refer to the precedent discussion of the results.

In the next step, we analyze the effects of competitor proximity on firm performance. *Table 1.11* presents our regressions with return on sales as dependent variable and competitor related variables.

## Table 1.10: Regressions Results - Industry-adjusted Return-on-Sales - Customer

This table contains regressions with *industry-adjusted return on sales (return on sales minus industry median of return on sales)* as dependent variable. A constant term, whose value is not reported, is included in all regressions. *Rel1 (Rel0)* indicates firms in (non) relationship industries. *Know1 (Know0)* indicates firms in (non) knowledge-intensive industries. *HighTech (LowTech)* indicates firms in high (low) technology industries. *Service (Non-service)* indicates firms in service (manufacturing) industries. All variables are defined as explained in *Table 1.1*.T-statistics are reported in parentheses. Asterisks denote statistical significance at the 0.01(***), 0.05(**) and 0.10(*)-level.

| | (1) All | (2) Rel1 | (3) Rel0 | (4) Know1 | (5) Know0 | (6) HighTech | (7) LowTech | (8) Non-Service | (9)Service |
|---|---|---|---|---|---|---|---|---|---|
| Log Median Distance Customers | -0.095** | -0.099** | -0.061 | 0.007 | -0.096*** | -0.049 | -0.094** | -0.089** | -0.039 |
| | (-2.272) | (-2.389) | (-1.474) | (0.128) | (-2.648) | (-0.637) | (-2.013) | (-2.095) | (-0.953) |
| Number Customers | 0.077* | 0.077* | 0.042 | -0.025 | 0.084** | 0.069 | 0.078 | 0.090** | 0.040 |
| | (1.846) | (1.872) | (1.008) | (-0.505) | (2.271) | (0.877) | (1.596) | (2.021) | (0.998) |
| Leverage | -0.169*** | -0.165*** | 0.032 | -0.064 | -0.040 | -0.006 | -0.027 | -0.037 | -0.071 |
| | (-3.910) | (-3.840) | (0.714) | (-1.266) | (-0.959) | (-0.073) | (-0.543) | (-0.796) | (-1.649) |
| Sales Growth | -0.059 | -0.053 | -0.037 | -0.045 | -0.043 | -0.026 | -0.090* | -0.089** | 0.034 |
| | (-1.445) | (-1.290) | (-0.890) | (-0.854) | (-1.183) | (-0.340) | (-1.911) | (-2.078) | (0.827) |
| Size | 0.155** | 0.164*** | -0.015 | 0.411*** | 0.003 | 0.368*** | 0.029 | 0.018 | 0.151*** |
| | (2.673) | (3.009) | (-0.262) | (6.349) | (0.065) | (3.818) | (0.427) | (0.289) | (2.911) |
| Firm Age | 0.122** | 0.142*** | 0.054 | -0.012 | 0.094** | 0.061 | 0.033 | 0.039 | 0.157*** |
| | (2.346) | (2.796) | (1.010) | (-0.184) | (2.125) | (0.608) | (0.568) | (0.749) | (3.064) |
| Diversification | 0.018 | 0.061 | 0.028 | -0.066 | 0.030 | 0.007 | 0.026 | 0.019 | 0.037 |
| | (0.364) | (1.501) | (0.555) | (-1.075) | (0.699) | (0.091) | (0.576) | (0.462) | (0.922) |
| Volatility | -0.014 | -0.010 | -0.307*** | 0.030 | -0.206*** | 0.042 | -0.299*** | -0.282*** | 0.021 |
| | (-0.323) | (-0.230) | (-6.586) | (0.577) | (-5.058) | (0.530) | (-5.775) | (-5.969) | (0.477) |
| Dummy Dividends | 0.001 | 0.002 | -0.033 | 0.047 | -0.012 | 0.001 | -0.005 | -0.005 | -0.001 |
| | (0.016) | (0.031) | (-0.610) | (0.773) | (-0.258) | (0.005) | (-0.075) | (-0.100) | (-0.017) |
| Dummy NYSE | -0.001 | 0.001 | 0.030 | -0.104 | 0.047 | -0.052 | 0.045 | 0.046 | -0.009 |
| | (-0.027) | (0.022) | (0.531) | (-1.556) | (0.953) | (-0.506) | (0.673) | (0.782) | (-0.176) |
| Dummy Stakeholder State | -0.040 | -0.039 | 0.007 | -0.022 | -0.016 | -0.019 | -0.024 | -0.016 | -0.017 |
| | (-0.954) | (-0.927) | (0.155) | (-0.413) | (-0.448) | (-0.241) | (-0.508) | (-0.376) | (-0.416) |
| Dummy Delaware | -0.071 | -0.059 | -0.011 | -0.103* | -0.047 | -0.012 | -0.062 | -0.060 | -0.029 |
| | (-1.649) | (-1.374) | (-0.245) | (-1.897) | (-1.261) | (-0.141) | (-1.254) | (-1.335) | (-0.683) |
| Industry Controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| N | 1,126 | 566 | 557 | 379 | 746 | 175 | 428 | 519 | 612 |
| $R^2$ | 0.082 | 0.113 | 0.118 | 0.141 | 0.103 | 0.128 | 0.146 | 0.135 | 0.075 |
| F-Stat. (p-Values) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.030 | 0.000 | 0.000 | 0.000 |

## Table 1.11: Regressions Results - Return on Sales - Competitors

This table contains regressions with *return on sales (net income to total revenues)* as dependent variable. *Rel1 (Rel0)* indicates firms in (non) relationship industries. *Know1 (Know0)* indicates firms in (non) knowledge-intensive industries. *HighTech (LowTech)* indicates firms in high (low) technology industries. *Service (Non-service)* indicates firms in service (manufacturing) industries. All variables are defined as explained in *Table 1.1*. A constant term, whose value is not reported, is included in all regressions. T-statistics are reported in parentheses. Asterisks denote statistical significance at the 0.01(***), 0.05(**) and 0.10(*)-level.

| | (1) All | (2) Rel1 | (3) Rel0 | (4) Know1 | (5) Know0 | (6) High Tech | (7) Low Tech | (8) Non-service | (9) Service |
|---|---|---|---|---|---|---|---|---|---|
| Log Median Distance | 0.085*** | -0.055 | 0.190*** | 0.007 | 0.109*** | 0.002 | 0.164*** | 0.149*** | -0.008 |
| Competitors | (3.274) | (-1.396) | (5.358) | (0.153) | (3.412) | (0.024) | (3.771) | (3.864) | (-0.238) |
| Number Competitors | 0.016 | 0.020 | 0.020 | -0.009 | 0.025 | 0.006 | -0.004 | -0.002 | 0.030 |
| | (0.515) | (0.435) | (0.486) | (-0.164) | (0.675) | (0.073) | (-0.079) | (-0.044) | (0.720) |
| Leverage | -0.078*** | -0.144*** | -0.041 | -0.091** | -0.078** | -0.056 | -0.119*** | -0.107*** | -0.070* |
| | (-2.815) | (-3.658) | (-1.091) | (-2.021) | (-2.251) | (-0.776) | (-2.631) | (-2.681) | (-1.863) |
| Sales Growth | -0.039 | -0.052 | -0.043 | 0.076 | -0.041 | -0.056 | -0.087** | -0.086** | 0.039 |
| | (-1.495) | (-1.370) | (-1.224) | (1.651) | (-1.311) | (-0.806) | (-2.000) | (-2.224) | (1.129) |
| Size | 0.104** | 0.178*** | 0.051 | 0.413*** | 0.050 | 0.346*** | 0.089 | 0.085 | 0.155*** |
| | (2.591) | (2.977) | (0.945) | (6.197) | (0.981) | (3.121) | (1.278) | (1.388) | (2.996) |
| Firm Age | 0.058* | 0.085* | 0.069 | 0.035 | 0.062 | 0.009 | 0.007 | 0.012 | 0.118*** |
| | (1.805) | (1.793) | (1.548) | (0.592) | (1.625) | (0.100) | (0.135) | (0.265) | (2.745) |
| Diversification | 0.008 | 0.007 | 0.004 | -0.082 | 0.018 | 0.005 | 0.014 | -0.020 | -0.002 |
| | (0.260) | (0.154) | (0.103) | (-1.519) | (0.503) | (0.058) | (0.254) | (-0.528) | (-0.071) |
| Volatility | -0.101*** | -0.029 | -0.142*** | 0.027 | -0.125*** | 0.014 | -0.156*** | -0.150*** | -0.015 |
| | (-3.620) | (-0.699) | (-3.708) | (0.582) | (-3.669) | (0.193) | (-3.415) | (-3.677) | (-0.391) |
| Dummy Dividends | 0.031 | 0.007 | 0.027 | 0.069 | 0.031 | 0.037 | 0.049 | 0.047 | 0.016 |
| | (0.974) | (0.146) | (0.602) | (1.256) | (0.789) | (0.401) | (0.892) | (0.963) | (0.381) |
| Dummv NYSE | 0.021 | -0.015 | 0.034 | -0.095 | 0.044 | -0.073 | 0.044 | 0.048 | -0.011 |
| | (0.603) | (-0.297) | (0.713) | (-1.609) | (1.048) | (-0.765) | (0.716) | (0.946) | (-0.234) |
| Dummy Stakeholder State | -0.012 | -0.022 | -0.003 | -0.026 | -0.013 | -0.013 | -0.024 | -0.018 | -0.008 |
| | (-0.474) | (-0.580) | (-0.091) | (-0.564) | (-0.423) | (-0.173) | (-0.553) | (-0.474) | (-0.238) |
| Dummy Delaware | -0.040 | -0.071* | -0.012 | -0.072 | -0.043 | -0.062 | -0.042 | -0.046 | -0.041 |
| | (-1.472) | (-1.796) | (-0.335) | (-1.516) | (-1.317) | (-0.805) | (-0.917) | (-1.164) | (-1.109) |
| Industry Controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| N | 1,444 | 688 | 777 | 469 | 996 | 210 | 516 | 658 | 815 |
| $R^2$ | 0.076 | 0.095 | 0.104 | 0.155 | 0.084 | 0.113 | 0.125 | 0.112 | 0.071 |
| F-Stat. (p-Values) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.028 | 0.000 | 0.000 | 0.000 |

Our main regression using the overall sample (M1) shows that distance to competitors significantly increases firm performance. As firms share the same regional market for employees, products, and resources, they have to face higher levels of competition and inferior market conditions (see, e.g., Graitson 1982). This is, for instance, due to increased advertising costs and higher expenditures for research and development in order to produce local competitive advantages. In contrast, number of competitors does not influence firm performance in any of the different model specifications. In Model 2 and Model 3 it becomes apparent that geographical remoteness of competitors in non-relationship industries significantly (ß=0.190) improves firm performance, while there is no detectable impact on performance of firms in relationship industries. We interpret this finding as follows: as interactions in relationship industries rely on long-term relations with customers and social networks (see Cremers and Nair 2008), firms in these industries are not influenced as strongly by the closeness of competitors. Results further indicate that remoteness to competitors is an important positive and highly significant factor (at the 1 percent level) in non-knowledge intensive (M5) and low-technology (M7) industries. Contrarily to our expectations, only insignificant effects can be observed in knowledge-intensive (M4) as well as in high-technology (M6) industries. Shaver and Flyer (2000) argue that geographic proximity to competitors can result in involuntary knowledge outflows. Contrary to our expectations, this disadvantage of spatially close competitors is especially prevalent in low technology and non-knowledge intensive industries. We would argue that these knowledge outflows are more likely to occur in firms that produce undifferentiated goods that are less reliant on intensive research and development and easier to imitate. Additionally, we find a significant and positive relation between remoteness of competitors and performance of firms in non-service industries. This can be ascribed to the circumstance that remote competitors in these industries face severe transportation costs and struggle to compete with prices on local markets.

### 1.4.2 Robustness Tests

In this section, we present our robustness tests. Results are shown in *Table 1.12*. All displayed robustness tests use industry-adjusted return on sales as dependent variable.

## Table 1.12: Regressions Results - Robustness Tests - Industry-adjusted Return on Sales

This table contains regressions with *industry-adjusted return on sales (return on sales minus industry median of return on sales).* All variables are defined as explained in *Table 1.1*. A constant term, whose value is not reported, is included in all regressions. Regressions in column 7 and column 8 are without firms from New York and without firms from New York and California, respectively. T-statistics are reported in parentheses. Asterisks denote statistical significance at the 0.01(***), 0.05(**) and 0.10(*)-level.

| | | | | | | | | (excl. NY) | (excl. NY/CA) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) |
| Average Distance Customer | -0.071** | | | | | | | | | | |
| | (-2.398) | | | | | | | | | | |
| Median Distance Customer | | -0.063** | | | | | | | | | |
| | | (-2.130) | | | | | | | | | |
| Minimum Distance Customer | | | -0.079** | | | | | | | | |
| | | | (-2.559) | | | | | | | | |
| Growing Median Distance | | | | -0.060* | | | | | | | |
| | | | | (-1.723) | | | | | | | |
| Prox Distance Airport | | | | | -0.060* | | | | | | |
| | | | | | (-1.851) | | | | | | |
| Prox Distance Harbor | | | | | | -0.070** | | | | | |
| | | | | | | (-2.178) | | | | | |
| Remote Big City | | | | | | | -0.054* | | | | |
| | | | | | | | (-1.796) | | | | |
| Stock Listed | | | | | | | | | | | 0.062* |
| | | | | | | | | | | | (1.952) |
| Same SIC | | | | | | | | | | 0.051* | |
| | | | | | | | | | | (1.735) | |
| Log Median Distance Customers | | | | | -0.068** | -0.068** | -0.074** | -0.078** | -0.060* | -0.069** | -0.072** |
| | | | | | (-2.228) | (-2.236) | (-2.471) | (-2.511) | (-1.688) | (-2.349) | (-2.296) |
| Number Customers | 0.061** | 0.057* | 0.039 | 0.065* | 0.062** | 0.061** | 0.061** | 0.068** | 0.050 | | 0.064** |
| | (2.056) | (1.913) | (1.248) | (1.868) | (2.043) | (2.014) | (2.011) | (2.160) | (1.390) | | (2.034) |

| **(Continuation of *Table 1.12*)** | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Leverage | -0.053* | -0.053* | -0.042 | -0.055 | -0.048 | -0.051 | -0.043 | -0.057* | -0.049 | -0.060** | -0.044 |
| | (-1.675) | (-1.671) | (-1.340) | (-1.499) | (-1.476) | (-1.565) | (-1.321) | (-1.728) | (-1.285) | (-1.973) | (-1.379) |
| Sales Growth | -0.043 | -0.043 | -0.041 | 0.064 | -0.042 | -0.043 | -0.042 | -0.017 | -0.039 | -0.046 | -0.053* |
| | (-1.457) | (-1.455) | (-1.378) | (1.789) | (-1.412) | (-1.429) | (-1.412) | (-0.545) | (-1.106) | (-1.584) | (-1.693) |
| Size | 0.069* | 0.066 | 0.075* | 0.032 | 0.083* | 0.083* | 0.074* | 0.049 | 0.019 | 0.059 | 0.041 |
| | (1.657) | (1.588) | (1.896) | (0.651) | (1.951) | (1.968) | (1.754) | (1.137) | (0.379) | (1.636) | (1.068) |
| Firm Age | 0.081** | 0.081** | 0.096*** | 0.103** | 0.064* | 0.065* | 0.073* | 0.075* | 0.073* | 0.085** | 0.056 |
| | (2.177) | (2.167) | (2.612) | (2.278) | (1.673) | (1.710) | (1.931) | (1.905) | (1.676) | (2.082) | (1.302) |
| Diversification | 0.014 | 0.014 | 0.017 | 0.008 | 0.013 | 0.013 | 0.019 | 0.022 | 0.010 | 0.014 | 0.016 |
| | (0.392) | (0.403) | (0.596) | (0.198) | (0.352) | (0.375) | (0.540) | (0.610) | (0.236) | (0.408) | (0.426) |
| Volatility | -0.154*** | -0.153*** | -0.149*** | -0.138*** | -0.157*** | -0.159*** | -0.156*** | -0.164*** | -0.222*** | -0.156*** | -0.163*** |
| | (-4.810) | (-4.778) | (-4.646) | (-3.641) | (-4.815) | (-4.853) | (-4.769) | (-4.880) | (-5.867) | (-4.881) | (-4.810) |
| Dummy Dividends | -0.001 | 0.000 | -0.005 | 0.010 | -0.007 | -0.008 | -0.004 | -0.003 | -0.005 | -0.009 | 0.002 |
| | (-0.029) | (0.008) | (-0.147) | 0.229) | (-0.188) | (-0.204) | (-0.094) | (-0.078) | (-0.124) | (-0.239) | (0.057) |
| Dummy NYSE | 0.020 | 0.021 | 0.021 | 0.031 | 0.001 | -0.001 | 0.010 | 0.030 | 0.038 | 0.005 | 0.014 |
| | (0.508) | (0.535) | (0.532) | (0.649) | (0.016) | (-0.034) | (0.243) | (0.724) | (0.792) | (0.127) | (0.337) |
| Dummy Stakeholder State | -0.014 | -0.014 | -0.012 | -0.018 | -0.019 | -0.018 | -0.017 | -0.020 | -0.023 | -0.020 | -0.013 |
| | (-0.452) | (-0.453) | (-0.385) | (-0.500) | (-0.613) | (-0.581) | (-0.562) | (-0.627) | (-0.635) | (-0.670) | (-0.409) |
| Dummy Delaware | -0.039 | -0.040 | -0.027 | -0.025 | -0.038 | -0.037 | -0.053 | -0.041 | -0.026 | -0.046 | -0.043 |
| | (-1.261) | -1.278) | (-0.870) | (-0.679) | (-1.206) | (-1.177) | (-1.644) | (-1.277) | (-0.723) | (-1.501) | (-1.304) |
| Industry Controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| N | 1,127 | 1,126 | 819 | 787 | 1,089 | 1,089 | 1,089 | 1,024 | 783 | 1,126 | 1,004 |
| $R^2$ | 0.081 | 0.080 | 0.075 | 0.073 | 0.083 | 0.084 | 0.083 | 0.081 | 0.089 | 0.069 | 0.074 |
| F-Stat. (p-Value) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

In our first models, we alternatively use non-logarithm distances as explanatory variables (as done by Coval and Moskovitz 1999). Our results still indicate a significant (both at the 5 percent level) and negative relation for average distances to principal customers (M1) as well as for median distances (M2). In M3, we get a similar result by including the distance to the closest customer instead of an aggregated distance measure of all customers. In our fourth model, we include an indicator variable named *GROWING MEDIAN DISTANCE* to answer the question if proximity changes in the customer base have an effect on firm performance. The variable takes a value of one if the median distance to historical customers is smaller than the median distance to recent customers. In line with our main reasoning, we find a negative (ß=-0.076) and at the 10 percent level significant effect on firm performance.

*Alternative measures of transportation costs*

Distances to airports, harbors, and other adequate infrastructure can be seen as alternative approximation for transportation costs (Combes and Lafourcade 2005). Furthermore, a remote location of corporate headquarters (e.g., a bigger distance to a major city) should result in higher transportation costs. First, we calculate the nearest distance to one of the biggest 50 airports in the U.S. as indicated by the Federal Aviation Administration and create an indicator variable *PROX DISTANCE AIRPORT* that has a value of "1" if a firm is located within a 100 km radius of one of these airports and "0" otherwise.

Second, we apply a similar approach by inducing a dummy variable *PROX DISTANCE HARBOR*. This variable gets a value of "1" if a firm is located less than 100 kilometers away from one of the 20 biggest seaports (in total cargo) as classified by the American Association of Port Authorities and "0" in all the other cases. Additionally, we adopt the concept of Coval and Moskowitz (2001) and introduce a dummy variable called "*REMOTE CITY*". A remote city is defined as a city located more than 250 kilometers away from one of the 21 major cities of the United States. The list of the major cities is obtained by the U.S. Census Bureau population surveys of 1990 and 2000.[14]

Consequently, in Models 5 – 7 we step by step include our variables *PROX DISTANCE AIRPORT, PROX DISTANCE HARBOR* and *REMOTE CITY* indicating the average distance to the respective transportation hub and bigger cities. We especially expect distance to sea ports to have a negative relation to firm performance. Every variable shows a negative and weakly significant (at the 10 percent level for proximity to airports and bigger cities and at the 5 percent

[14] In further, not reported regressions we use the distance to the federal capitol (as potential administrative and commercial centre of a state) as alternative remoteness variable. Though, results remain qualitatively unchanged.

level for proximity to harbors) influence on firm performance which points to transportation costs that increase with distance.

*Alternative measures of information asymmetries*

The following proxies should mainly affect performance due to informational asymmetries and not transportation costs. Firstly, we incorporate number of customers from same three-digit SIC-industry (*SAME SIC*). A higher number of customers from same industry should lead to lower uncertainties and should therefore affect performance positively. While geographic proximity still shows the negative relation on firm performance, we find a slightly significant and positive coefficient for customers from the same three-digit SIC industry. Secondly, we incorporate the ratio of stock listed customers to total customers (*STOCK LISTED*). Equally, we expect that a higher ratio should result in lower information asymmetries towards customers as information publishing and visibility is much higher for public stakeholders. Our findings confirm this as the variable *STOCK LISTED* exhibits a significant and positive influence on industry-adjusted return on sales.

*Cluster effects*

As Delgado et al. (2012) show, firms located in industrial clusters exhibit performance gains. In order to validate our findings and abstract from cluster effects, we exclude firms located in the New York Metropolitan area and California as they represent the biggest industry clusters in our sample. Results presented in Models 8 and 9 remain virtually the same. Further, according to Klepper (2007) clusters can be in different life cycle stages and, thus, shape the business procedures and performances of associated firms differently. We acknowledge that these are potential omitted cluster effects that we cannot control for.

*Further robustness tests and reverse causality*

We rerun our regressions with return on assets (*RoA*) and industry-adjusted return on assets (firm RoA minus industry median of RoA) as alternative performance measure. Results stay nearly the same though slightly less significant in general. In addition, in order to control for corporate governance aspects (see Gillan et al. 2007 and Palia 2001), we include the following variables into our models: insider ownership, board size, percentage of outside directors, and number of analysts. Our results, though, remain unchanged in terms of statistical significance throughout all our model specifications. Furthermore, we perform regressions using the shortest distance to respective stakeholders as substitution for median distances. This substitution yields comparable but less significant results. Regressions are not reported for brevity.

Finally, we address concerns that our results are driven by reverse causality as follows. Firms have no possibilities to select their major customers or competitors actively and, thus, have no influence on certain properties like geographic proximity. This is especially true in times of critical market conditions (e.g., the financial crisis) where firms eagerly embrace every major customer. As additional alternative mechanism and source of potential biases, one could think of firms that relocate their headquarters close to a major customer after a business link has been established. Still, since firms of our sample are major public firms in the United States, relocations of headquarters (either from the firm or from stakeholders) are a rare event and connected with essential costs (see Pirinsky and Wang 2006). Finally, we argue that firms are not picked by their closely located customers for enhanced financial performance but due to more important selection criteria like service quality, product prices, or technological considerations. Consequently, we would not assume major biases from reverse causality issues.

## 1.5 Conclusion

In this first chapter, we analyze how geographic proximity to stakeholders influences performance of U.S. public firms. To accomplish this, we calculate spatial distances between the firm and stakeholders´ headquarters. As firms establish several relationship forms towards stakeholders based on different goals (e.g., cooperation, monitoring, support, etc.), we investigate which of these functional relationships is influenced by geographic proximity. Thus, we take distances to an extensive set of stakeholders into account: suppliers, customers, competitors, distributors, alliance partners, and shareholders of a firm.

First, our findings point to the fact that firms that exhibit a higher geographical closeness to certain stakeholders perform better. According to our results firms should especially manage distances to their customers carefully as their proximity has a significant and positive impact on firm performance. In addition, we find that spatial remoteness to competitors is connected to a significantly increased firm performance, while proximity to other stakeholders does not show any significant influence. Second, we analyze which distance-related mechanisms actually affect firm performance. We differentiate between three mechanisms and identify industries where we assume a predominance of one of the following issues: information asymmetries, social networks, and transportation costs. While we find positive effects of customer proximity in industries with high transportation costs and relationship industries, we find no significant effect in knowledge or high technology industries. We suggest that firms with experience in creating differentiated, research-intensive goods and transferring knowledge can counterbalance potentially negative effects of customer remoteness. Additionally, we find that distance to

competitors is positively and significantly related to performance of firms operating in manufacturing or non-knowledge (low tech) industries. Finally, our findings document that the remoteness of competitors significantly influences firm performance in non-relationship industries. As we can find no evidence for similar effects of competitor proximity in relationship industries, we argue that long-term relations and personal networks between business partners overshadow a potentially negative close co-localization of competitors.

In total, we present findings that proximity-related aspects in a globalized setting with international competition still have their relevance. Based on the insights gained from our analyses, we argue that the management of proximity to stakeholders (e.g., the location of subsidiaries) is an important task for firms as it has a direct effect on business processes and firm performance.

The findings of this chapter are limited in the following points. Business relations consist of a spectrum of distance-related factors that shape the strength and nature of interactions. Alternative measures of distance concerning perceived distances represent much "softer" measures, so we refrain from an exhaustive inclusion of theories regarding cultural, lingual, or psychic proximity. Thus, a more comprehensive approach with regard to additional facets could yield more detailed insights into the whole spectrum of distance-related processes. This becomes even more important in a dynamic environment. Relations and distances are not static and consequently are opposed to changes. With competitors, suppliers, and other stakeholders changing their localization in space, it is even more challenging to identify an optimal and stable distance set for the firm. As we use cross-sectional data, it would be fruitful for further research to analyze firms´ allocation processes in a dynamic framework in order to identify how firms adapt to stakeholder distance changes over time. Finally, detailed data to stakeholders´ subsidiaries would yield interesting insights by gaining a more precise idea of actual distances between firms.

In the following chapter, we focus on major corporate customers as their spatial proximity has a significant influence on firm performance. As argued in this chapter, distances to customers can result in higher information asymmetries, lower density of social networks, and higher transportation costs. Although the composition of major customers is exogenously determined, firms can adapt to these increased levels of uncertainty caused by remote customers. In the following, we use a cross-section of U.S. public firms to empirically analyze how firms try to counterbalance these potential negative effects of customer remoteness by adjusting their capital structure.

# 2 Effects of Customer Proximity on Firm´s Capital Structure

## 2.1 Introduction[15]

Customers are among the most important and influential stakeholders of the firm.[16] Accordingly, a growing body of literature in the areas of corporate finance, marketing, and strategy examines the role that customers play for suppliers. Empirical research documents that customer characteristics and satisfaction affect suppliers' performance (Ittner and Larcker 1998, Anderson et al. 2004, and Gruca and Rego 2005) and capital structure (Kale and Shahrur 2007, Banerjee et al. 2008, and Chu and Wang 2011). However, so far, scholars have paid only little attention to one of the most obvious customer characteristics: the geographical distance to suppliers. This is surprising; not only in the light of globalization and the increasing number of companies operating worldwide, but also as informational benefits (e.g., Coval and Moskowitz 1999, 2001) and an increase in buyer-supplier trust (Bönte 2008) caused by proximity have already been documented.

Contributing to the literature on customer-supplier relations and capital structure, this empirical study is the first to examine the impact of customer proximity on the capital structure of suppliers. We hypothesize and demonstrate that a negative relation between suppliers' leverage and their geographical distance to principal customers exists. Thereby, our study provides recent evidence on the empirically ambiguous relation between business risk and optimal debt level (for a discussion, see Kale et al. 1991). In particular, we argue that the reduction in leverage is a reaction to increased uncertainty and decreased trust regarding remote customers. As the capabilities (costs) of information acquisition and monitoring of their customers decrease (increase) with distance, suppliers generally face a higher level of uncertainty and a lower level of control when they have more remote customers.[17] Especially for suppliers with more closely located customers that share product markets and similar economic and legal environments, we expect lower perceived risks and higher levels of familiarity.

[15] This chapter is based on a working paper with the title "Does the proximity of principal customers affect supplier´s capital structures?" and is joint work with Peter Limbach from Karlsruhe Institute of Technology, see Göttner and Limbach (2012).

[16] In this regard, John Mackey, CEO of Whole Foods Market, comments: *"There is only one boss. The customer. […] he can fire everybody in the company […], simply by spending his money somewhere else."*

[17] The assumption that monitoring costs increase with distance is frequently made in the banking literature (see, e.g., Degryse and Ongena 2005 and Sussman and Zeira 1995). Regarding uncertainty, Souder and Moenaert (1992) argue that user needs as well as technological and competitive environments are among the major drivers of firms' uncertainty.

In line with our reasoning, Chhaochharia et al. (2012) recently show that physical proximity between firms and shareholders facilitates more effective monitoring due to, the authors state, lower communication and information gathering costs and easier access to firm-level data. In this regard, Alam et al. (2011) document that the geographic distance of unaffiliated directors to corporate headquarters affects monitoring. Among other results, the authors find that closer boards have better access to soft information and argue that distance reflects the costs of information acquisition. Furthermore, Knoben and Oerlemans (2006) argue that lingual and cultural differences lead to higher communication and knowledge transfer costs among firms.

One main reason for the observed reduction in leverage can be the uncertainty regarding the stability of principal customers' sales contribution to suppliers that can increase with the customers' remoteness.[18] We argue that supplying firms' uncertainty may particularly stem from their limited abilities to assess and monitor remote customers' business and compliance standards, business prospects, and bankruptcy probabilities as well as their limited abilities to assess and improve the stability of their business relationships, especially with foreign customers. As sales to principal customers account for a considerable part of suppliers' cash flows used to make debt service payments, suppliers should take the uncertainty of these cash flows (beyond customer bankruptcy risk) into account when determining their capital structure.

Our study is primarily motivated by the insights provided in Hertzel et al. (2008) who examine contagion effects of financial distress along the supply chain. The authors show that financial distress related to bankruptcy filings of principal customers lead to significantly negative stock price effects of the respective suppliers. They further document that customers do not suffer significant contagion effects of supplier distress and conclude that "*customers anticipate and/or cause the financial distress of a supplier (p. 375)"*. One may hence infer that principal customers' stability of their sales contribution to the supplying firms influences the suppliers' financial decisions. Accordingly, Bae and Wang (2010) recently document a significantly positive relation between aggregate sales to principal customers and suppliers' (precautionary) cash holdings.

In addition, several recent studies document that investors benefit from superior information of local firms (see, e.g., Ivkovic and Weisbrenner 2005 and Baik et al. 2010). The limited access to information, particularly "soft" information, of remote institutions such as principal customers is

[18] In this context, Michael Milken comments: *"Over the past four decades, many companies have struggled with the wrong capital structures. […] Especially vulnerable are enterprises with unpredictable revenue streams that end up with too much debt during business slowdowns".* See "Why Capital Structure Matters" in *The Wall Street Journal* online on April 21, 2009.

further caused by the following aspects (see, e.g., Lerner 1995, Alam et al. 2011, and Chhaochharia et al. 2012): i) remote customers cannot directly be inspected or only at high costs, ii) acquiring knowledge about their internal operations and governance is difficult, iii) acquiring knowledge about and relations with their management is difficult, iv) the probability that suppliers' and remote customers' executive managers meet (e.g., at the golf club) or belong to the same social network is low, and v) the local media is less likely to provide information about remote customers.

Regarding the data employed to conduct our study, we decide to use data from the Standard & Poor's Capital IQ (CIQ) database as opposed to most studies on the effects of customers that use data from the Compustat database. Our decision to use CIQ data results from a direct comparison of the customer data available in the two databases. While CIQ provides customer data only for the cross-section of firms (i.e., a firm's customer history is not provided on an annual basis) and accumulated for the firms' past (since 2005), the available customer data is significantly more comprehensive and more convenient to work with. In fact, our analysis reveals several drawbacks and inaccuracies with respect to customer information from Compustat.[19] For example, Compustat only keeps record of up to four nongovernmental principal customers and the available data is restricted to public firms. On the contrary, CIQ provides much more customer information as it includes private firms (i.e., non-listed customers) as well, among other reasons. These aspects motivate us to employ CIQ data although this means that the use of a firm panel is hence not possible. Yet, the use of CIQ data brings with it several other advantages. For example, direct information about the location of customers', distributors', and suppliers' headquarters and firm identifiers (e.g., exchange tickers) are available. This facilitates handling and matching the data and reduces the risk of making mistakes. Accordingly, we examine a 2010 cross-section of U.S. public firms for which customer data is available in CIQ.[20] In line with Banerjee et al. (2008), principal customers represent firms that account for at least 10% of a supplier's sales as well as those customers that are voluntarily disclosed by suppliers due to their importance for business.

Our study provides insightful and robust results. First and foremost, the negative relation between supplier leverage and the distance to principal customers holds irrespective of the estimation techniques we apply (OLS, WLS, and Tobit) and irrespective of the employed variables that quantify capital structure and customer distance. Leverage is measured by book

[19] We elaborate on these aspects in the second section of the chapter and provide the reader with several examples and statements made in published work regarding the problems of using Compustat customer data.
[20] Recently, Rauh and Sufi (2012) also use a cross section of CIQ data, i.e., only one year of data, due to the comprehensive information provided therein.

and market values for the years 2010 and 2011. To measure a supplier's distance to its customers, we use the median and the logarithm of the median and the average distance between suppliers' and customers' headquarters, the logarithm of the median distance between suppliers and historical customers (i.e., 'lagged distance'), and the number of the suppliers' reported geographical segments. When we use the ratio of U.S. customers to all of a firm's customers as an additional measure for proximity, we find a strong positive relation to leverage, in line with our reasoning.

In additional analyses, we examine potential channels through which customer proximity may affect leverage. Although we control for the variables that have been shown to affect leverage (Frank and Goyal 2009), an examination of alternative channels allows us to significantly reduce the probability of measuring the effects of a spurious regression and provides the reader with additional insights regarding the impact of customer proximity on suppliers' financials. The potential channels are the suppliers' SG&A margin, R&D intensity, and the cash conversion cycle. All variables show a significantly positive relation to customer proximity indicating that suppliers' costs and asset-specificity increase with customer distance, while liquidity decreases. As distance could hence affect leverage through the aforementioned channels, we include the channel variables in additional regressions. The effect of customer distance on supplier leverage remains significant using OLS and Tobit. The same holds when we use simultaneous regression models (SUR and 3SLS) that allow for correlation of the error terms and reverse causality.

Finally, the relation between supplier leverage and customer proximity remains significant when we control for the competition (switching costs) suppliers (customers) have to face, for accounting rules, for political stability, and for legal quality. Controlling for suppliers' office locations, we find that, in line with lower information and monitoring costs, the effect of customer proximity on leverage is reduced when suppliers have more offices abroad.

The remainder of this chapter is organized as follows. Section 2.2 discusses our choice of database, describes the data selection process, and provides the reader with sample statistics about the supplying firms. Section 2.3 presents our measures of customer proximity and the respective customer statistics, offers the reader an overview of the employed variables, and describes our econometric strategy. In Section 2.4 we present and discuss our empirical findings regarding the effect of customer proximity on firm leverage. Section 2.5 deals with alternative channels through which customer proximity may affect leverage and presents additional results regarding the robustness of our findings and our general reasoning. Section 2.6 concludes.

## 2.2 Comparison of Databases and Data Selection

### 2.2.1 Comparing Customer Data from Capital IQ and Compustat

Crucial in the context of our study is that customer data from Capital IQ (CIQ), as compared to Compustat, is more comprehensive and significantly easier to identify and match with reported firms.[21] We thus use CIQ as the primary data source. This way we can also more likely avoid mistakes in our data. As the majority of empirical work uses the Compustat database, we further motivate our choice of CIQ in the following. The use of customer data available in Compustat brings with it several difficulties or, to our point of view, disadvantages as pointed out in the existing literature (see, e.g., Fee and Thomas 2004, Banerjee et al. 2004, 2008, Fee et al. 2006, Cohen and Frazzini 2008, Hertzel et al. 2008, and Ellis et al. 2009 – all of them use Compustat).

First, Compustat reports the customer name, or in many cases only a text abbreviation of the name, without a unique identifier that can be associated with the respective customer. The existing studies employing customer data from Compustat hence use algorithms and text-matching approaches to match customers' names to the filing firms. Yet, Compustat does not have a standard naming convention for the single customers across supplier firms. CIQ provides unique identifiers, such as exchange tickers and often also CUSIPs, for both suppliers and customers. Second, in Compustat many suppliers report either divisions of a firm or regions as a customer instead of reporting a company's name. This necessitates visual inspections of matching approaches that involve some discretion and can cause further inaccuracies. Third, in many cases Compustat reports a descriptive term (instead of an actual organization) or simply the number of principal customers (e.g., "7 Customers") but not the actual identity of the customers. Randomly comparing the customer data provided in CIQ and Compustat on firm level shows that CIQ has more comprehensive and detailed information: for example, while Compustat only provides information like "3 Clients" or "Inside the U.S./Outside the U.S.", Capital IQ, for the same firm, has detailed information about the respective customer identities.[22] One reason why CIQ offers more complete data stems from the fact that Compustat only covers

[21] We acknowledge that the data that can be retrieved from the two databases is derived from different collection sources and gathered by different working groups. To verify this, we conducted interviews with account managers from both Compustat and Capital IQ. The latter collects its data mainly from the following sources: i) SEC filings including 10-K, 20-F, and Prospectus forms; ii) System for Electronic Document Analysis and Retrieval (SEDAR) filings that include annual information forms; iii) annual reports, iv) news articles, and v) surveys with major public companies in which CIQ attempts to confirm its captured data. Rauh and Sufi (2012) report similar data sources regarding the competitor information provided in the CIQ database.

[22] To name a few examples: For Amkor Technology Inc., Compustat only reports "15 Customers", whereas CIQ lists the identities of 13 firm customers (most of them large stock-listed corporations). For Eastman Kodak Co., Compustat reports sales for "Inside the US" and "Outside the US", while CIQ identifies 6 major customers from the US and 1 from the UK. For Pfizer Inc., Compustat does not name any major distributors, whereas CIQ reports the identities of 9 distributors from the US, Japan, China, Australia, Russia, and the UK.

stock-listed corporations, whereas CIQ has a much wider range into the worldwide public and private company universe. Finally, as stated in Banerjee et al. (2008), Compustat only keeps record of up to 4 (!) nongovernmental principal customers with some of them accounting for less than 10% of firm sales. However, relying on CIQ as data, we find that many firms report more than 4 nongovernmental (i.e., firm) customers. In fact, about 37% of the firms in our full sample report more than 4 recent customers with some firms reporting as many as 13 firm customers including their identity. Overall, we believe that these issues should generally call the use of Compustat customer data into question.

### 2.2.2 Sample Selection and Data Availability

Regarding customer information, the Financial Accounting Standards Board (FASB) as well as the U.S. Securities and Exchange Commission (SEC) Regulation S-K require firms to disclose information about their principal customers that comprise at least 10% of their consolidated sales revenues. As mentioned in Banerjee et al. (2008), with the revise of SFAS No. 14 by SFAS No. 131 in June 1997, firms are no longer required to disclose the identity of their principal customers but still need to report the respective sales. Hence, some firms restated their customer information as a result of this change in regulation. Yet, Ellis et al. (2009) mention that publicly traded firms are required by the SEC to report both the sales to and the identity of their principal customers.[23]

Capital IQ, in its 'Business Relationships' section, reports comprehensive information about firms' principal customers (as well as the major distributors), being both public and private firms. The data is mainly collected from annual filings (such as 10-Ks) of the parent companies and complemented by reports of their subsidiaries (e.g., Caterpillar Inc. and its fully owned and consolidated subsidiaries Bitelli SpA, Caterpillar Forest Products Inc., etc.). CIQ has started collecting information about business relationships in 2005 but does not, however, provide an annual record of this information. The database only provides data on recent relations (usually completely updated every two years) and historical customer relations (dating back to 2005). The customer information available includes the companies' names (often additionally or only subsidiaries' names) with a standard naming convention in most cases as well as governmental or state organizations acting as customers. Contrary to Compustat, company divisions or regions are not listed as customers in CIQ. In fact, information about the number of business segments

[23] Ellis et al. (2009) further document that, although required by the SEC, some firms do not disclose their principal customers' identity while other firms report the identity of customers that account for less than 10% of the firm sales. Therefore, some firms voluntarily report information about customers they consider important for their business (see also Banerjee et al. 2008).

and geographical segments can be retrieved separately. If available the customer firms' exchange tickers are provided (such as NYSE:IBM for IBM Inc. or DB:BMW for German BMW Group) as well as their primary industry sector and their country of origin (such as 'Automobile Manufacturers' and 'Germany' for BMW Group). The latter attributes, however, cannot be retrieved for all customers. For the customers in our sample for which information is available, we further retrieve (or match) data for several attributes like SIC codes, leverage, and headquarters location. Unfortunately, this data is not available for all firms.

As we need detailed information for our analysis and as we have found several inaccuracies regarding Compustat customer data, we employ the (customer) information available in the CIQ database at the price of being unable to use a firm panel. Thus, the sample we use for this study is a cross-section of firms retrieved from the Capital IQ database for the year 2010. It consists of all operating U.S. stock-listed firms with total revenues larger than 10 million dollars. Utilities and financial firms, i.e., Standard Industrial Classification (SIC) codes 4900-4999 and 6000-6999, are excluded from the sample leaving us with 2,730 firms.[24] We place no such restrictions on the firms' identified customers, i.e., we do not exclude financial or private firms from the list of customers. In a next step, we exclude from our sample 572 firms for which customer information cannot be retrieved (neither in CIQ nor in Compustat). We further have to exclude 681 firms that do not have principal customers, i.e., the reported number of principal customers is zero. This leaves us with a final sample of 1,477 firms (i.e., suppliers). The overall number of customer-supplier relations amounts to 5,723.[25] We also identify 665 firm-distributor relations in our sample. This data is used for robustness purposes.

Our final sample covers a total year-end 2010 market capitalization of about 8 trillion U.S. dollars representing about 47% of the year's total U.S. market capitalization (according to data from the World Bank).[26] Comparing the final sample to those firm observations we have to exclude in the data selection process because principal customers are reported to be zero (i.e., 1,477 firms in the final sample versus 681 firms without principal customers), the following can be said. Firms in the final sample are significantly larger in terms of their 2010 year-end market capitalization ($ 5.4bn vs. $ 2.2bn), are rather listed on the New York Stock Exchange (34.9% vs. 27.6%), and have more geographic segments (3.7 vs. 2.8). Yet, the number of business

[24] These firms are excluded mainly for the following reasons: i) they are regulated with respect to their use of debt, ii) they are not generally subject to segment reporting requirements (see Ellis et al. 2009), iii) they have different definitions of their main performance measures (particularly in the case of banks and insurance companies).
[25] Similar to Banerjee et al. (2008), we distinguish between "identified" and "unidentified" customers. For the unidentified customers in our sample the entities' names are either not provided or these customers cannot be traced in CIQ or they cannot be matched unambiguously to one (parent) firm or other institution.
[26] The data is available at http://data.worldbank.org/indicator/cm.mkt.lcap.cd.

segments is comparable (2.6 vs. 2.4). Firms are also comparable in terms of Tobin's Q (2.03 vs. 2.07), book leverage (19.7% vs. 23.2%), and cash holdings (16.5% vs. 15.2%).

As we do not have full information on all of the inspected attributes (like stock volatility) for our sample firms and as missing data results in an exclusion when regressions are run, we are not able to provide the reader with regressions that include all of the 1,477 potential observations. To cope with this limitation, we show univariate results that incorporate the full sample (see econometric strategy in section 2.3). In case of R&D expenditures, we follow Kale and Shahrur (2007), among many others, and set the value of missing observations to zero.

### 2.2.3 Sample Statistics

With respect to our sample's attributes, *Table 2.1* provides an overview of the sample firms' financials (panel A) and their respective industry distribution (panel B). With regard to the latter, manufacturing firms producing electronics, plastics, fabricated metals, industrial machinery, among others (first-digit SIC-code 3) account for 43% of our sample. According to the classification in Cremers and Nair (2008), almost 49% of the sample firms operate in relationship industries. Average firm size as measured by total assets is $ 5.1billion, while the respective median value is only $ 510 million. Fixed assets (measuring collateral) account for 55% of total assets on average. The respective median value is 73%. The average Tobin´s Q is 2.0, while the median is 1.5. Kale and Shahrur (2007) report corresponding value of 2.3 and 1.5, respectively. Firm leverage as measured by total debt to total assets is 20% on average. The median value however is only 13%. For their 2009 U.S. cross-section, Rauh and Sufi (2012) report an average (median) book leverage of 19.5% (14.8%). Firms' average (median) market leverage as measured by total debt to total debt plus market value of equity is 17% (11%). These values are also comparable to Kale and Shahrur (2007) who report an average (median) market leverage of 19% (13%). The average cash ratio amounts to 16.5%. This figure is almost identical to Bae and Wang (2010) who report a mean of 16.3% for their sample (from 1982 to 2006) and in line with the figures reported in Bates et al. (2009). The average R&D expenses amount to 5% of our sample firms' total assets close to Kale and Shahrur (2007) who report an average of 5.8%. In sum, our sample appears to be representative of the U.S. public firm universe.

**Table 2.1: Descriptive Statistics - Sample Firms (Suppliers)**

**Panel A: Fundamental Data**

| | N | Min | Max | Average | 25% | Median | 75% | Standard Deviation |
|---|---|---|---|---|---|---|---|---|
| Firm Age | 1397 | 1.00 | 209.00 | 44.37 | 19.00 | 30.00 | 58.00 | 36.92 |
| Total Revenue | 1477 | 10 | 408,085 | 4,356 | 108 | 481 | 1997 | 16,856 |
| Total Assets (TA) | 1477 | 2 | 751,216 | 5,147 | 115 | 510 | 2,451 | 25,430 |
| Book Leverage | 1477 | 0.00 | 3.18 | 0.20 | 0.00 | 0.13 | 0.30 | 0.25 |
| Market Leverage | 1477 | 0.00 | 1.00 | 0.17 | 0.00 | 0.11 | 0.27 | 0.21 |
| Cash/Total Assets | 1477 | 0.00 | 0.89 | 0.17 | 0.06 | 0.12 | 0.23 | 0.15 |
| Tobin´s Q | 1477 | 0.29 | 24.95 | 2.03 | 1.18 | 1.54 | 2.24 | 1.69 |
| R&D Intensity | 1477 | 0.00 | 2.01 | 0.05 | 0.00 | 0.00 | 0.07 | 0.10 |
| SG&A Margin | 1477 | 0.00 | 5.03 | 0.26 | 0.13 | 0.22 | 0.34 | 0.24 |
| Business Segments | 1465 | 1.00 | 19.00 | 2.61 | 1.00 | 2.00 | 4.00 | 1.85 |
| Geographic Segments | 1374 | 1.00 | 25.00 | 3.67 | 2.00 | 3.00 | 5.00 | 2.82 |
| Analyst Coverage | 1477 | 0 | 53 | 8.42 | 1.00 | 6.00 | 13.00 | 8.752 |
| Non-Debt Tax Shield | 1477 | 0.00 | 0.45 | 0.04 | 0.02 | 0.04 | 0.05 | 0.03 |
| Collateral (FA/TA) | 1456 | -65.58 | 98.75 | 0.55 | 0.31 | 0.73 | 0.96 | 4.87 |
| Avg. CCC (in days) | 1150 | -647.3 | 585.2 | 78.5 | 37.6 | 70.4 | 112.3 | 72.5 |

**Panel B: Industry Distribution (all SIC 49 and all SIC 6 firms are excluded from the sample)**

| | | | | | |
|---|---|---|---|---|---|
| SIC 0 | 0.3% | SIC 3 | 43.1% | SIC 7 | 18.5% |
| SIC 1 | 2.0% | SIC 4 | 8.0% | SIC 8 | 4.7% |
| SIC 2 | 16.9% | SIC 5 | 6.2% | SIC 9 | 0.3% |

## 2.3 Employed Variables and Econometric Strategy

### 2.3.1 Measures of Customer Proximity and Customer Statistics

Measuring customer proximity, we make use of the fact that Capital IQ, in most cases, provides the location of firms' headquarters. We first determine geographical coordinates, i.e., longitude and latitude, of each firm's headquarters using the mapping software GoogleMaps. In the next step, similar to Coval and Moskowitz (1999) and our approach in the previous chapter, we calculate the distance ($D_{i,x}$) between firm i's and its respective customer x's headquarters using the following equation (4):

(4) $$D_{i,x} = \arccos\left(\sin(\emptyset_i) * \sin(\emptyset_x) + \cos(\emptyset_i) * \cos(\emptyset_x) * \cos(\lambda_x - \lambda_i)\right) * r$$

In this equation $\emptyset_i$ equals the geographical latitude of sample firm i (i.e., the supplier), $\emptyset_x$ equals the geographical latitude of customer x, $\lambda_i$ equals the geographical longitude of the firm i, and $\lambda_x$ equals the geographical longitude of customer x. The letter r stands for the mean radius of the earth and equals 6,370km. Finally, we aggregate the distances $D_{i,x}$ for all of a firm i's principal customers x (with x = 1, 2, …, n) to calculate the average and the median distance of firm i to its customers.

Following this method, we create several variables that we use in our later regressions to measure customer proximity: the median and average distance of a supplier to its principal customers, the logarithm of the median distance, the logarithm of the average distance, and the logarithm of the median distance to a firm's historical customers. The latter is a 'lagged' distance measure based on the historic customer information as provided in Capital IQ. In addition to these variables, we use the fraction of U.S. principal customers to all principal customers and the number of geographic segments to measure customer proximity. Particularly the latter is a rather vague estimate of principal customer proximity. However, it brings with it the advantage that we can use more observations in our regressions. *Table 2.2* provides sample statistics for our customer data and distance measures.

**Table 2.2: Descriptive Statistics - Principal Customers**

| | Min | Max | Average | Median | Standard Deviation |
|---|---|---|---|---|---|
| Median distance customer | 0.06 | 16,928 | 3,593 | 2,452 | 3,216.54 |
| Median distance customer (historical) | 0.26 | 15,410 | 3,879 | 2,759 | 3,300.80 |
| Median distance distributors | 1.50 | 16,932 | 4,342 | 2,686 | 4,259.95 |
| Number of customers | 1 | 17 | 3.87 | 3.00 | 3.33 |
| Number of historical customers | 0 | 17 | 2.03 | 1.00 | 2.58 |
| Number of distributors | 0 | 11 | 0.45 | 0.00 | 1.04 |
| Number of institutional customers | 0 | 20 | 0.73 | 0.00 | 2.03 |
| Fraction of U.S. customers | 0 | 1 | 0.72 | 0.79 | 0.29 |

The median (average) distance to recent customers is 3,593 (3,876) kilometers which is slightly lower than median distance to historical customers (3,879 km). The median number of customers per firm is 3, slightly lower than the average of 3.87. 18% of the sample firms report more than

10 principal customers. On average, about 72% of a firm's customers are domestic customers from the United States. The median fraction of U.S. customers is 79%. With respect to the group of foreign customers, on average 4% are from BRIC countries and 24% are from other countries, predominantly from Europe and Japan.

### 2.3.2 Dependent and Control Variables

In our analyses, we primarily investigate suppliers' capital structures, i.e., we are interested in the effect of our customer proximity measures (as described in section 2.3.1.) on supplier leverage. To measure supplier leverage, we use the variable *BOOK LEVERAGE*, defined as total debt over total assets (e.g., Frank and Goyal 2009 and Rauh and Sufi 2010, 2012) and we employ the variable *MARKET LEVERAGE*, defined as total debt over the sum of total debt and market capitalization (e.g., Kale and Shahrur 2007, Kayhan and Titman 2007, and Frank and Goyal 2009). Many studies on corporate capital structure use both book and market leverage measures (e.g., Rajan and Zingales 1995, Kayhan and Titman 2007, and Frank and Goyal 2009). In addition, we use the variable *BOOK LEVERAGE 2011* as an alternative measure for suppliers' leverage. That means, we use all variables as of year-end 2010, except for the variable capturing supplier leverage. This way, we are able to regress lagged variables on leverage to further account for potential reverse causality.

In our baseline regressions on leverage, we employ the following control variables as suggested in the literature: *FIRM SIZE* measured as the logarithm of firms' total assets (e.g., Kale and Shahrur 2007 and DeJong et al. 2011), *TANGIBILITY* measured as the ratio of fixed assets to total assets (e.g., Banerjee et al. 2008 and DeJong et al. 2011), *PROFITABILITY* measured as return on assets (e.g., Titman and Wessels 1988 and Rajan and Zingales 1995), *GROWTH* measured as the firms' Tobin's Q[27] (e.g., Kale and Shahrur 2007 and Banerjee et al. 2008), and *INDUSTRY* dummies[28] to capture industry-specific effects (e.g., Kayhan and Titman 2007 and Rauh and Sufi 2010). Frank and Goyal (2009) document that the aforementioned factors, besides inflation, are the core factors (i.e., the most stable drivers) of corporate capital structure. As we examine a cross-section of firms, we do not consider inflation.

However, our baseline regressions include three additional variables. First, following Bharath et al. (2009), we control for the variable *VOLATILITY* as measured by the three-year (i.e., 2007 to 2009) standard deviation of the firms' stock returns. The authors recently control for stock

[27] Following Bebchuk and Cohen (2005), among others, we define Tobin's Q as the market value of a firm's assets divided by the book value of these assets. The market value of assets is calculated as the book value of assets plus the market value of common stock less the book value of common stock and deferred taxes.
[28] Specifically, we use first-digit Standard Industry Classification (SIC) codes.

volatility and find that it significantly increases leverage. This is in line with increased cost of equity due to higher stock volatility and the pecking order theory (Myers 1984, and Myers and Majluf 1984) that predicts less use of information-sensitive equity (relative to debt) when firms suffer more from adverse selection. Second, we include the variable *DIVERSIFICATION* as measured by the firms' number of business segments (see, e.g., Daines 2001). The latter is controlled for to capture the effect of internal capital markets and the resulting coinsurance effect on firm leverage. In this regard, Hann et al. (2012) recently show that diversified firms, on average, have lower costs of capital than comparable portfolios of stand-alone firms. Furthermore, Kuppuswamy and Villalonga (2010) show that during the 2007-09 financial crisis diversified firms became significantly more leveraged than comparable non-diversified firms. As we examine a 2010 cross-section, i.e., the time immediately after the financial crisis, it seems necessary to control for these aspects of diversification. Finally, we control for the firms' number of principal customers (*NUMBER CUSTOMERS*) to approximate the potential effort that is needed (and that can actually be spent) to acquire information about and monitor each of the customers. We assume that if a firm has more principal customers (independent of their actual sales contribution), it will have less resources to devote to each of these customers. Consequently, the level of information (uncertainty) a firm has about each of its principal customers and the level of monitoring regarding each of these customers will generally decrease (increase) in the number of customers.

In additional regressions, we extend our baseline model for robustness purposes and further control for the variables *NON-DEBT TAX SHIELD* as measured by depreciation and amortization expenses over total assets (e.g., DeJong et al. 2011) and the number of firms' analysts (*ANALYST COVERAGE*). We use the latter variable as a measure for firms' information asymmetries between firm insiders and outsiders as done in Chang et al. (2006). The authors show that firms covered by fewer analysts (i.e., firms with higher information asymmetries) less likely issue equity as opposed to debt. This finding is in line with the pecking order theory and the results in Bharath et al. (2009). Furthermore, we control for the variable *CUSTOMER LEVERAGE* because Chu and Wang (2011) recently show that suppliers' leverage is significantly increasing in their customers' indebtedness. The authors ascribe this positive leverage relation to the bargaining power of leverage (see, e.g., Matsa 2010, Hennessy and Livdan 2009, and Bronars and Deere 1991). We measure customer leverage as the median leverage of a firm's customers.

As several studies suggest that firms' capital structure and debt financing conditions can be affected by corporate governance due to, among other reasons, enhanced monitoring and

mitigated agency problems (see, e.g., Agrawal and Knoeber 1996 and Bhojraj and Sengupta 2003), we control for the following variables in robustness tests (in section 2.5): *EXTERNAL DIRECTORS* (defined as the percentage of external (non-officer) directors (Bhojraj and Sengupta 2003)), *INSIDERS OWNED* (i.e., percentage of shares held by officers and directors (Agrawal and Knoeber 1996 and Jensen et al. 1992)), and *BOARD SIZE* (i.e., the number of directors (Yermack 1996)).

Regarding our channel variables used (as both dependent and independent variables) in section 2.5, we employ the following measures. First, we use the variable *SG&A MARGIN* defined as the firms' SG&A margin calculated as the ratio of selling, administrative and general expenses to total sales similar to Banerjee et al. (2008). Second, we use two variables for research and development (R&D) expenditures: i) *R&D INTENSITY* calculated as R&D expenditures to total assets similar Kale and Shahrur (2007) and ii) the indicator variable *INDUSTRY ADJUSTED R&D* that obtains a value of one if R&D intensity exceeds the two-digit SIC industry median R&D intensity (zero otherwise). In general, firms making large discretionary expenditures, as captured by SG&A and R&D expenses, will have more intangible assets and thus less debt (see, e.g., Frank and Goyal 2009). Accordingly, Banerjee et al. (2008) document a negative effect of SG&A on leverage and Kayhan and Titman (2007) find a negative effect of R&D intensity on (predicted) leverage.[29] Finally, we use the variable cash conversion cycle (*CCC*) in (average) days to measure firms' working (or short-term) capital efficiency and liquidity management as suggested by Luo et al. (2009) and Jose et al. (1996). As working capital represents cash that is bound in the production cycle of a firm, firms' with more efficient working capital management may witness a lower need for capital and hence lower leverage ratios.

*Table 2.3* contains a list of all variables used in our empirical analyses including detailed definitions; *Table 2.4* shows the pair-wise correlations of our main variables.

[29] However, on the one hand, we already account for the amount of intangible assets using our variable *TANGIBILITY*. On the other hand, only few recent studies control for SG&A and/or R&D expenses and the evidence is not conclusive regarding the significance of these variables. Chu and Wang (2011), for example, find R&D to be significant in some regressions only. Thus, not surprisingly, Frank and Goyal (2009) do not include these variables in their list of the core factors driving corporate capital structure.

**Table 2.3: Description of Key Analyses Variables**

This table provides an overview of all variables used in our analyses. All data is retrieved from Capital IQ. All distances are calculated as headquarter-to-headquarter distances in kilometers (km).

| Variable | Definition |
|---|---|
| Analyst Coverage | Number of analysts covering the firm´s stock. |
| Average Distance Offices | Average distance to firm´s offices. |
| Board Size | Logarithm of the number of directors in corporate board of directors. |
| Book Leverage | Total debt relative to the firm´s total assets. |
| Book Leverage 2011 | Total debt in 2011 relative to the firm´s total assets in 2011. |
| CapEx/Total Assets | Capital expenditures to total assets. |
| CCC | Average cash conversion cycle (measured in days). |
| CEO/Chairman duality | Indicator variable that obtains a value of one if the CEO is also chairman of the firm´s board of directors. |
| Customer Leverage | Median of a firm's customers´ leverage measured as total debt to total assets. |
| Days Sales Outstanding | Accounts receivable to average sales per day. |
| Diversification | Number of business segments. |
| Distributor Distance | Logarithm of median distance to distributors. |
| Dummy Admired Company | Indicator variable that has a value of one if a firm belongs to the Fortune Magazine's 300 Most Admired Companies. |
| Dummy Durable Goods | Indicator variable that has a value of one if a firm is operating in a durable goods industry. |
| Dummy Non-Durable Goods | Indicator variable that has a value of one if a firm is operating in a non-durable goods industry. |
| Dummy Negative Net Income | Indicator variable that has a value of one if a firm has a negative net income in year 2008 and 2009. |
| Dummy Relationship Industry | Indicator variable that has a value of one if a firm is operating in a relationship industry as classified by Cremers and Nair (2008). |
| External Directors | Percentage of external board members. |
| Firm Size | Logarithm of the book asset value of the firm. |
| Fraction Non-US Offices | Ratio of Non-U.S. offices to total offices. |
| Geographic Segments | Number of geographic segments the firm reports. |
| Growing Customer Distance | Indicator variable that is set to one if the median distance of firms' current customers is larger than the distance to their historical customers. |

**Table 2.3: Description of Key Analyses Variables (continued)**

| Variable | Definition |
|---|---|
| Growth | Tobin's Q (market value of assets divided by the book value of assets, whereas the market value of assets is calculated as book value of assets plus the market value of common stock less book value of common stock and deferred taxes). |
| Historical Log Median Distance Customer | Logarithm of median distance to historical customers. |
| Industry- adjusted R&D | Indicator variable that has a value of one if a firm's R&D intensity is higher than its two-digit SIC industry median of R&D intensity. |
| Insiders Owned | Percentage of firm´s equity held by insiders (CEO plus members of the board of directors). |
| Log Average Distance Customer | Logarithm of average distance to firm´s customers. |
| Log Median Distance Customer | Logarithm of median distance to firm´s customers. Distances are determined as the amount of kilometers between supplier and customer headquarters. |
| Log Median Distance Distributor | Logarithm of median distance to firm´s distributors. |
| Log Dist_x_Leverage Median | Logarithm of median customer distance interacted with median customer leverage. |
| Market Leverage | Firms' total debt divided by the sum of firms' market capitalization and total debt. |
| Median Distance Customer | Median distance to firm´s customers. |
| Median Distance Distributor | Median distance to firm´s distributors. |
| Median Distance Competitor | Median distance to firm´s distributors. |
| Min Distance Competitor | Distance to firm´s closest competitor. |
| Non-Debt Tax Shield (NDTS) | Depreciation and amortization divided by total assets. |
| Non-USGAAP/IFRS | Fraction of a supplier's customers that do not use U.S. GAAP or IFRS accounting standards. |
| Number Competitors | Number of a firm´s reported competitors. |
| Number Customer | Number of a firm´s reported principal customers. |
| Political Stability | Country-specific value for political stability (see Nunn 2007). |
| Profitability | Return on assets (EBITDA divided by total assets). |
| R&D Intensity | R&D expenditures divided by total assets. |
| Ratio US customer | Ratio of U.S. principal customers to the total number of principal customers. |
| Rule of Law | Country-specific value for legal quality (see Nunn 2007). |
| SG&A Margin | Selling, general and administrative expenses to total revenues. |
| Tangibility | Ratio of a firm´s fixed assets to total assets. |
| Volatility | 3 year standard deviation of firm´s stock return. |

**Table 2.4: Pearson Correlation Coefficient Matrix**

This table reports the pair-wise correlations of the main variables employed in this study's analyses. For brevity, we do not report all variables. However, none of the pair-wise correlations between the variables we use reach critical values. For convenience, some important correlations are directly mentioned in the text.

| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Book Leverage | 1 | | | | | | | | | | | | |
| 2 | Log Median Distance Customer | -0.1003 | 1 | | | | | | | | | | | |
| 3 | Historical Log Median Distance Customer | -0.0553 | 0.1235 | 1 | | | | | | | | | | |
| 4 | Number Customer | -0.064 | 0.1132 | 0.1129 | 1 | | | | | | | | | |
| 5 | Ratio U.S. Customer | 0.0202 | -0.4235 | -0.0855 | 0.1711 | 1 | | | | | | | | |
| 6 | Geographic Segments | -0.1015 | 0.1414 | 0.1478 | 0.221 | -0.1085 | 1 | | | | | | | |
| 7 | Firm Size | 0.0849 | 0.0136 | -0.0166 | 0.1281 | 0.0339 | 0.2157 | 1 | | | | | | |
| 8 | Diversification | 0.0707 | 0.0144 | -0.023 | 0.0658 | 0.0262 | 0.1806 | 0.4369 | 1 | | | | | |
| 9 | Tangibility | -0.0019 | 0.0146 | 0.0285 | 0.0084 | -0.0177 | -0.0055 | -0.0325 | -0.0147 | 1 | | | | |
| 10 | Profitability | -0.068 | -0.0439 | -0.0496 | 0.0493 | 0.0258 | 0.0844 | 0.3106 | 0.1382 | -0.0304 | 1 | | | |
| 11 | Growth | 0.0073 | 0.0232 | 0.0963 | -0.008 | -0.038 | -0.0401 | -0.15 | -0.1445 | 0.0673 | -0.1527 | 1 | | |
| 12 | Volatility | 0.1628 | 0.0233 | 0.0259 | -0.0312 | -0.0085 | -0.1019 | -0.2995 | -0.1316 | 0.0528 | -0.2653 | 0.0263 | 1 | |
| 13 | Non-debt Tax Shield | 0.3321 | -0.0417 | -0.0403 | -0.009 | -0.0031 | -0.0397 | -0.1207 | -0.0313 | 0.0068 | -0.1828 | 0.0632 | 0.1607 | 1 |
| 14 | Analyst Coverage | 0.0055 | 0.0189 | 0.0226 | 0.1251 | 0.0402 | 0.1462 | 0.7609 | 0.2462 | -0.0411 | 0.2229 | 0.0925 | -0.258 | -0.0683 |

### 2.3.3 Econometric Strategy

First, to cope with data limitations arising from missing attributes for some of our sample firms (such as stock volatility) that lead to data exclusions in multivariate regressions, we show univariate results that incorporate the full sample for the relation between customer distance and supplier leverage. Therefore, we separate our sample firms into quartiles according to their median distance to principal customers and consider sample mean differences regarding leverage and other attributes between the first and the fourth quartile of firms.

Second, performing our regression analyses as shown in sections 2.4 and 2.5, we primarily employ ordinary least squares (OLS) and Tobit (Tobin 1958) regressions. The latter type of estimation technique is used because our main dependent variable (*BOOK* and *MARKET*) *LEVERAGE*, is a limited variable that does not take on negative values and lies between 0 and 1. Tobit regressions are regularly used in capital structure research (see, e.g., Rajan and Zingales 1995, Kayhan and Titman 2007, and Bharath et al. 2009). Following Rauh and Sufi (2012) who also examine a cross-section of firms, we employ weighted least squares (WLS) in additional robustness checks. Doing so, we use the number of customers and the firms' revenues as weights. We primarily use the logarithm of the median distance to customers in our regressions. This is done for two reasons. First, the median, as opposed to the average, accounts for outliers. Second, the logarithm of the distance measure is a linear transformation of the distance measured in kilometers which is generally better suited for OLS and several other regression models as the statistical assumptions of the procedures are more nearly met. Accordingly, Alam et al. (2011), Chhaochharia et al. (2012), and Keloharju et al. (2012) use the logarithm of distance in their studies. To account for heteroskedasticity, we use White (1980) robust standard errors in the majority of our regressions. Additionally, we present results for industry-clustered standard errors (cluster: 3-digit SIC codes).

Third, to further validate our findings, we run regressions on important channels that could be affected by customer proximity and that could themselves affect firm leverage (in section 2.5). Customer proximity could have an impact on the following selling-related variables: the firms' SG&A margins, their R&D expenses, and their average cash conversion cycle (CCC). In section 2.5, we elaborate on how proximity could impact these variables. Selling and R&D expenses are used in some studies on firms' capital structures (see, e.g., Kayhan and Titman 2007). As customer proximity could have a direct effect on these selling-related variables, we might measure a spurious regression. That means we might (falsely) conclude that there is an effect of

customer proximity on capital structure, although proximity does not directly affect leverage but only the channels that impact it. If this was the case, we could not provide direct evidence for our hypothesis that firms reduce their leverage as a reaction to increased uncertainty, higher information and monitoring costs, and decreased trust (as argued in the introduction). Hence, an analysis of the aforementioned channels and their impact on leverage is necessary to test our hypothesis. Moreover, it provides additional insightful results on the effects of customer proximity. Consequently, in a first step, we regress customer proximity and respective control variables on the aforementioned channels to see if proximity has an impact on these variables.

Next, to examine whether our hypothesis holds, we include the channel variables in our baseline OLS and Tobit leverage regression. Finally, we consider a system of equations consisting of our baseline regression for leverage including the channel variables and one regression for each of the channel variables including leverage as an explanatory variable. All regressions include customer proximity among the explanatory variables. We employ simultaneous regression models that allow for interrelationships between variables. First, to control for the potential correlation of the cross-sectional residuals, we apply the method of seemingly unrelated regressions (SUR) as proposed by Zellner (1962). Second, we run three-stage least squares (3SLS) regressions to account for the potential problem of endogeneity caused by a simultaneous determination of the variables of interest (in our case leverage and the channel variables).[30] Berger and Bonaccorsi di Patti (2006), to the best of our knowledge, are the first to take reverse causality between leverage and firm performance into account. The authors use a 2SLS approach and only mention that their main results also hold when they employ 3SLS. Kale and Shahrur (2007) also use a 2SLS approach to examine the (potential) simultaneous determination of customers' R&D intensity and suppliers' leverage. We basically follow their empirical strategy. Yet, we prefer 3SLS to 2SLS as it accounts for the potential correlation between the error terms across the equations that we use. This approach is recently used in corporate governance research to account for the simultaneous determination of governance variables and performance (see, e.g., Bhagat and Bolton 2008). In the 3SLS regressions, we treat leverage and the three channel variables as endogeneous variables regarding that leverage might as well affect firms' R&D intensity, their working capital management (i.e., CCC), and SG&A margins.

[30] In our OLS regressions, we already cope with the problem of reverse causality and simultaneous determination in two ways. First, we use a 'lagged' measure for customer proximity: the distance to historical customers (see section 2.3.1.). Second, we use a leverage measure for the year-end 2011 (*BOOK LEVERAGE 2011*) as an alternative dependent variable (see section 2.3.2.).

## 2.4 Empirical Findings

This section reports the main results regarding the effect of principal customer proximity on supplier leverage. We employ the variables presented in sections 2.3.1 and 2.3.2 and follow our econometric strategy as described in section 2.3.3. Accordingly, we first present the results of our univariate analysis as reported in *Table 2.5*.

**Table 2.5: Univariate Analysis - Comparison of Means**

This table contains comparison of means. Firms are divided into quartiles with respect to their median distance to customers. The first quartile (1st) includes firms with the closest customers, while the 4th quartile includes firms with the most remote customers. Difference of means is reported in the third column. All variables are defined as explained in *Table 2.3*. A T-test for difference in means is applied. Asterisks denote statistical significance at the 0.01(***), 0.05(**) and 0.10(*)-level.

| Variables | 1st Quartile | 4th Quartile | Diff. (1st – 4th) |
|---|---|---|---|
| Book Leverage | 0.224 | 0.157 | 0.067*** |
| Market Leverage | 0.207 | 0.139 | 0.069*** |
| Book Leverage 2011 | 0.243 | 0.155 | 0.088*** |
| Growing Leverage (2010 to 2011) Dummy | 0.420 | 0.350 | 0.070* |
| Growth | 1.958 | 2.090 | -0.132 |
| Profitability | 0.038 | 0.029 | 0.009 |
| Total Assets | 3,932 | 3,689 | 243 |
| Volatility | 0.592 | 0.616 | -0.024 |
| Diversification | 0.242 | 0.218 | 0.024 |
| SG&A Margin | 0.252 | 0.277 | -0.025 |
| R&D Intensity | 0.027 | 0.072 | -0.045*** |
| Customer Leverage | 0.277 | 0.258 | 0.019 |

Separating our sample firms in four quartiles according to their median distance to principal customers, a comparison of means of the first quartile (i.e., closest customers) and the fourth quartile (i.e., most remote customers) suggests the following. Firms in the first quartile have significantly higher leverage ratios in terms of both book and market leverage. The quartiles' means are significantly different at the 1% level (as indicated by the t-statistics). Firms in the first quartile have a leverage that is almost 7% higher than the leverage of firms in the fourth

quartile. This difference remains highly significant and is even larger (about 9%) when we consider the 2011 book leverage. In addition, firms in the fourth quartile have a 7% lower probability of increasing their leverage between 2010 and 2011 significant at the 10% level. We further find that firms with the most remote customers have a significantly higher R&D intensity than firms with the closest customers. This suggests that customer proximity has an effect on suppliers' R&D spending. We pick up on this in section 2.5.

Next, we turn to our multivariate regression results to find out whether our univariate results on supplier leverage still hold when we control for the factors that impact capital structure as described in section 2.3.2. Therefore, we run the baseline regression shown below in equation (5):

$$(5)\ \text{Leverage}_i = c_0 + c_1\,\text{CustomerProximity}_i + c_2\,\text{FirmSize}_i + c_3\,\text{Tangibility}_i + c_4\,\text{Growth}_i + c_5\,\text{Profitability}_i + c_6\,\text{Volatility}_i + c_7\,\text{Diversification}_i + c_8\,\text{Number Customers}_i + e_i$$

The results of our baseline regressions on book leverage are shown in *Table 2.6*. Additional results for market leverage and book leverage 2011 are shown in *Tables 2.7* and *2.8*, respectively. All of the analyses corroborate our univariate findings. In fact, we find strong evidence for an inverse relation between supplier leverage and the proximity of principal customers in all regressions.

## Table 2.6: Customer Distance and Book Leverage

This table contains OLS and Tobit regressions with *book leverage (total debt to total assets)* as the dependent variable. All variables are defined as explained in *Table 2.3*. A constant term, whose value is not reported, is included in all regressions. P-statistics are reported in parentheses. Asterisks denote statistical significance at the 0.01(***), 0.05(**) and 0.10(*)-level.

| | (1) **OLS Robust** | (2) **Tobit** | (3) **OLS Robust** | (4) **Tobit** | (5) **Tobit** | (6) **Tobit** |
|---|---|---|---|---|---|---|
| Median Distance Customer | $-3.26 \times 10^{-6}$* | $-5.77 \times 10^{-6}$** | | | | |
| | (0.074) | (0.038) | | | | |
| Log Median Distance Customer | | | -0.022* | -0.032** | | |
| | | | (0.085) | (0.038) | | |
| Log Average Distance Customer | | | | | -0.029* | |
| | | | | | (0.078) | |
| Historical Log Median Distance Customer | | | | | | -0.031** |
| | | | | | | (0.046) |
| Number Customer | -0.001 | -0.002 | -0.001 | -0.001 | -0.001 | -0.003 |
| | (0.471) | (0.413) | (0.630) | (0.591) | (0.704) | (0.219) |
| Firm Size | 0.054*** | 0.083*** | 0.054*** | 0.083*** | 0.083*** | 0.067*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Diversification | 0.002 | 0.006 | 0.002 | 0.007 | 0.006 | 0.007 |
| | (0.667) | (0.234) | (0.634) | (0.215) | (0.217) | (0.194) |
| Tangibility | -0.001 | -0.001 | -0.001 | -0.001 | -0.001 | 0.000 |
| | (0.684) | (0.441) | (0.686) | (0.437) | (0.413) | (0.880) |
| Profitability | -0.119 | -0.165* | -0.124 | -0.173* | -0.171* | 0.018 |
| | (0.700) | (0.066) | (0.689) | (0.055) | (0.057) | (0.844) |
| Growth | 0.001 | -0.005 | 0.001 | -0.005 | -0.005 | -0.008 |
| | (0.907) | (0.410) | (0.914) | (0.400) | (0.411) | (0.211) |
| Volatility | 0.121** | 0.155*** | 0.121** | 0.154*** | 0.154 | 0.161*** |
| | (0.013) | (0.000) | (0.013) | (0.000) | (0.000) | (0.000) |
| Industry Controls | Yes | Yes | Yes | Yes | Yes | Yes |
| N | 1,148 | 1,148 | 1,148 | 1,148 | 1,149 | 1,108 |
| $R^2$ /Pseudo $R^2$ | 0.150 | 0.230 | 0.150 | 0.230 | 0.229 | 0.182 |
| F-Stat./ $\chi^2$ (p-values) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

**Table 2.6: Customer Distance and Book Leverage (continued)**

| | (7) **OLS Robust** | (8)**Tobit** | (9) **OLS Robust** | (10) **Tobit** | (11) **OLS Robust** | (12) **OLS Robust** | (13) **Tobit** |
|---|---|---|---|---|---|---|---|
| Ratio US Customer | 0.067*** | 0.105*** | | | | | |
| | (0.001) | (0.001) | | | | | |
| Log Median Distance Customer | | | | | -0.028** | -0.029* | -0.026* |
| | | | | | (0.047) | (0.084) | (0.084) |
| Customer Leverage | | | | | 0.072* | 0.069* | |
| | | | | | (0.089) | (0.100) | |
| Log Dist_x_Leverage Median | | | | | | $1.08x10^{-6}$ | |
| | | | | | | (0.866) | |
| Geographic Segments | | | -0.007*** | -0.007*** | | | |
| | | | (0.000) | (0.008) | | | |
| Analyst Coverage | | | | | | | -0.007*** |
| | | | | | | | (0.000) |
| Non-debt Tax Shield | | | | | | | 2.741*** |
| | | | | | | | (0.000) |
| External directors | | | | | | | -0.175* |
| | | | | | | | (0.048) |
| Board Size | | | | | | | -0.184* |
| | | | | | | | (0.078) |
| Insiders Owned | | | | | | | -0.013 |
| | | | | | | | (0.562) |
| Number Customer | -0.001 | -0.001 | 0.065*** | 0.096*** | -0.002 | -0.001 | -0.003 |
| | (0.671) | (0.646) | (0.000) | (0.000) | (0.420) | (0.376) | (0.285) |
| Firm Size | 0.055*** | 0.084*** | 0.002 | 0.006 | 0.052*** | 0.052*** | 0.170*** |
| | (0.000) | (0.000) | (0.553) | (0.139) | (0.000) | (0.002) | (0.000) |
| Diversification | 0.002 | 0.007 | 0.001 | 0.001 | 0.005 | 0.005 | 0.004 |
| | (0.645) | (0.208) | (0.908) | (0.977) | (0.243) | (0.216) | (0.470) |
| Tangibility | -0.001 | -0.001 | 0.078 | 0.035 | -0.001 | -0.001 | -0.002 |
| | (0.679) | (0.423) | (0.675) | (0.650) | (0.891) | (0.941) | (0.288) |
| Profitability | -0.116 | -0.160* | -0.007 | -0.017*** | -0.190** | -0.190 | -0.080 |
| | (0.705) | (0.074) | (0.206) | (0.001) | (0.019) | (0.623) | (0.361) |
| Growth | 0.002 | -0.004 | 0.156*** | 0.194*** | 0.006 | 0.006 | 0.008 |
| | (0.877) | (0.461) | (0.000) | (0.000) | (0.277) | (0.635) | (0.211) |

**(Continuation of Table 2.6)**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Volatility | 0.120** | 0.154*** | -0.007*** | -0.007*** | 0.150*** | 0.150*** | 0.140*** |
| | (0.014) | (0.000) | (0.000) | (0.008) | (0.000) | (0.008) | (0.000) |
| Industry Controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| N | 1,149 | 1,149 | 1,544 | 1,544 | 1,009 | 1,009 | 1,148 |
| $R^2$/ Pseudo $R^2$ | 0.154 | 0.238 | 0.185 | 0.275 | 0.162 | 0.162 | 0.332 |
| F-Stat./ $\chi^2$ (p-values) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

As can be seen in *Table 2.6*, the regression coefficients of both the median distance to customers and the logarithm of the median distance (variable: *LOG MEDIAN DISTANCE CUSTOMER*) negatively affect supplier leverage significant at the 5% level when we employ Tobit estimations (specifications 2 and 4). The coefficients of these variables remain significant at the 10% level when we use OLS (specifications 1 and 3). Also the logarithm of the average distance to customers and the logarithm of the median distance to historical customers (i.e., 'lagged distance') are negative and significant at the 10% and 5% level, respectively (specifications 5 and 6). Our main variable *LOG MEDIAN DISTANCE CUSTOMER* even remains negative and significant (at least at the 10% level) when we additionally control for customer leverage (specifications 11 and 12) or when we extend the baseline model by the variables *NON-DEBT TAX SHIELD*, *ANALYST COVERAGE*, and the governance variables described in section 2.3.2 (specification 13). Our controls for customer leverage validate the recent findings in Chu and Wang (2011) as we also document a positive relation of customer indebtedness on supplier leverage. More important, when we employ the fraction of U.S. customers to all principal customers as an alternative measure of customer proximity (specifications 7 and 8), we find that the corresponding regression coefficient is positive and significant at the 1% level. This further corroborates our hypothesis that increases in customer remoteness lead to reductions in suppliers' use of debt. The same holds when we employ the number of geographic segments as a more general measure of customer remoteness (specifications 9 and 10). The regression coefficient is negative and significant at the 1% level. We assume that firms operating in many different regions in the world should face higher information gathering and communication costs, higher uncertainty (also due to different legal systems and other country-specific aspects) and should consequently lower their debt levels due to increased information asymmetries and reduced monitoring abilities.

## Table 2.7: Customer Distance and Market Leverage

This table contains OLS and Tobit regressions with *market leverage (defined as total debt divided by the sum of market capitalization and total debt)* as the dependent variable. All variables are defined as explained in *Table 2.3*. A constant term, whose value is not reported, is included in all regressions. P-statistics are reported in parentheses. Asterisks denote statistical significance at the 0.01(***), 0.05(**) and 0.10(*)-level.

| | (1) **OLS Robust** | (2) **Tobit** | (3) **Tobit** | (4) **Tobit** | (5) **Tobit** | (6) **Tobit** |
|---|---|---|---|---|---|---|
| Log Median Distance Customer | -0.019** | -0.027** | -0.023** | | | |
| | (0.045) | (0.020) | (0.049) | | | |
| Historical Log Median Distance Customer | | | | -0.030*** | | |
| | | | | (0.007) | | |
| Ratio US Customer | | | | | 0.072*** | |
| | | | | | (0.002) | |
| Geographic Segments | | | | | | -0.007*** |
| | | | | | | (0.002) |
| Non-debt Tax Shield | | | 1.640*** | 1.326*** | 1.619*** | 1.140*** |
| | | | (0.000) | (0.000) | (0.000) | (0.000) |
| Analyst Coverage | | | -0.006*** | -0.005*** | -0.006*** | -0.006*** |
| | | | (0.000) | (0.000) | (0.000) | (0.000) |
| Number Customer | -0.002 | -0.003 | -0.004* | -0.005** | -0.003* | -0.004** |
| | (0.229) | (0.142) | (0.078) | (0.014) | (0.091) | (0.024) |
| Firm Size | 0.043*** | 0.066*** | 0.118*** | 0.105*** | 0.120*** | 0.133*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Diversification | 0.003 | 0.005 | 0.003 | 0.002 | 0.003 | 0.005 |
| | (0.322) | (0.203) | (0.453) | (0.629) | (0.440) | (0.179) |
| Tangibility | 0.001 | -0.001 | -0.001 | 0.001 | -0.001 | $3{,}91 \times 10^{-4}$ |
| | (0.950) | (0.831) | (0.553) | (0.459) | (0.544) | (0.759) |
| Profitability | -0.144 | -0.170** | -0.099 | -0.033 | -0.093 | -0.116* |
| | (0.153) | (0.014) | (0.144) | (0.627) | (0.168) | (0.070) |
| Growth | -0.037*** | -0.068*** | -0.058*** | -0.062*** | -0.057*** | -0.064*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Volatility | 0.115*** | 0.148*** | 0.136*** | 0.135*** | 0.135*** | 0.161*** |
| | (0.001) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Industry Controls | Yes | Yes | Yes | Yes | Yes | Yes |
| N | 1,148 | 1,148 | 1,148 | 1,108 | 1,148 | 1,544 |
| $R^2$/Pseudo $R^2$ | 0.267 | 0.640 | 0.738 | 0.711 | 0.749 | 0.696 |
| F-Stat./ $\chi^2$ (p-values) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

## Table 2.8: Customer Distance and Book Leverage 2011

This table contains OLS and Tobit regressions with *book leverage 2011 (total debt to total assets for the year 2011)* as the dependent variable. All variables are defined as explained in *Table 2.3*. A constant term whose value is not reported, is included in all regressions. P-statistics are reported in parentheses. Asterisks denote statistical significance at the 0.01(***), 0.05(**) and 0.10(*)-level.

| | (1) **OLS** | (2) **Tobit** | (3) **OLS Clustered SE** | (4) **OLS** | (5) **Tobit** | (6) **Tobit** | (7) **Tobit** |
|---|---|---|---|---|---|---|---|
| Log Median Distance Customer | -0.037*** | -0.047*** | -0.055*** | -0.011* | -0.014* | | |
| | (0.003) | (0.002) | (0.005) | (0.052) | (0.057) | | |
| Ratio US Customer | | | | | | 0.114*** | |
| | | | | | | (0.001) | |
| Geographic segments | | | | | | | -0.007** |
| | | | | | | | (0.012) |
| Book Leverage | | | | 0.965*** | 1.045*** | | |
| | | | | (0.000) | (0.000) | | |
| Number Customer | -0.001 | -0.002 | -0.003* | -0.001 | -0.001 | -0.002 | -0.004 |
| | (0.534) | (0.510) | (0.100) | (0.415) | (0.341) | (0.507) | (0.142) |
| Firm Size | 0.061*** | 0.093*** | 0.071*** | 0.004 | 0.016*** | 0.095*** | 0.114*** |
| | (0.000) | (0.000) | (0.000) | (0.422) | (0.006) | (0.000) | (0.000) |
| Diversification | -0.001 | 0.002 | 0.001 | 0.001 | 0.003 | 0.002 | 0.004 |
| | (0.889) | (0.682) | (0.924) | (0.674) | (0.254) | (0.672) | (0.327) |
| Tangibility | -0.002 | -0.002 | -0.002 | -0.001 | -0.001 | -0.002 | 0.000 |
| | (0.204) | (0.299) | (0.558) | (0.115) | (0.180) | (0.288) | (0.796) |
| Profitability | 0.031 | 0.080 | 0.001 | -0.249*** | -0.286*** | 0.084 | 0.067 |
| | (0.710) | (0.466) | (0.996) | (0.000) | (0.000) | (0.442) | (0.429) |
| Growth | -0.001 | -0.010 | -0.001 | 0.009*** | 0.007** | -0.009 | -0.016*** |
| | (0.766) | (0.141) | (0.903) | (0.000) | (0.030) | (0.204) | (0.004) |
| Volatility | 0.159*** | 0.199*** | 0.168*** | 0.010 | 1.045*** | 0.200*** | 0.249*** |
| | (0.000) | (0.000) | (0.000) | (0.312) | (0.000) | (0.000) | (0.000) |
| Industry Controls | Yes | Yes | No | Yes | Yes | Yes | Yes |
| N | 1,046 | 1,046 | 1,046 | 1,046 | 1,046 | 1,503 | 1,402 |
| $R^2$/Adj. $R^2$/ Pseudo $R^2$ | 0.169 | 0.283 | 0.110 | 0.809 | 1.830 | 0.288 | 0.308 |
| F-Stat./ $\chi^2$ (p-values) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

Regarding *Table 2.7* that presents the results for market leverage, we document that the regression coefficient of the variable *LOG MEDIAN DISTANCE CUSTOMER* is negative and significant at the 5% level throughout specifications 1-3 (using both Tobit and OLS). In particular, specification 3 includes the variables *NON-DEBT TAX SHIELD* and *ANALYST COVERAGE*. So do the remaining specifications 4-6 in *Table 2.7*. All of them are estimated using Tobit regressions. These regressions further corroborate our findings from *Table 2.6*: the regression coefficients for the distance of historical customers, the ratio of U.S. principal customers, and the number of geographic segments are all significant at the 1% level and have the expected signs. In sum, employing market leverage, our results are more significant and provide even stronger evidence for our hypothesis.

Finally, in *Table 2.8* we consider the dependent variable *BOOK LEVERAGE 2011* to be able to use lagged variables, particularly lagged customer distance measures, on suppliers' leverage. Again, our hypothesis is strongly corroborated. The regression coefficient of the variable *LOG MEDIAN DISTANCE CUSTOMER*, using both OLS and Tobit, is negative and significant at the 1% level in specifications 1-3 and remains significant at the 10% level when we control for lagged (i.e., 2010) leverage in specifications 4 and 5. Finally, the regression coefficients for our variables capturing the ratio of U.S. customers and the number of geographic segments both, again, are significant at the 1% and the 5% level, respectively, and have the predicted signs. Regressions with *MARKET LEVERAGE 2011*, not shown for brevity, yield comparable results.

Regarding the control variables we use in our regression analyses in *Tables 2.6, 2.7* and *2.8*, the following patterns can be observed. First, in line with the literature, we document a continuously significant and positive effect of *FIRM SIZE* on leverage. Second, we also find a steadily significant and positive effect of *VOLATILITY* on leverage. This finding corroborates the recent results in Bharath et al. (2009). Third, we document a significantly negative effect of the variable *ANALYST COVERAGE* on leverage in line with the results in Chang et al. (2006). Fourth, the effect of firms' non-debt tax shields (NDTS) on leverage is significant and positive. This finding is in contrast to DeAngelo and Masulis (1980) who suggest that NDTS should be negatively related to firm leverage. However, to date there is no conclusive evidence regarding the effect of NDTS on leverage: DeJong et al. (2011) report an insignificant effect of NDTS on leverage, while Eun and Wang (2012) recently report a significantly positive effect. Finally, in line with recent evidence (e.g., DeJong et al. 2011, Rauh and Sufi 2010, and Kayhan and Titman 2007), the regression coefficient of *PROFITABILITY* is negative (and partly significant) in the vast majority of the regressions. Overall, our results follow the same patterns as other recent studies

on corporate capital structure and particularly corroborate recent findings regarding the impact of asymmetric information (as measured by stock volatility and analyst coverage) on leverage.

## 2.5 Robustness: Channel Analysis and Other Tests

### 2.5.1 Channels

In the following, we present the results of a detailed analysis about the potential channels through which customer proximity may affect supplier leverage. We do so to test the robustness of our results presented in section 2.4 and to provide the reader with additional insights regarding the effects of principal customer proximity on suppliers' business and financials. Therefore, we run several regressions as described in section 2.3.3. First, however, we explain how customer proximity may impact the channel variables SG&A margin, R&D intensity, and CCC.

More remote principal customers can increase firms' SG&A margins due to higher advertising and marketing expenses, additional commissions as well as higher travel expenses and salaries paid for salespeople and executives working abroad (see, e.g., Banker et al. 2011). Firms' R&D expenses can increase with their distance to principal customers due to, for example, the need for i) foreign market research and ii) selling especially tailored products to foreign customers. Furthermore, technological innovation (possible through R&D spending) can be modeled as a process of uncertainty reduction (e.g., Souder and Moenaert 1992). As more remote customers generally mean increased uncertainty, the distance to customers can affect firms' R&D intensity as a reaction to reduce uncertainty. Finally, due to increased time-consuming transport needs, possible special payment agreements for large foreign customers, and, possibly, less disciplined payment morale, the days of sales outstanding and the whole cash conversion cycle can increase with customer distance. To test the effect of principal customer proximity on our channel variables, we run the following regression models as shown in *Table 2.9* (for SG&A margin and working capital) and *Table 2.10* (for R&D intensity).

## Table 2.9: Channel Analysis - SG&A Margin and Working Capital

This table contains OLS and Tobit regressions with *selling-related* dependent variables. All variables are defined as explained in *Table 2.3*. A constant term, whose value is not reported, is included in all regressions. P-statistics are reported in parentheses. Asterisks denote statistical significance at the 0.01(***), 0.05(**) and 0.10(*)-level.

| | SG&A Margin | | | | CCC | Days Sales Outstanding |
|---|---|---|---|---|---|---|
| | (1) **OLS** | (2) **Tobit** | (3) **OLS** | (4) **Tobit** | (5) **OLS** | (6) **OLS** |
| | **Robust** | | **Clustered SE** | | **Robust** | **Robust** |
| Log Median Distance Customer | 0.026** | 0.027*** | | | 5.120* | 3.803** |
| | (0.012) | (0.010) | | | (0.093) | (0.015) |
| Growing Customer Distance | | | 0.033** | 0.030** | | |
| | | | (0.012) | (0.036) | | |
| Number Customer | -0.003* | -0.003 | -0.006*** | -0.006** | -0.705* | 0.342 |
| | (0.097) | (0.118) | (0.008) | (0.011) | (0.092) | (0.104) |
| Firm Size | -0.073*** | -0.074*** | -0.071*** | -0.074*** | -3.689 | -1.195 |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.167) | (0.283) |
| Diversification | -0.013*** | -0.013*** | -0.015*** | -0.013*** | -1.158 | 0.134 |
| | (0.001) | (0.000) | (0.003) | (0.003) | (0.362) | (0.851) |
| Market Leverage | -0.103*** | -0.099*** | -0.112*** | -0.108*** | -35.509*** | -19.285*** |
| | (0.001) | (0.001) | (0.010) | (0.004) | (0.001) | (0.001) |
| External Directors | 0.008 | 0.007 | -0.112* | -0.105 | | |
| | (0.884) | (0.909) | (0.059) | (0.168) | | |
| Board Size | 0.284*** | 0.286*** | 0.333*** | 0.303*** | | |
| | (0.000) | (0.000) | (0.000) | (0.001) | | |
| CEO/Chairman Duality | 0.019 | 0.017 | 0.047 | 0.042 | | |
| | (0.355) | (0.255) | (0.449) | (0.117) | | |
| Insiders Owned | -0.009 | -0.009 | -0.001 | -0.010 | | |
| | (0.404) | (0.615) | (0.966) | (0.601) | | |
| Dummy Negative Net Income | | | | | -13.093*** | 2.126 |
| | | | | | (0.010) | (0.562) |
| Dummy Admired Company | | | | | -20.333*** | -1.864 |
| | | | | | (0.000) | (0.411) |
| Industry Controls | Yes | Yes | No | Yes | Yes | Yes |
| N | 1,463 | 1,463 | 1,018 | 1,018 | 1,126 | 1,126 |
| $R^2$ / Pseudo $R^2$ | 0.140 | 10.192 | 0.123 | 4.322 | 0.154 | 0.056 |
| F-Stat./ $\chi^2$ (p-values) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

First, as can be seen from the results in *Table 2.9*, the distance to principal customers significantly (at the 5% level) increases firms' SG&A margins. This holds for our main variable *LOG MEDIAN DISTANCE CUSTOMER* (specifications 1 and 2) as well as for the indicator variable *GROWING CUSTOMER DISTANCE* (specifications 3 and 4) that is set to one if the median distance of firms' current customers is larger than the distance to their historical customers. In these regressions, we control for several variables - the number of customers, firm size, diversification, leverage, and industries - and include measures of corporate governance (the fraction of external directors, board size, insider ownership, and CEO-chairman duality).

Second, *Table 2.9* further shows that customer proximity also significantly affects working capital efficiency as measured by the variables *CCC* and *DAYS SALES OUTSTANDING*. In line with our aforementioned reasoning, more remote customers lead to longer periods over which cash is bound in the production cycle of suppliers as both variables are positively affected by customer distance. In these regressions, we again control for the number of customers, firm size, diversification, leverage, and industries. In addition, we include two indicator variables: *DUMMY NEGATIVE NET INCOME*, set to one if a firm reported negative earnings in the two years prior to our sample period (i.e., 2008 and 2009), and *DUMMY ADMIRED COMPANY*, set to one for firms that belong to the 2010 list of Fortune Magazine's 300 Most Admired Companies. The first variable is used to control for the firms' capacities of internal financing and particularly their liquidity needs, while the second variable is a control for firms' market power. Firms with high market power or admired products are rather less likely to grant special payment agreements to attract customers. Finally, we acknowledge that leverage is significant in all specifications (1-6).

Third, as shown in *Table 2.10*, customer proximity has a significant effect on suppliers' R&D intensity. In particular, we find a strong and positive relation between the distance to principal customers and suppliers' R&D expenses in line with our reasoning. This effect is significant at the 1% level throughout all regressions (specifications 1-6) and holds for several measures of proximity: the logarithm of the distance to current and to historical customers as well as the fraction of U.S. principal customers. We use two estimation techniques and two definitions of R&D intensity in our analysis. In specifications 1-3, we estimate a logit model with (three-digit) industry-clustered standard errors on the dependent variable *INDUSTRY ADJUSTED R&D*. In the remaining specifications we use OLS and Tobit regressions on the ratio of R&D expenses to total assets (variable *R&D INTENSITY*). All regressions control for the number of geographic

## Table 2.10: Channel Analysis - R&D Related Variables

This table contains Logit, OLS, and Tobit regressions with *R&D related variables* as dependent variables. All variables are defined as explained in *Table 2.3*. A constant term, whose value is not reported, is included in all regressions. P-statistics are reported in parentheses. Asterisks denote statistical significance at the 0.01(***), 0.05(**) and 0.10(*)-level.

| | **Industry-adjusted R&D** | | **R&D Intensity (R&D Expenditures/TA)** | | |
|---|---|---|---|---|---|
| | (1) **Logit** | (2) **Logit** | (3) **OLS** | (4) **Tobit** | (5) **Tobit** |
| | **Clustered SE** | **Clustered SE** | **Robust** | | |
| Log Median Distance Customer | 0.439*** | | 0.017*** | 0.037*** | |
| | (0.000) | | (0.000) | (0.000) | |
| Historical Log Median Distance Customer | | 0.583*** | | | 0.050*** |
| | | (0.000) | | | (0.000) |
| Geographic Segments | 0.107*** | 0.075*** | 0.004*** | 0.009*** | 0.008*** |
| | (0.000) | (0.008) | (0.000) | (0.000) | (0.000) |
| Diversification | -0.225*** | -0.240*** | -0.008*** | -0.014*** | -0.014*** |
| | (0.000) | (0.001) | (0.000) | (0.000) | (0.000) |
| Firm Size | -0.049 | -0.108 | -0.023*** | -0.033*** | -0.036*** |
| | (0.683) | (0.466) | (0.006) | (0.000) | (0.000) |
| Dummy Negative Net income | 0.468*** | 0.418*** | 0.027*** | 0.046*** | 0.037*** |
| | (0.001) | (0.003) | (0.000) | (0.000) | (0.001) |
| Book Leverage | -2.000*** | -1.637*** | 0.028 | -0.016 | -0.006 |
| | (0.000) | (0.000) | (0.646) | (0.461) | (0.774) |
| CapEx/Total Assets | -4.535** | -5.324** | -0.051 | -0.161 | -0.156 |
| | (0.022) | (0.011) | (0.405) | (0.239) | (0.285) |
| Dummy Admired Company | 0.372 | 0.461* | 0.027*** | 0.034** | 0.039** |
| | (0.129) | (0.052) | (0.003) | (0.049) | (0.029) |
| Industry Controls | Yes | Yes | Yes | Yes | Yes |
| N | 1,344 | 1,263 | 1,352 | 1,352 | 1,264 |
| $R^2$ / Pseudo $R^2$ | 0.199 | 0.201 | 0.183 | 1.112 | 1.112 |
| F-Stat./ $\chi^2$ (p-values) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

segments to better point out the additional effect of large customers' remoteness. The number of geographical segments itself has a significantly positive impact on R&D intensity, in line with generally increased R&D expenses due to an increased number of different regions the firms' already operate in. We further control for diversification, firm size, leverage, capital expenditures, industries, and the two indicator variables *DUMMY NEGATIVE NET INCOME* and *DUMMY ADMIRED COMPANY*. These two variables are included for the following reasons. Firms with lower (or no) internal financing capacities may be forced to reduce discretionary spendings such as R&D or they may have an incentive to increase R&D spendings (if possible) to enhance their market position and to overcome their current problems that manifest in negative earnings. Our results indicate that the latter seems to be the case. Furthermore, admired companies have an incentive to spend a significant portion of cash flows for R&D in order to maintain their superior market position. Results are in line with this reasoning.

Next, as shown in the previous analyses, principal customers' distance to their suppliers significantly affects our channel variables. Thus, the effect of customer remoteness on firm leverage we have measured in section 2.4 might be driven by the channel variables. That means, the findings presented so far might be the results of a spurious regression as customer remoteness might impact leverage only indirectly through the effects on the channels variables that might have a direct impact on firm leverage. Particularly, increased SG&A and R&D expenses as well as a lower short-term liquidity, can cause firms to adopt a more conservative (i.e., less debt-financed) capital structure. Therefore, to rule out that our findings reflect a spurious regression, we run four types of regressions (as described in section 2.3.3): an OLS and a Tobit regression of our baseline leverage regression model from section 2.4 including the three channel variables, a seemingly unrelated regression (SUR) approach, and a three-stage least squares (3SLS) regression approach. SUR and 3SLS are estimated in a system of equations including the baseline leverage regression model and the three channel regression models. The results of these regressions (only the leverage regressions for brevity) are shown in *Table 2.11*.

**Table 2.11: Simultaneous Regression Results - SUR and 3SLS Regressions**

This table contains OLS, Tobit, SUR (seemingly unrelated regressions), and 3SLS (three-stage least squares) regressions with *book leverage* as the dependent variable. All variables are defined as explained in *Table 2.3*. A constant term, whose value is not reported, is included in all regressions. P-Statistics are reported in same column, respectively. Asterisks denote statistical significance at the 0.01(***), 0.05(**) and 0.10(*)-level.

| | (1) **Tobit** | | (2) **OLS** Robust | | (3) **SUR** | | (4) **3SLS** | |
|---|---|---|---|---|---|---|---|---|
| | | **p-stat.** | | **p-stat.** | | **p-stat.** | | **p-stat.** |
| Log Median Distance Customer | -0.068*** | (0.000) | -0.053*** | (0.000) | -0.061*** | (0.000) | -0.034** | (0.048) |
| Number Customer | -0.002 | (0.541) | -0.001 | (0.582) | -0.001 | (0.723) | 0.007*** | (0.005) |
| SG&A Margin | -0.019 | (0.749) | -0.001 | (0.989) | -0.045 | (0.385) | 1.127*** | (0.009) |
| R&D Intensity | 0.377*** | (0.000) | 0.392 | (0.186) | 0.703*** | (0.000) | -0.500 | (0.157) |
| CCC | $1.28x10^{-4}$* | (0.068) | $-1.84x10^{-4}$** | (0.038) | $-4.08x10^{-4}$*** | (0.000) | -0.002*** | (0.001) |
| Firm Size | 0.080*** | (0.000) | 0.059*** | (0.000) | 0.070*** | (0.000) | 0.085*** | (0.001) |
| Diversification | 0.007 | (0.161) | 0.003 | (0.439) | 0.006 | (0.155) | 0.005 | (0.290) |
| Tangibility | $7.90x10^{-5}$ | (0.963) | $8.33x10^{-5}$ | (0.976) | $-9.02x10^{-5}$ | (0.947) | 0.001 | (0.720) |
| Profitability | 0.035 | (0.701) | 0.068 | (0.750) | 0.037 | (0.642) | 0.240 | (0.310) |
| Growth | -0.019** | (0.013) | -0.013 | (0.200) | -0.010* | (0.083) | 0.002 | (0.895) |
| Volatility | 0.157*** | (0.000) | 0.126*** | (0.004) | 0.148*** | (0.000) | 0.119*** | (0.000) |
| Industry Controls | Yes | | Yes | | Yes | | Yes | |
| N | 925 | | 925 | | 868 | | 868 | |
| $R^2$/ Pseudo $R^2$ | 0.412 | | 0.199 | | 0.195 | | -0.486 | |
| F-Stat./ $\chi^2$ (p-values) | 0.000 | | 0.000 | | 0.000 | | 0.000 | |

The results in *Table 2.11* suggest that no matter which type of estimation technique we apply, the relation between customer remoteness and supplier leverage remains significant. Except for specification 4 (3SLS), the regression coefficient of our main variable *LOG MEDIAN DISTANCE CUSTOMER* is negative and significant at the 1% level (at the 5% level otherwise). This suggests that our findings from section 2.4 are most probably not the result of a spurious regression. This further suggests that, most probably, our findings are neither a pure effect of disregarded reverse causality. Hence, we conclude that our hypothesis holds: firms reduce their use of debt when they have more remote principal customers. This is most probably a reaction to increased uncertainty caused by increased information acquisition and monitoring costs and a less stable contribution of remote customers to suppliers' sales.

With respect to the OLS and Tobit regressions, we find that the coefficient of the variable CCC is negative, close to zero, and significant at least at the 10% level. The corresponding coefficient is even significant at the 1% level when we apply SUR or 3SLS estimation. This indicates that, in line with our reasoning, firms with a lower short-term liquidity (or a less efficient working capital management) slightly reduce their leverage. Except for specification 4, our results also suggest that R&D intensity increases firms' use of debt as we report a significantly positive regression coefficient of the variable *R&D INTENSITY*. This finding is in line with the pecking order theory (for a discussion on the effect of R&D on debt levels, see Frank and Goyal 2009). We do not find a significant effect of the variable *SG&A MARGIN* on firm leverage.[31]

### 2.5.2 Additional Robustness Tests

In this section, we perform additional tests to further check the robustness of our results and our general reasoning. In a first step, we deal with the problem of data availability. As we are not able to gather full information about the headquarters' locations of all of the firms' customers in several cases, we conduct the following robustness check. We repeat our baseline regressions from section 2.4 for only those firms for which we are able to obtain customers' headquarters locations for at least 75% of all of a firm's principal customers. Results are shown in *Tables 2.12* and *2.13*.

[31] We acknowledge that the correlation between the variables *SG&A MARGIN* and *R&D INTENSITY* is 19.8%.

## Table 2.12: Subsample with 75% Customer Identification Rate per Supplier (book leverage)

This table contains OLS and Tobit regressions with *book leverage (total debt to total assets)* as the dependent variable. We only include firms with a customer identification rate of at least 75%. All variables are defined as explained in *Table 2.3*. A constant term, whose value is not reported, is included in all regressions. P-statistics are reported in parentheses. Asterisks denote statistical significance at the 0.01(***), 0.05(**) and 0.10(*)-level.

| | (1) **OLS** **Robust** | (2) **OLS** **Robust** | (3) **OLS** **Clustered SE** | (4) **Tobit** | (5) **Tobit** | (6) **OLS** **Robust** | (7) **OLS** **Robust** | (8) **OLS** **Robust** | (9) **OLS** **Robust** | (10) **OLS** **Robust** |
|---|---|---|---|---|---|---|---|---|---|---|
| Median Distance Customer | $-6.49 \times 10^{-6}$*** | | | | | | | | | |
| | (0.003) | | | | | | | | | |
| Log Median Distance Customer | | -0.031** | -0.031** | -0.047** | | | | -0.041** | -0.025* | -0.024* |
| | | (0.035) | (0.037) | (0.013) | | | | (0.029) | (0.064) | (0.071) |
| Historical Log Median Distance Customer | | | | | -0,037* | | | | | |
| | | | | | (0.057) | | | | | |
| Geographic Segments | | | | | | -0.007*** | | | | |
| | | | | | | (0.002) | | | | |
| Ratio US Customer | | | | | | | 0.075*** | | | |
| | | | | | | | (0.002) | | | |
| Customer Leverage | | | | | | | | 0.104* | | |
| | | | | | | | | (0.068) | | |
| Log Dist_X_Leverage Median | | | | | | | | 0.000 | | |
| | | | | | | | | (0.859) | | |
| Non-Debt Tax Shield | | | | | | | | | 2.221** | 2.267** |
| | | | | | | | | | (0.017) | (0.015) |
| Analyst Coverage | | | | | | | | | -0.006*** | -0.007*** |
| | | | | | | | | | (0.000) | (0.000) |
| External Directors | | | | | | | | | | -0.179 |
| | | | | | | | | | | (0.144) |
| Board Size | | | | | | | | | | -0.204 |
| | | | | | | | | | | (0.156) |
| Insiders Owned | | | | | | | | | | 0.060 |
| | | | | | | | | | | (0.401) |

**(Continuation of *Table 2.12*)**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Number Customer | 0.000 | 0.000 | 0.000 | 0.001 | -0.001 | -0.001 | 0.000 | 0.000 | -0.001 | -0.001 |
| | (0.846) | (0.890) | (0.879) | (0.829) | (0.775) | (0.637) | (0.855) | (0.991) | (0.787) | (0.665) |
| Firm Size | 0.049*** | 0.049*** | 0.049** | 0.081*** | 0.047*** | 0.069*** | 0.050*** | 0.045** | 0.105*** | 0.137*** |
| | (0.005) | (0.005) | (0.016) | (0.000) | (0.002) | (0.000) | (0.004) | (0.026) | (0.000) | (0.000) |
| Diversification | -0.002 | -0.001 | -0.001 | 0.003 | 0.009 | -0.003 | -0.001 | 0.002 | -0.003 | -0.003 |
| | (0.924) | (0.933) | (0.801) | (0.634) | (0.195) | (0.502) | (0.939) | (0.756) | (0.497) | (0.466) |
| Tangibility | 0.000 | 0.000 | 0.000 | 0.000 | 0.001 | 0.001 | 0.000 | 0.001 | 0.000 | 0.000 |
| | (0.924) | (0.933) | (0.932) | (0.838) | (0.657) | (0.704) | (0.939) | (0.555) | (0.867) | (0.916) |
| Profitability | 0.001 | -0.006 | -0.006 | -0.046 | 0.198 | 0.409 | 0.008 | -0.038 | 0.097 | 0.065 |
| | (0.998) | (0.988) | (0.988) | (0.700) | (0.137) | (0.197) | (0.986) | (0.940) | (0.803) | (0.861) |
| Growth | 0.001 | 0.001 | 0.001 | -0.003 | -0.008 | -0.010 | 0.001 | 0.007 | 0.012 | 0.014 |
| | (0.926) | (0.937) | (0.929) | (0.649) | (0.407) | (0.168) | (0.925) | (0.685) | (0.365) | (0.269) |
| Volatility | 0.119** | 0.117** | 0.117*** | 0.150*** | 0.120*** | 0.211*** | 0.117** | 0.140** | 0.100* | 0.101** |
| | (0.027) | (0.029) | (0.007) | (0.000) | (0.000) | (0.004) | (0.030) | (0.030) | (0.051) | (0.050) |
| Industry Controls | Yes | Yes | No | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| N | 835 | 835 | 835 | 835 | 743 | 787 | 835 | 725 | 835 | 835 |
| $R^2$ /Pseudo $R^2$ | 0.143 | 0.141 | 0.141 | 0.207 | 0.155 | 0.254 | 0.144 | 0.155 | 0.204 | 0.218 |
| F-Stat./ $\chi^2$ (p-values) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

**Table 2.13: Subsample with 75% Customer Identification Rate (book leverage 2011 and market leverage)**

This table contains OLS and Tobit regressions with *book leverage 2011* and *market leverage (defined as total debt divided by the sum of market capitalization and total debt)* as dependent variables. We only include firms with a customer identification rate of at least 75%. All variables are defined as explained in *Table 2.3*. A constant term, whose value is not reported, is included in all regressions. P-statistics are reported in parentheses. Asterisks denote statistical significance at the 0.01(***), 0.05(**) and 0.10(*)-level.

| | Book Leverage 2011 | | Market Leverage | |
|---|---|---|---|---|
| | (1) **OLS** **Clustered SE** | (2) **Tobit** | (3) **OLS** **Robust** | (4) **Tobit** |
| Log Median Distance Customer | -0.043*** | -0.036** | -0.030*** | -0.042*** |
| | (0.004) | (0.030) | (0.007) | (0.002) |
| Number Customer | -0.003 | -0.001 | -0.001 | -0.002 |
| | (0.166) | (0.828) | (0.417) | (0.389) |
| Firm Size | 0.073*** | 0.096*** | 0.043*** | 0.066*** |
| | (0.000) | (0.000) | (0.000) | (0.000) |
| Diversification | -0.003 | -0.005 | $-7{,}60 \times 10^{-5}$ | 0.001 |
| | (0.444) | (0.414) | (0.982) | (0.764) |
| Tangibility | 0.000 | $9{,}87 \times 10^{-5}$ | 0.001 | 0.001 |
| | (0.967) | (0.960) | (0.573) | (0.623) |
| Profitability | 0.274 | 0.415*** | -0.187 | -0.135 |
| | (0.295) | (0.001) | (0.143) | (0.138) |
| Growth | -0.008 | -0.019** | -0.034*** | -0.064*** |
| | (0.175) | (0.023) | (0.000) | (0.000) |
| Volatility | 0.152*** | 0.184*** | 0.116*** | 0.141*** |
| | (0.000) | (0.000) | (0.009) | (0.000) |
| Industry | No | Yes | Yes | Yes |
| N | 768 | 768 | 835 | 835 |
| $R^2$/Pseudo $R^2$ | 0.126 | 0.350 | 0.288 | 0.613 |
| F-Stat./ $\chi^2$ (p-values) | 0.000 | 0.000 | 0.000 | 0.000 |

As can be seen from both Tables, our results for all proximity measures hold and are partly even more significant than for the full sample regressions. For brevity and as the findings are equivalent to the full sample regressions, we do not elaborate on these results.

The distance to principal customers could have a negative effect on suppliers' leverage only because it reflects country-specific risk factors or non-international accounting practices. Therefore, in a second step, we test if our main variable of interest *LOG MEDIAN DISTANCE CUSTOMER* remains significant when we control for the customers' accounting standards, political stability, and the quality of the legal system (i.e., the quality of contract enforcement, courts, etc.). Generally following the accounting literature (e.g., Barth et al. 2008), we control for customers' average accounting quality via a variable measuring the fraction of a supplier's customers that do not use U.S. GAAP or IFRS (*NON-USGAAP/IFRS*). Unfortunately, this information is not available for all customers. The average political stability of a supplier's customers is controlled for using the average of Kaufmann et al.'s (2009) country-specific index for political stability and absence of violence (*POLITICAL STABILITY*) over the different customers. The same is done for Kaufmann et al.'s (2009) rule of law index (*RULE OF LAW*) to account for legal quality (following, e.g., Nunn 2007). In particular, each of a supplier's customers is assigned a country-specific value for political stability and rule of law and then the average over a supplier's number of customers is taken and used in addition to the variables of the benchmark regression model.[32] We acknowledge that the correlation between the variables *POLITICAL STABILITY* and *RULE OF LAW* is 0.8. Results are shown in *Table 2.14*.

[32] Further, as gravitation models are used to explain bilateral trade flows between countries (see Tinbergen 1962 and Anderson and Van Wincoop 2003), they can be regarded as alternative controls on microeconomic levels. As we use the above mentioned measures for country-specific uncertainty, we do not control for these trade-related issues. Nevertheless, we acknowledge that strong trade relations between countries could affect general country-specific uncertainties and, thus, have an effect on (perceived) uncertainties between business partners.

## Table 2.14: Accounting Standards, Political Stability, and the Rule-of-Law Index

This table contains Tobit regressions with *book leverage (defined as total debt to total assets)*, *market leverage (defined as total debt divided by the sum of market capitalization and total debt)* and *book leverage 2011* as dependent variables. All variables are defined as explained in *Table 2.3*. For information about the exact composition of the index-variables Political Stability and Rule of Law, please refer to Kaufmann et al. (2009). A constant term, whose value is not reported, is included in all regressions. P-statistics are reported in parentheses. Asterisks denote statistical significance at the 0.01(***), 0.05(**) and 0.10(*)-level.

| | **Book Leverage** | **Market Leverage** | **Book Leverage 2011** | **Book Leverage** | **Book Leverage 2011** | **Market Leverage** |
|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Non-US GAAP/IFRS | 0.015 | 0.005 | 0.020 | 0.023 | 0.028 | 0.013 |
| | (0.660) | (0.844) | (0.594) | (0.511) | (0.444) | (0.621) |
| Political Stability | 0.021 | 0.022 | 0.040 | | | -0.089* |
| | (0.633) | (0.499) | (0.382) | | | (0.086) |
| Rule of Law | | | | 0.066** | 0.080** | 0.106*** |
| | | | | (0.044) | (0.016) | (0.006) |
| Log Median Distance Customer | -0.044** | -0.035*** | -0.064*** | -0.037** | -0.056*** | -0.024* |
| | (0.011) | (0.007) | (0.000) | (0.036) | (0.002) | (0.072) |
| Number Customer | -0.003 | -0.004** | -0.003 | -0.003 | -0.003 | -0.004* |
| | (0.287) | (0.044) | (0.280) | (0.290) | (0.291) | (0.063) |
| Firm Size | 0.084*** | 0.069*** | 0.092*** | 0.086*** | 0.095*** | 0.072*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Diversification | 0.009 | 0.006 | 0.004 | 0.008 | 0.003 | 0.006 |
| | (0.111) | (0.117) | (0.521) | (0.142) | (0.612) | (0.175) |
| Tangibility | 0.000 | -0.001 | -0.001 | 0.000 | 0.000 | -0.001 |
| | (0.919) | (0.689) | (0.784) | (0.950) | (0.824) | (0.738) |
| Profitability | -0.243** | -0.214*** | 0.071 | -0.237** | 0.073 | -0.216*** |
| | (0.018) | (0.007) | (0.550) | (0.021) | (0.536) | (0.006) |
| Growth | -0.001 | -0.067*** | -0.010 | -0.001 | -0.009 | -0.067*** |
| | (0.831) | (0.000) | (0.197) | (0.837) | (0.211) | (0.000) |
| Volatility | 0.188*** | 0.178*** | 0.211*** | 0.189*** | 0.212*** | 0.179*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Industry Controls | Yes | Yes | Yes | Yes | Yes | Yes |
| N | 1,035 | 1,035 | 940 | 1,035 | 940 | 1,035 |
| Pseudo $R^2$ | 0.238 | 0.675 | 0.281 | 0.242 | 0.288 | 0.688 |
| F-Stat./ $\chi^2$ (p-values) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

We jointly control for customers' average accounting quality and average political stability in specifications 1-3, for accounting quality and the rule of law in specifications 4 and 5, and for all of the three variables together in specification 6. As can be seen from *Table 2.14*, *LOG MEDIAN DISTANCE CUSTOMER* does not lose magnitude and remains significant at least at the 5% level in specifications 1-5 and at the 10% level in specification 6. While neither the customers' accounting standards nor the political stability of the countries where the customers are headquartered show considerable impact on suppliers' capital structures, the regression coefficient of the customers' average value of the rule of law index has a significantly positive effect on supplier leverage. This is in line with general economic reasoning as increased legal quality (indicated by larger values of the rule of law index) should lead to reduced uncertainty regarding legal risks for suppliers.

In a third step, we examine whether competition and industry characteristics have an impact on our results. One can argue that suppliers facing more competition may reduce their leverage due to lower margins and, in particular, due to an increased risk of principal customers that (can) switch to competitors. Generally, customers should face lower switching costs in case suppliers have more competitors. In this context, a related, distance-based argument can be made in addition: as the majority of principal customers are U.S. companies (see *Table 2.2*), these customers also face lower switching costs if a supplier has more proximate competitors.[33] To test the effect of competitors, we make use of the detailed competitor data available in Capital IQ (for more information, see Rauh and Sufi 2012). We retrieve the number of all of a firm's competitors (and their location if available) and calculate the median distance (of headquarters) between the competitors and the respective firm (denoted *NUMBER COMPETITORS* and *MEDIAN DISTANCE COMPETITOR,* respectively). Furthermore, we determine the distance between a firm and its closest competitor (*MIN DISTANCE COMPETITOR*) to more accurately test our distance-based competition measure. We expect the variable *NUMBER COMPETITORS* to have a negative impact on supplying firms' leverage, while *MEDIAN DISTANCE COMPETITOR* and *MIN DISTANCE COMPETITOR* should have a positive impact due to increased customer switching costs. We test our hypotheses and the robustness of our main result on customer proximity in the regressions shown in *Table 2.15*. In specifications 5 and 6 we additionally control for industry characteristics using indicator variables for relationship industries as well as durable-good and non-durable-good industries.

[33] In this context, we argue that customers are potentially more willing to switch to closer (or even other U.S.) competitors as these suppliers are better known and more familiar to customers. Furthermore, customers might already have experienced the product quality of closer competitors with a higher probability and they might generally prefer suppliers form the same or more comparable (closer) legal systems.

## Table 2.15: Competition, Switching Costs, and Industry Characteristics

This table contains OLS and Tobit regressions with *book leverage (defined as total debt to total assets)* and *market leverage (defined as total debt divided by the sum of market capitalization and total debt)* as dependent variables. All variables are defined as explained in *Table 2.3*. Specification 7 is a subsample analysis in which a restriction of > 4,000 km is set on the minimum distance to the closest competitor (i.e., customers of these 122 firms have very high switching costs when following a distance-based definition of switching costs). A constant term, whose value is not reported, is included in all regressions. P-statistics are reported in parentheses. Asterisks denote statistical significance at the 0.01(***), 0.05(**) and 0.10(*)-level.

| | Book Leverage | Market Leverage | Market Leverage | Market Leverage | Book Leverage | Market Leverage | Book Leverage |
|---|---|---|---|---|---|---|---|
| | (1) **Tobit** | (2) **Tobit** | (3) **OLS Robust** | (4) **Tobit** | (5) **OLS Clustered SE** | (6) **OLS Clustered SE** | (7) **Tobit (Subsample)** |
| Log Median Distance Customer | -0.029* | -0.025** | -0.017* | -0.025** | -0.025** | -0.025*** | -0.060 |
| | (0.062) | (0.034) | (0.076) | (0.040) | (0.034) | (0.007) | (0.123) |
| Number Customer | -0.001 | -0.002 | -0.001 | -0.003 | 0.000 | -0.001 | 0.004 |
| | (0.816) | (0.247) | (0.432) | (0.181) | (0.797) | (0.406) | (0.654) |
| Number Competitors | -0.003*** | -0.002*** | -0.002*** | | -0.002*** | -0.002*** | -0.002 |
| | (0.004) | (0.003) | (0.000) | | (0.000) | (0.000) | (0.464) |
| Median Distance Competitor | | | | $-3.95 \times 10^{-6}$ | $-8.72 \times 10^{-6}$** | $-4.83 \times 10^{-6}$ | |
| | | | | (0.180) | (0.015) | (0.125) | |
| Min Distance Competitor | | | | | $4.39 \times 10^{-6}$ | $2.60 \times 10^{-6}$ | |
| | | | | | (0.435) | (0.630) | |
| Dummy Relationship Industry | | | | | -0.049* | -0.044 | |
| | | | | | (0.093) | (0.114) | |
| Dummy Durable Goods | | | | | -0.016 | -0.016 | |
| | | | | | (0.391) | (0.363) | |
| Dummy Non-Durable Goods | | | | | -0.009 | -0.012 | |
| | | | | | (0.807) | (0.671) | |
| Firm Size | 0.100*** | 0.080*** | 0.057*** | 0.074*** | 0.080*** | 0.073*** | 0.149*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.002) |
| Diversification | 0.007 | 0.005 | 0.003 | 0.005 | 0.002 | 0.002 | -0.005 |
| | (0.197) | (0.183) | (0.297) | (0.182) | (0.748) | (0.638) | (0.710) |
| Tangibility | -0.001 | 0.000 | 0.000 | 0.000 | -0.001 | 0.000 | -0.031** |
| | (0.441) | (0.857) | (0.946) | (0.819) | (0.738) | (0.864) | (0.048) |
| Profitability | -0.186** | -0.182*** | -0.155 | -0.215*** | -0.171 | -0.202** | 0.305 |
| | (0.038) | (0.008) | (0.129) | (0.002) | (0.604) | (0.035) | (0.203) |

**(Continuation of *Table 2.15*)**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Growth | -0.003 | -0.066*** | -0.036*** | -0.062*** | 0.004 | -0.034*** | -0.096*** |
| | (0.618) | (0.000) | (0.000) | (0.000) | (0.607) | (0.000) | (0.002) |
| Volatility | 0.155*** | 0.148*** | 0.116*** | 0.142*** | 0.129*** | 0.123*** | 0.299*** |
| | (0.000) | (0.000) | (0.001) | (0.000) | (0.005) | (0.002) | (0.004) |
| Industry Controls | Yes | Yes | Yes | Yes | No | No | Yes |
| N | 1,148 | 1,148 | 1,148 | 1,056 | 1,054 | 1,054 | 122 |
| $R^2$/ Adj. $R^2$/Pseudo $R^2$ | 0.293 | 0.654 | 0.276 | 0.743 | 0.114 | 0.239 | 0.412 |
| F-Stat./ $\chi^2$ (p-values) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.001 |

Results show that our main variable *LOG MEDIAN DISTANCE CUSTOMER* remains significant throughout all regressions (specifications 1-6). As expected, the coefficient of the variable *NUMBER COMPETITORS* is significant (at the 1% level) and negative in all regressions. Except for specification 5, the coefficients of our distance-based competition variables are not significant. Finally, in specification 7, we run our baseline regression model and restrict our sample to those firms whose closest competitor is at least 4,000 kilometers (km) away, i.e., the most proximate competitor is not headquartered in the U.S. and customer switching costs are hence potentially high. This is the case for 122 firms. In line with our reasoning, the coefficient of our main variable *LOG MEDIAN DISTANCE CUSTOMER* now loses statistical significance. The same result occurs when we use a distance of 3,500 km as another minimum (not reported).

In a fourth step, we perform two further robustness tests as shown in *Table 2.16*. First, we examine the effect of a squared, i.e., non-linear, measure of customer distance on book leverage. Therefore, we use the squared values of our main variable *LOG MEDIAN DISTANCE CUSTOMER*. Second, following Rauh and Sufi (2012), we repeat our baseline book leverage regression with our main distance measure employing weighted least squares (WLS).[34] To do so, we use two weights: the firms' number of customers (specification 3) and the firms' sales (specification 4).

Results indicate that, the negative effect of customer distance on leverage is smaller by magnitude but remains significant when we use the squared distance measure. Using OLS, the regression coefficient is significant at the 10% level, while the Tobit regression yields a significance level of 5%. Furthermore, using WLS our results remain significant at the 10% level (specification 3) and the 5% level (specification 4), respectively.

Next, we conduct two additional checks regarding our general reasoning, i.e., our hypothesis that firms reduce their leverage primarily due to uncertainty / asymmetric information. Therefore, we use additional information partly available in the Capital IQ database. For the first check, we collect information about the location of firms' reported offices around the globe. Unfortunately, this information is only available for a little more than 200 firms.[35] Yet, with this information we are able to calculate (as done before for customer distances) the average distance of firms' offices to their headquarters.

[34] Similar to Rauh and Sufi (2012), we use the 'aweight' function in STATA to conduct the WLS regressions. However, our results also remain significant when we use other weight functions (not reported for brevity).
[35] These firms are rather larger than the firms in the full sample, are more diversified, have slightly smaller values of Tobin's Q, and are considerably more often listed at the New York Stock Exchange.

## Table 2.16: Squared Customer Distance and WLS estimates

This table contains OLS and Tobit as well as WLS regressions with *book leverage (defined as total debt divided to total assets)* as the dependent variable. All variables are defined as explained in *Table 2.3*. A constant term, whose value is not reported, is included in all regressions. P-statistics are reported in parentheses. Asterisks denote statistical significance at the 0.01(***), 0.05(**) and 0.10(*)-level.

| | (1) **OLS Robust** | (2) **Tobit** | (3) **WLS Number customers** | (4) **WLS Total Revenues** |
|---|---|---|---|---|
| Log Median Distance Customer Squared | -0.004* | -0.006** | | |
| | (0.085) | (0.030) | | |
| Log Median Distance Customer | | | -0.030* | -0.023*** |
| | | | (0.068) | (0.008) |
| Number Customer | -0.001 | -0.002 | -2,32x10-05 | -0.008*** |
| | (0.588) | (0.552) | (0.990) | (0.000) |
| Firm Size | 0.054*** | 0.083*** | 0.042*** | 0.046*** |
| | (0.000) | (0.000) | (0.000) | (0.000) |
| Diversification | 0.002 | 0.006 | 0.003 | 0.001 |
| | (0.654) | (0.226 | (0.439) | (0.627) |
| Tangibility | -0.001 | -0.001 | 0.001 | -0.002 |
| | (0.681) | (0.430 | (0.277) | (0.250) |
| Profitability | -0.122 | -0.171 | 0.061 | 0.111 |
| | (0.692) | (0.057 | (0.434) | (0.386 |
| Growth | 0.001 | -0.005 | 0.006 | -0.016** |
| | (0.907) | (0.411 | (0.244) | (0.021) |
| Volatility | 0.121** | 0.155*** | 0.130*** | 0.273*** |
| | (0.013) | (0.000) | (0.000) | (0.000) |
| Industry | Yes | Yes | Yes | Yes |
| N | 1,148 | 1,148 | 1,148 | 1,148 |
| $R^2$/ Adj. $R^2$/ Pseudo $R^2$ | 0.150 | 0.230 | 0.116 | 0.371 |
| F-Stat./ $\chi^2$ (p-values) | 0.000 | 0.000 | 0.000 | 0.000 |

Additionally, we are able to determine the fraction of offices outside the U.S. as an alternative variable. While we expect the regression coefficients of these variables to be negatively related with firm leverage (as these variables may be interpreted as different proxies for customer remoteness), we also expect to find a reduction in magnitude and/or significance of our distance variable *LOG MEDIAN DISTANCE CUSTOMER*. This is because firms with a larger average distance of their offices from their headquarters' locations or a larger number of non-U.S. offices are potentially closer located to their customers, are more familiar with other regions and cultures, and are better able to acquire information about their remote and/or foreign principal customers. Consequently, their perceived uncertainty should be lower and hence their reduction in leverage as a result of this uncertainty should be lower as well. The results of our baseline leverage regression model including the aforementioned office distance measures are shown in *Table 2.17*.

As shown in *Table 2.17,* the regression coefficient of our main distance variable *LOG MEDIAN DISTANCE CUSTOMER* remains significant at the 5% level when we run regressions with only the larger firms (for which office information is available) as shown in specifications 1 and 2. Regarding specifications 3-6, our office distance measures are negative and significant, while the coefficient of the variable *LOG MEDIAN DISTANCE CUSTOMER* is lower by magnitude (as compared to specifications 1 and 2) and only significant at the 10% level in specifications 4-6. This corroborates our interpretation. We acknowledge that the correlation between the office and the customer distance measure is only about 15%. Thus, office distance is rather a measure of more information or reduced uncertainty than another measure for customer remoteness.

As our second check, we examine the effect of the logarithm of our sample firms' median distance to their distributors as reported in Capital IQ. This information is available for more than 350 firms. If our general economic reasoning is correct, we would expect to see a comparable, i.e., negative, effect of distributor distance on firm leverage. Thus, we run our baseline leverage regression model with the variable capturing distributor distance instead of customer distance. Results are shown in *Table 2.18*. This second check also confirms our reasoning as we report a significant inverse relation between firms' leverage and the distance to their distributors.

## Table 2.17: Office Distances and Book Leverage

This table contains OLS and Tobit regressions with *book leverage (defined as total debt divided to total assets)* as the dependent variable. All variables are defined as explained in *Table 2.3*. A constant term, whose value is not reported, is included in all regressions. P-statistics are reported in parentheses. Asterisks denote statistical significance at the 0.01(***), 0.05(**) and 0.10(*)-level.

| | (1) **OLS** | (2) **Tobit** | (3) **OLS** | (4) **Tobit** | (5) **OLS** **Clustered SE** | (6) **Tobit** |
|---|---|---|---|---|---|---|
| Average Distance Offices | | | $-8.73 \times 10^{-6}$** | $-1.22 \times 10^{-5}$** | | |
| | | | (0.034) | (0.016) | | |
| Fraction Non-US Offices | | | | | -0.093*** | -0.125*** |
| | | | | | (0.002) | (0.006) |
| Log Median Distance Customer | -0.049** | -0.057** | -0.031 | -0.047* | -0.042* | -0.048* |
| | (0.028) | (0.038) | (0.190) | (0.082) | (0.064) | (0.073) |
| Number Customer | -0.008* | -0.010** | -0.006 | -0.009* | -0.007* | -0.010* |
| | (0.080) | (0.049) | (0.146) | (0.068) | (0.090) | (0.052) |
| Firm Size | 0.078*** | 0.094*** | 0.077*** | 0.103*** | 0.082*** | 0.101*** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Diversification | 0.001 | -0.001 | -0.005 | -0.003 | 0.000 | -0.002 |
| | (0.841) | (0.916) | (0.521) | (0.720) | (0.944) | (0.776) |
| Tangibility | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |
| | (0.910) | (0.861) | (0.788) | (0.929) | (0.903) | (0.850) |
| Profitability | 0.880*** | 1.179*** | 0.801*** | 1.143*** | 0.855*** | 1.167*** |
| | (0.000) | (0.001) | (0.003) | (0.001) | (0.000) | (0.001) |
| Growth | -0.019 | -0.026 | -0.015 | -0.027 | -0.020 | -0.028 |
| | (0.224) | (0.151) | (0.312) | (0.123) | (0.189) | (0.120) |
| Volatility | 0.269*** | 0.304*** | 0.257*** | 0.304*** | 0.265*** | 0.304*** |
| | (0.001) | (0.000) | (0.000) | (0.000) | (0.001) | (0.000) |
| Industry | Yes | Yes | Yes | Yes | No | Yes |
| N | 211 | 211 | 211 | 211 | 211 | 211 |
| Adj. $R^2$/Pseudo $R^2$ | 0.252 | 1.114 | 0.338 | 1.186 | 0.274 | 1.205 |
| F-Stat./ $\chi^2$ (p-values) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

## Table 2.18: Distributor Distances and Book Leverage

This table contains OLS and Tobit regressions with *book leverage (total debt to total assets)* as the dependent variable. All variables are defined as explained in *Table 2.3*. A constant term, whose value is not reported, is included in all regressions. P-statistics are reported in parentheses. Asterisks denote statistical significance at the 0.01(***), 0.05(**) and 0.10(*)-level.

| | (1) **OLS** **Clustered SE** | (2) **Tobit** | (3) **OLS** **Clustered SE** | (4) **Tobit** |
|---|---|---|---|---|
| Median Distance Distributors | $-5.31 \times 10^{-6}$*** | $-5.79 \times 10^{-6}$** | | |
| | (0.005) | (0.028) | | |
| Log Median Distance Distributors | | | -0.028* | -0.031* |
| | | | (0.100) | (0.087) |
| Firm Size | 0.089*** | 0.111*** | 0.089*** | 0.110*** |
| | (0.000) | (0.000) | (0.000) | (0.000) |
| Diversification | 0.000 | 0.002 | 0.000 | 0.001 |
| | (0.989) | (0.797) | (0.927) | (0.854) |
| Tangibility | 0.002 | 0.005 | 0.001 | 0.005 |
| | (0.740) | (0.315) | (0.777) | (0.340) |
| Profitability | -0.023 | -0.035 | -0.026 | -0.037 |
| | (0.862) | (0.797) | (0.851) | (0.784) |
| Growth | -0.008 | -0.012* | -0.007 | -0.012* |
| | (0.205) | (0.084) | (0.233) | (0.089) |
| Volatility | 0.098* | 0.105*** | 0.101* | 0.107*** |
| | (0.071) | (0.002) | (0.072) | (0.001) |
| Industry | No | Yes | No | Yes |
| N | 367 | 367 | 367 | 367 |
| $R^2$/Pseudo $R^2$ | 0.126 | 0.758 | 0.203 | 0.747 |
| F-Stat./ $\chi^2$ (p-values) | 0.000 | 0.000 | 0.000 | 0.000 |

Finally, we would like to say some more words on the issue of endogeneity. First, we believe that in general, but particularly in 2010 (our sample year), the year after the financial crisis, firms should rather tend to accept any kind of large customer contributing to their sales. Thus, comparable to corporate ownership structure, we argue that firms are only hardly able to actively influence their customer structure. Second, regarding the choice of a supplier by a large customer, we think that supplier leverage is a rather minor determinant of a customer's supplier choice. Certainly, firm reputation, product prices and quality should be more important for firms when choosing their suppliers.[36] Third, we argue that changing the location of corporate headquarters to actively influence the distance to principal customers (or vice versa to suppliers) is very unlikely as this is a costly and rare corporate event. Accordingly, Pirinsky and Wang (2006) report that only about 2% of their sample firms changed the location of their headquarters in a 5-year period. Fourth, although we do not directly expect any biases with respect to our main result, we account for voluntary or potentially strategic disclosure of certain customers: running our benchmark regression without those suppliers that definitely report voluntarily (i.e., they report more than 10 principal customers), results remain quantitatively and qualitatively unchanged.

## 2.6 Conclusion

In this chapter, we hypothesize and empirically demonstrate the existence of a negative relation between firms' use of debt and the geographical distance to their principal customers. This result holds for several measures of customer proximity and leverage, and stands a battery of robustness tests. We argue that the reduction in leverage is primarily a reaction of supplying firms to increased uncertainty. The increase in uncertainty with distance is caused by increasing costs of information acquisition and monitoring of more remote customers. This reasoning is in line with the arguments and findings in the existing literature (e.g., Chhaochharia et al. 2012, Alam et al. 2011, Butler 2008, Coval and Moskowitz 1999, 2001, and Lerner 1995) and confirmed by additional robustness tests.

Our findings indicate that firms reduce their risk in the balance sheet when they face more risk in their business. In our case this risk is the increased uncertainty regarding remote customers,

[36] In additional unreported regressions, we hence try to control for the aforementioned aspects using an indicator variable that is set to one if the supplier belongs to the group of the Fortune Magazine's 300 Most Admired Companies. When we split our sample into two subsamples according to the firms' status regarding their inclusion or exclusion to the Fortune list, we find that our results on customer distance and supplier leverage remain significant in both subsamples. Results also remain significant when we control for the Fortune indicator variable in our benchmark full sample regressions. In some regression specifications, our findings become even more significant.

particularly with respect to their contribution to suppliers' sales. Our findings and interpretation are in line with the recent evidence suggesting that financial distress of customers causes negative stock price reactions or even financial distress of suppliers (Hertzel et al. 2008) and the documented increase in cash holdings when firms have more principal customers accounting for large portions of their sales (Bae and Wang 2010).

We make two additional contributions to the literature. First, we provide evidence that customer proximity affects firms' business: more remote customers are associated with increases in supplying firms' SG&A margins and R&D intensity as well as decreases in short-term liquidity. Second, we explicitly point out the disadvantages or inaccuracies that result from using customer data provided in the Compustat database. Thereby, we hope to motivate scholars to take a closer look at customer data in future work.

Finally, we want to mention the following. As customers are among the most important stakeholders of firms and an integral part of firms' daily business and managerial decision making processes, the results presented in this chapter are important to practitioners and researchers, especially in the areas of corporate finance, marketing, and strategy. The findings in this chapter raise the question whether a trade-off between investments in customer management and monitoring (including, for example, investments in local offices) and the risk of having a too low (non-firm-value-maximizing) leverage exists. We leave this question for future research.

In the last chapter, we expand our analysis and abstract from spatial distances between firms in order to investigate if similar relations between the spatial proximity of CEOs and the firm can be observed. As documented in the literature, personal traits of managers have a crucial influence on the strategic course and the performance of firms. We focus on the most influential top managers (i.e., CEOs) and empirically investigate if geographic proximity to firms´ headquarters has an impact on firm performance and CEO compensation.

# 3 Effects of CEO Proximity and Pre-job Mobility on Firm Performance and CEO Compensation

## 3.1 Introduction[37]

Personal characteristics of managers strongly shape strategic decisions and business success of firms. International knowledge is one of the most important characteristics of CEOs as firms operate beyond borders and look for opportunities to generate international growth (Stulz 1999). As recent examples like the designation of Anshu Jain as CEO of Deutsche Bank show[38], companies are trying to develop suitable strategies for this recent challenge, and strive to build up multinational network ties by employing globally connected and mobile staff (Magnusson and Boggs 2006).[39] Especially for the allocation of resources among multinational firms, a high level of international knowledge can be regarded as an important characteristic of CEOs (see Roth 1995).

At the same time, firms are interwoven in regional clusters in order to exchange knowledge and services more easily (Delgado et al. 2012). Communication and information costs heavily depend on the degree of interpersonal face-to-face interactions and the understanding of regional specificities like local market dynamics and regulations (Dahl and Pedersen 2004, Lord and Ranft 2000, and Gupta and Govindajaran 1991). Thus, specific local knowledge of CEOs can represent an important asset in order to adapt to the individual needs of geographically close stakeholders and manage the core activities of the firm successfully.

As these personal traits rank among other managerial characteristics (like leadership skills and education), it is not fully clear whether, and to which extent, these two knowledge concepts actually affect firm performance. In our study, we address this question and further investigate the effect of CEO personal knowledge characteristics on CEO compensation. For this purpose, we differentiate between two main knowledge concepts of managers that both can be valuable for firms: i) local knowledge (CEO's local connectivity to a firm) and ii) international knowledge (gained by CEO´s pre-job mobility).

[37] This chapter is based on a working paper with the title "Local and international knowledge of managers, firm performance and CEO compensation" and grew out of joint research project with Thomas Fessler from Karlsruhe Institute of Technology, see Göttner and Fessler (2012).
[38] Financial Times Deutschland, May, 31st, 2012, "Anshu Jain- Wider die Deutschtümelei".
[39] Similarly, it is reported by Schild and Herrendorf (2008) in their survey of CEOs of DAX companies that there is a recent trend towards hiring more external CEOs from abroad.

We determine the level of local knowledge by calculating geographical distances from several points in a CEO's pre-job life (including place of birth and several institutions of education) to their later firm. In our view, stages of a CEO´s life that are closely located to the firm help him or her to develop a higher level of local knowledge. In addition, we measure the average distance a CEO has covered over her or his path of life, and hereby determine the degree of CEOs pre-job mobility. We see this pre-job mobility as approximation for the level of CEO´s international knowledge.

We examine a cross-sectional data set of European and U.S. CEOs in order to test if these two forms of specific knowledge contribute to financial performance of a firm. Our results indicate that CEOs exhibiting a closer geographic connection to the location of firm headquarters significantly enhance firm performance. These findings can be interpreted as a consequence of improved local knowledge of the firm, its closely situated stakeholders and local market conditions.[40] In contrast to this, CEO pre-job mobility and a higher international knowledge does not seem to have any significant influence on corporate performance.

One would expect that these personal characteristics (i.e., intrinsic motivation for mobility and local connectivity) should also be reflected in the annual compensation of CEOs. It is documented that certain personal characteristics of managers have an impact on the structure and the level of managerial compensation (see, e.g., Ryan and Wiggins 2001). Similar to Carpenter et al. (2001), our additional results indicate that more mobile CEOs can significantly benefit from higher levels of international knowledge and receive higher salaries than less mobile CEOs. In contrast, we cannot find any significant influence of local knowledge on compensation levels. These findings can be interpreted as biased valuation of the importance of international knowledge compared to the importance of local knowledge.

In total, the analyses in this chapter combine several streams of literature including knowledge management, geographical and personal economics to contribute to the question how a CEO's background influences firm performance and CEO compensation.

The remainder of this chapter is organized as follows: Section 3.2 reviews the related literature, and Section 3.3 presents our hypotheses. Section 3.4 discusses our data, and provides the reader with an overview of employed variables and applied methodology. Section 3.5 presents our analyses and results, and Section 3.6 concludes with a discussion of our findings.

[40] The Financial Times Deutschland published an article on April, 6th 2010 about Thomas Weber, though not CEO, but executive board member of Daimler, who was born close to Stuttgart, studied in Stuttgart and worked close to Stuttgart for his whole life.

## 3.2 Related Literature

In this study, we focus on local and international knowledge as important personal trait of CEOs. We investigate these two CEO characteristics in order to assess the ability to manage two different business aspects:

i) Manage the core business of a firm in the region/country, where the corporate headquarter is located;

ii) Manage the complexity of resource allocation among several subsidiaries of the firm.

We expect requirements for the fulfilment of these tasks to be fundamentally different.

***Local knowledge***

The location of a corporate headquarter represents the geographical nucleus of business activities. As stated by Davis and Henderson (2008), we state that the corporate headquarter is the most important control centre of information and service exchange between the firm and its stakeholders. Thus, managers need a specific background and a high level of local knowledge to manage these main headquarter activities successfully. We assume that a long time span is necessary to learn local specificities and gain a fundamental understanding of the core activities of the firm. Living in proximity to corporate headquarters over many years enables managers to build up personal ties with employees and stakeholders. Furthermore, they are able to collect information about domestic regulations and market structures (Dahl and Pedersen 2004 and Lord and Ranft 2000). As a consequence, local knowledge is difficult to replicate or imitate by other CEOs as it requires years of direct contact to a specific region. As firms should struggle with the task to inculcate their managers this knowledge later on, local knowledge is an important, inherent managerial trait that potentially enhances firm performance.

***International knowledge***

In contrast, other requirements are posed on CEOs to manage geographically dispersed subsidiaries of the firm. It is a complex task to successfully allocate resources between different business units of the firm (Roth 1995). We argue that pre-job mobility is an inherent characteristic of a manager representing an open-minded and cosmopolitan attitude that helps him or her to fulfil these tasks more easily. Mobile CEOs are more likely to have gained a dispersed knowledge of different languages, cultures, product markets, and economical surroundings (Masulis et al. 2009 and Magnusson and Boggs 2006). A person moving to another place needs to adapt to the new circumstances and faces higher switching, transportation, and

communication costs. By facing these difficulties in early stages of his life an open-minded manager gains international experience, wider sociocultural and linguistic competence, and better insights into different cultural and economic systems.[41] Hence, international knowledge facilitates the management of different intra-firm business cultures and potentially disparate subsidiaries of a multinational firm.

We further assume that these two concepts can exist independently from another. Thus, it is possible that managers grow up geographically very close to a firm and build up local knowledge without any tendencies for pre-job mobility (i.e., level of international knowledge) and vice versa. Nevertheless, the correlation coefficients between our main proximity variable and mobility variable show an average negative correlation giving a slight indication that mobile CEOs tend to possess less local connectivity to the firm.

***Literature on CEO proximity and mobility***

To our knowledge, we are the first study to analyze in detail the impact of geographic proximity and CEO pre-job mobility on firm performance.

With regard to the benefit of local knowledge there are only few studies which, contrary to our focus on CEOs, deal with local connectivity of other board members. Masulis et al. (2009) mention that board directors from foreign countries possess valuable information about cultural norms, regulations and market structures in other regions of the world. In contrast, their findings also document that foreign directors possess lower degree of information about regional firms. Consequently, the authors show that foreign directors are less able to monitor firms closely which leads to lower firm performance. Alam et al. (2011) argue that distances between board directors´ residences and corporate headquarters affect information acquisition costs and the quality of monitoring and, thus, influence the structure of CEO compensation of affiliated firms. In addition, the authors find that spatial proximity of directors significantly and positively affects the CEO turnover after poor performance.

Another branch of literature looks especially at job mobility of CEOs and its impact on firm performance. The most related to our work are studies by Hamori and Kakarika (2009) and Ryan and Wang (2012). While the former claim that career success of top managers is positively correlated with their frequency of career moves, the latter provide evidence that CEO mobility enhances shareholder value and firm´s risk-taking strategy. While former studies refer to CEO

[41] Further effects of job mobility documented in the literature are knowledge spill-overs (Agrawal et al. 2006, Agarwal et al. 2007, and Audretsch and Feldman 1996), new interfirm links through social network ties (Breschi and Lissoni 2009 and Dahl and Pedersen 2004) as well as increased salaries in the new job (Johnston 1977 and Murell et al. 1996).

mobility as career mobility switching between job positions (see Ryan and Wang 2012, Campbell et al. 2012, Hamori and Kakarika 2009, and Vardi 1980), we expand the literature on CEOs career paths by using a more comprehensive approach to mobility. As mentioned above, we look at several important pre-job stations of managers like place of birth and location of educational institutions.

We assume that pre-job location changes are caused by a person's own choice and characterize her or his intrinsic motivation for mobility. In our view, this personal characteristic cannot be actively influenced by the firm as it is developed prior to the job start. Hereby, we avoid essential biases. At the moment the manager starts working in a firm his job mobility is not uniquely influenced by his own attitude but also by firm policy (e.g., intra-firm job-moves due to on-the-job training programmes). In our case, CEOs already incorporate the local roots and an intrinsic motivation for mobility at the (later) point when the employment history of the CEO starts. Ergo, the levels of local knowledge as well as international knowledge represent inherent personal traits of every CEO on the job market that hardly can be imitated, altered, or reproduced by the firm later on.[42] Hence, studies that examine on-the-job mobility should struggle with difficulties to clearly differentiate between firm policy and CEO intrinsic motivation for mobility (see, e.g., Huson et al. (2001) for involuntary and forced CEO turnovers).

To our view, with this approach we can apply variables that should show the unbiased influence of managerial characteristics on firm performance and compensation more accurately.

## 3.3 Hypotheses

In this section, we present our hypotheses. Managers can acquire very concentrated knowledge of a certain region by spending much time on the spot (Lord and Ranft 2000). Mainly by living in a specific geographical area CEOs pick up useful pieces of information about regional regulations, local markets, and residing firms (see Gupta and Govindajaran 1991). Additionally, they can establish valuable network ties to employees and managers in these local industrial clusters and consequently create strategic advantages (Owen-Smith and Powell 2004 and Lansing and Müller 1967). This local knowledge should be especially valuable to manage core activities of firm headquarters and for interactions with regional stakeholders. In order to test this assumption, we pose as first hypothesis:

[42] Similarly, managers have very limited possibilities to deliberately influence place of birth and specific places of education to build up firm-specific local knowledge.

*H1) CEOs with local knowledge increase firm performance*

CEOs can build up specific knowledge about the countries and regions in which they spend significant time of their life. This international knowledge can consist in broad information about economical and regulatory structures, consumer preferences, or cultural and social norms in different countries. It is difficult to acquire without actually living in the respective country for a sufficient period of time (see Masulis et al. 2009). As Hambrick (2007) as well as Hambrick and Mason (1984) suggest, CEOs use skills gained in the course of their life in order to make strategic decisions later on. Consequently, this cosmopolitan characteristic of CEOs aims especially at an improvement in managing multinational firms successfully. For instance, it is argued by Inkpen and Beamish (1997) that wider knowledge of foreign markets helps to stabilize international joint ventures. Thus, following the concept of Ryan and Wang (2012) and Carpenter et al. (2001) that mobile CEOs enhance firm performance, we formulate as second hypothesis:

*H2) CEOs with international knowledge increase firm performance*

We state that managerial pre-job mobility and local connectivity can represent a unique personal characteristic of managers. That is to say, they can potentially steer headquarter activities more elaborately (due to increased local knowledge) or allocate resources to geographically dispersed business units more efficiently (due to increased international knowledge). As benefits for the firm seem apparent, though, it remains unclear if managers also can bargain from these personal traits. It is known that CEO characteristics in general play an important role for CEO compensation (see Ryan and Wiggins 2001, Graham et al. 2009, Carpenter et al. 2001, and Zajac 1990)[43]. Assuming that CEOs can negotiate compensation terms with their employers on an individual basis (see also Bebchuk and Fried 2003 and Jovanovic 1979), these beneficial personal traits should also be reflected in higher salaries. Thus, we formulate as third and fourth hypotheses:

*H3) International knowledge of CEOs increases managerial compensation*

*H4) Local knowledge of CEOs increases managerial compensation*

[43] Again, it should be noted that the two are not mutually exclusive: A person can be deeply rooted locally and at the same time show considerable mobility during her or his life path. Thus, the level of local knowledge should be independent from the level of international knowledge.

## 3.4 Employed Variables and Data

Our choice of variables to analyze effects of CEO proximity and pre-job mobility is motivated in the following section.

### 3.4.1 Employed Variables

*Firm performance*

We examine the empirical relation between CEO characteristics and the dependent variable firm performance as measured by return on assets (*ROA*).[44] The return on assets is calculated as net income divided by total assets in 2009 (see Chhaochharia et al. 2012 and Zajac 1990). As our main explanatory variables, we include CEO proximity to the firm and pre-job mobility as approximations for local and international knowledge:

We calculate the distances between major points of CEO´s pre-job path of life. That means, we start with the place of birth, follow the path of life along different stations of CEO´s education, and end at the location of CEO´s firm headquarter as final point. For each CEO, two alternative distance variables in relation to her or his own curriculum vitae are calculated:

(A) *CEO_BORDERS:* We count how often he or she has moved from one country to another to determine the number of CEO moves with national border crossings.

(B) *CEO_KM*: For each recorded $station_i$ in a CEO's curriculum vitae we calculate the distance $d_i=d(station_i; station_{i-1})$ in kilometres and determine the sum of all well-defined $d_i$. Distance across the earth's surface is calculated by the following equation (6):

(6) $$D(station_i; station_j) = arccos\left(\sin\left(\frac{\pi}{2}a_i\right)\times\sin\left(\frac{\pi}{2}a_j\right)+\cos\left(\frac{\pi}{2}a_i\right)\times\cos\left(\frac{\pi}{2}a_j\right)\times\cos\left(\frac{\pi}{2}b_j-\frac{\pi}{2}b_i\right)\right)\times 6371\text{km}$$

where $\alpha_i$ is the latitude of $station_i$ in radians and $\beta_i$ is the longitude of $station_i$ in radians (see Zwillinger 2003 and Coval and Moskowitz 1999). In alternative models, we use the logarithm of measured distances and receive similar results.

[44] As alternative performance measure, we use Tobin´s Q in our robustness tests. Similar to Gillan et al. (2007), we define Tobin's Q as market value of assets divided by total assets, whereas the market value of assets is calculated as total assets plus the market value of common stock less book value of common stock. Nevertheless, as suggested by Zhou (2011), we refrain from using it as our primary performance measure as it tends to be biased due to high stock volatility during the financial crisis.

Both variables are also calculated as a relative measure by dividing them by the number of recorded changes of location accounted for in the calculation. This adjustment is done to at least partly correct for large singular moves. The relative variables are denoted by *CEO_BORDERS_AVG* and *CEO_KM_AVG,* respectively.

*Firm variables*

We include the following standard control variables into our regressions that are applied in the literature on firm performance (see, e.g., Pástor and Veronesi 2003, Agrawal and Knoeber 1996, and Zajac 1990): *FIRM AGE*, firm size as measured by log of total assets (*SIZE*) and *LEVERAGE* (as defined by long term debt relative to the firm´s total assets) to capture capital structure effects. Further, *GROWTH* (measured as 3 years compound annual growth rate of total revenues), *VOLATILITY* (standard deviation of ROA of three preceding years divided by mean of ROA of the respective years), as well as *LIQUIDITY* (total current assets divided by total current liabilities) are incorporated into our models. To control for diversification effects, similar to Lang and Stulz (1994) and Berger and Ofek (1995), we use number of business (geographic) segments as reported by Capital IQ and label them *BUSINESS SEGMENTS* and *GEOGRAPHIC SEGMENTS*, respectively.

*CEO salary*

For our second analysis, we use CEO salary (*SALARY*) as dependent variable. Similar to Bebchuk and Fried (2003) and Jovanovic (1979), we assume that CEOs and firms negotiate remunerations on an individual basis. Salary is chosen over total compensation as primary remuneration indicator, since it depends on CEO's personal characteristics and curriculum vitae to a higher degree than total compensation, which lies under a stronger influence from actual firm performance. Nevertheless, we also use CEO total compensation as alternative dependent variable in robustness tests.

*CEO variables*

As further control variables for CEO salary, we apply the following personal characteristics of managers. We include *CEO AGE* and years in the respective firm (*FIRM TENURE*), and expect a positive relation between CEO age/tenure and compensation (see, e.g., Ryan and Wang 2012, Rajgopal et al. 2006, Algood and Farrell 2003, and Ryan and Wiggins 2001). Additionally, we apply a *FEMALE* dummy to control for gender differences in pay levels (see Brick et al. 2006). According to Bhagat et al. (2010), Jalbert et al. (2002), and Gottesman and Morey (2006) education can be seen as approximation for intellectual capacities, knowledge level and abilities to abstract thinking. Though the authors find only weak indications for the influence on firm

performance, we control for different levels of education by using CIQ denomination that divides the educational degrees into categories to set four indicator variables: *BACHELOR, MASTER*[45]*, MBA* and *PHD*. By following Barker and Mueller (2002), we construct an indicator variable (*BUSINESS EDU*) to capture the influence of education in a field of study related to economics or management.

*Governance variables*

As documented by Core et al. (1999), weak corporate governance and greater agency problems of firms result in greater compensation of CEOs. In order to control for these issues, we use several corporate governance variables. We construct a dummy variable that obtains a value of "one" if an insider has a stake in the firm's equity (*INSIDERS OWNED*). Alternatively, we use *CEO PARTICIPATION* that denotes if the CEO has a stake in the firm (Barker and Mueller 2002). Further, we apply number of board members *(BOARD SIZE)* as well as an indicator variable that obtains a value of one for CEOs who are also chairman of the board *(CEO/CHAIRMAN DUALITY)*. Additionally, we control for industry effects and countries as firms are located in different legal systems with different degrees of investor protection (see LaPorta et al. 1998 and Agarwal et al. 2009).

A description of our key variables is expounded in *Table 3.1.*

**Table 3.1: Description of Key Analyses Variables**

| Variable | Definition |
|---|---|
| Board Size | Number of members on the board of directors. |
| Business Edu | Indicator variable that obtains a value of one if CEO has completed a degree in economics or management. |
| Business Segments | Number of business segments as provided by CIQ |
| CEO Age | Age of CEO in years. |
| CEO_BORDERS | Numbers of boarders crossed during CEO´s path of life. |
| CEO_BORDERS_AVG | Number of border crossings divided by total career steps. |
| CEO/Chairman Duality | Indicator variable that obtains a value of one if CEO is also the Chairman of the board, and zero otherwise. |
| CEO_KM | Total distance covered during CEO´s path of life. |
| CEO_KM_AVG | Distance covered in CEO´s life divided by number of career moves. |
| CEO Participation | Indicator variable that is set to one if CEO has a share in firm´s stock. |
| CEO Tenure | Years as CEO in recent firm. |

[45] German degree "Diplom" as well as French "Diplôme" is treated as a Master degree, the French degree "Licence" is treated as Bachelor degree. Doctoral degrees are equated with PhD degrees. MBA programs are treated as separate category.

**Table 3.1: Description of Key Analyses Variables (continued)**

| Variable | Definition |
|---|---|
| Country „X“ =Firm | Indicator variable that obtains a value of one if a station in CEO´s path of life is located in the same country as firm headquarter whereas “X” denotes respective station. |
| Distance „X“ – Firm | Geographical distance from station of CEO´s path of life to headquarter of the firm where “X” indicates the specific station, respectively. Only in the case of “Distance Edu – Firm” an average geographical distance is calculated from all CEO´s educational institutions to firm´s headquarter. |
| Dummy – „X“ | Indicator variable that obtains a value of one if CEO has completed a certain educational degree whereas “X” marks the educational degree: Bachelor (BA), Master (MA), MBA or PhD, respectively. |
| Female | Indicator variable that has a value of one if CEO is female. |
| Founder CEO | Indicator variable that obtains a value of one if CEO is founder of the firm. |
| Firm Age | Number of years since founding. |
| Firm Tenure | Years of manager in firm in any position. |
| Geographic Segments | Number of geographic segments as provided by CIQ. |
| Growth | 3-year growth of total revenues (in percent). |
| Industry Controls | Industry affiliation classified according to the first digit of the SIC industry code. |
| Insiders Owned | Indicator variable that is set to one if insiders have a share in firm´s stock. |
| Legal Systems | Set of indicator variables that indicate which type of corporate governance system a company is subject to (archetypes are: French Civil Code, Common Law and German Civil Law). |
| Leverage | Long term debt relative to the firm´s total assets. |
| Liquidity | Total current assets divided by total current liabilities. |
| Return on Assets (RoA) | Net Income over total assets. |
| Salary | CEO basic salary without bonuses. |
| Size | Natural logarithm of the total book asset value of the firm. |
| Tobin´s Q | Market value of assets divided by the book value of assets, whereas the market value of assets is calculated as book value of assets plus the market value of common stock less book value of common stock. |
| Total Compensation | CEO´s total compensation including bonuses, stock and options. |
| Volatility | Standard deviation of return on assets of the years 2006, 2007 and 2008 divided by mean of return of assets of the respective years. |

*Table 3.2* presents the Pearson correlation coefficients between the variables applied in the analyses. We control for intercorrelation between independent variables and forbear from including highly correlated variables in the same regression models.

**Table 3.2: Pearson Correlation Coefficient Matrix**

Asterisks denote statistical significance at the 0.01(***), 0.05(**) and 0.10(*)-level. For brevity, we do not report all variables.

| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Salary | 1 | | | | | | | | | | | | | | | | | | | | |
| 2 | Total Compensation | 0.447** | 1 | | | | | | | | | | | | | | | | | | | |
| 3 | CEO Age | 0.156** | 0.166** | 1 | | | | | | | | | | | | | | | | | | |
| 4 | Dummy CEO Founder | -0.166** | -0.094 | 0.061 | 1 | | | | | | | | | | | | | | | | | |
| 5 | Dummy Bachelor | 0.156** | 0.249** | -0.058 | -0.069 | 1 | | | | | | | | | | | | | | | | |
| 6 | Dummy Master | 0.040 | -0.076 | -0.030 | -0.010 | -0.290** | 1 | | | | | | | | | | | | | | | |
| 7 | Dummy MBA | 0.117** | 0.172** | -0.075* | -0.077 | 0.248** | -0.038 | 1 | | | | | | | | | | | | | | |
| 8 | Dummy PhD | 0.039 | 0.005 | -0.012 | 0.006 | -0.169** | 0.161** | -0.074* | 1 | | | | | | | | | | | | | |
| 9 | Firm Tenure | 0.130** | 0.216** | 0.390** | 0.131** | -0.021 | -0.155** | -0.134** | -0.049 | 1 | | | | | | | | | | | | |
| 10 | CEO_BORDERS_AVG | 0.059 | -0.092* | -0.067 | -0.020 | 0.005 | -0.049 | 0.230** | -0.005 | -0.151** | 1 | | | | | | | | | | | |
| 11 | CEO_KM_AVG | 0.086 | 0.064 | -0.020 | -0.063 | 0.151** | -0.115** | 0.247** | -0.041 | -0.102** | 0.652* | 1 | | | | | | | | | | |
| 12 | CEO _LOCBIRTH_NORM | 0.228** | 0.343** | -0.030 | -0.045 | 0.322** | -0.246** | 0.087 | -0.036 | 0.010 | 0.347* | 0.644* | 1 | | | | | | | | | |
| 13 | CEO_LOCHOMEHQ_NORM | 0.077 | 0.381** | 0.165** | -0.048 | 0.152** | -0.079* | 0.069 | -0.008 | 0.146** | -0.013 | 0.129* | 0.270* | 1 | | | | | | | | |
| 14 | CEO _LOCEDU_NORM | 0.205** | 0.220** | 0.024 | 0.043 | 0.345** | -0.350** | 0.074 | -0.103* | 0.055 | 0.315* | 0.521* | 0.701* | 0.155** | 1 | | | | | | | |
| 15 | Distance Place of Birth- Firm | 0.173** | 0.278** | 0.025 | -0.050 | 0.225** | -0.144** | 0.089 | 0.044 | -0.030 | 0.368* | 0.647* | 0.924* | 0.260** | 0.641* | 1 | | | | | | |
| 16 | Distance Edu - Firm | 0.147** | 0.177** | 0.041 | 0.004 | 0.247** | -0.239** | 0.272** | -0.032 | 0.000 | 0.497* | 0.814* | 0.642* | 0.147** | 0.780* | 0.679* | 1 | | | | | |
| 17 | Distance Residence - Firm | -0.007 | -0.028 | 0.018 | 0.148* | 0.066 | -0.137* | 0.006 | 0.082 | 0.031 | 0.173* | 0.220* | 0.338* | -0.048 | 0.357* | 0.377* | 0.319* | 1 | | | | |
| 18 | Business Segments | 0.318** | 0.147** | 0.113** | -0.135** | 0.077* | 0.015 | 0.035 | 0.070 | 0.052 | -0.002 | 0.027 | 0.144* | 0.007 | 0.071 | 0.109* | 0.013 | 0.026 | 1 | | | |
| 19 | Geographic Segments | 0.200** | 0.072 | 0.066 | -0.105* | -0.004 | 0.119** | 0.066 | 0.059 | -0.006 | 0.124* | 0.105* | 0.152* | -0.022 | 0.111* | 0.147* | 0.123* | -0.041 | 0.236** | 1 | | |
| 20 | Return on Assets (RoA) | 0.038 | 0.184** | -0.022 | -0.097* | 0.122** | -0.168** | 0.070 | -0.087* | 0.113** | -0.087* | 0.022 | 0.149* | 0.117** | 0.117* | 0.086 | 0.077 | 0.042 | 0.023 | -0.069 | 1 | |
| 21 | Growth | -0.128** | -0.065 | -0.082* | 0.210** | 0.063 | -0.102** | 0.023 | 0.142* | -0.026 | 0.002 | -0.006 | 0.086 | 0.016 | 0.061 | 0.060 | 0.002 | 0.079 | -0.045 | -0.071 | 0.178* | 1 |

### 3.4.2 Data Selection and Methodology

Our cross-sectional sample consists of public firms listed in the major indices of Germany (DAX, TecDAX, MDAX, SDAX), Austria (ATX), Switzerland (SMI, SMIM), The Netherlands (AEX, AMX), France (SBF250), UK (FTSE350), and the United States (S&P100) at the year end of 2009. In total, 1001 firms from three different legal systems (French Civil Code, Common Law and German Civil Law, see La Porta et al. 1998) were originally sampled. It is shown by Anderson and Gupta (2009) that different legal systems can shape overall corporate governance levels as well as market valuation of firms. These indices were chosen to get initial subsamples of comparable sizes for each legal system. We admit to the fact that this sampling includes small and mid-cap firms from smaller indices (e.g., the Swiss SMIM) as well as large firms from well-known indices like the S&P 100. Nevertheless, this sample of heterogeneous international firms allows us to investigate the different impacts of CEO mobility in two Corporate Governance (one-tier and two-tier) systems. Financial firms with Standard Industrial Classification (SIC) codes ranging from 6000-6999 are excluded. Due to missing fundamental data, we excluded further firms remaining with a final cross-sectional data set of 785 firms. A comprehensive list of the indices can be found in the *Table 3.3*.

**Table 3.3: List of all Included Indices**

| Index | Country | Number of Firms | Description |
|---|---|---|---|
| DAX | Germany | 30 | 30 largest public German firms (Deutscher Aktien Index) |
| MDAX | Germany | 50 | 50 largest German mid-caps from the German Prime Standard (Mid-Cap DAX) |
| SDAX | Germany | 50 | 50 largest German small-caps from German Prime Standard (Small-cap DAX) |
| TecDAX | Germany | 30 | 30 largest technology firms from German Prime Standard (Technology DAX) |
| SMI | Switzerland | 20 | 20 largest Swiss firms (Swiss Market Index) |
| SMIM | Switzerland | 30 | 30 largest Swiss mid-cap firms (SMI Mid) |
| ATX | Austria | 20 | 20 largest Austrian firms (Austrian Trading Index) |
| AEX | Netherlands | 25 | 25 largest Dutch firms(Amsterdam Exchange Index) |
| AMX | Netherlands | 25 | 25 largest Dutch mid-cap firms(Amsterdam Midcap Index) |
| SBF250 | France | 250 | 250 largest french firms (Société des Bourses Françaises 250) |
| FTSE350 | UK | 350 | 350 largest firms in the United Kingdom (Financial Times and the London Stock Exchange 350) |
| S&P100 | U.S. | 100 | 100 largest U.S.firms (Standard & Poor´s 100) |

Fundamental firm data is primarily obtained from the Capital IQ (CIQ) and Compustat database. Manager-related data, compensation and biographies are gathered from CIQ. Whenever required, we resort to additional sources as *WhoIsWho*- Databases of the specific country, company websites, Reuters.com, interviews, and other articles from the LexisNexis news database to collect missing data. We exclude outliers and extreme data values.

Detailed information is gathered about the place of birth, the location of educational institutions, recent residence of the CEO, and the geographic location of firm´s headquarters. Following Coval and Moskowitz (1999), we calculate geographic distances between cities using their geodesic coordinates (latitude/longitude) as described in the previous section. We refrain from measuring distances from job positions in a CEO´s life to firm headquarter due to missing data in CIQ on the exact geographical placement of managers during their career. Additionally, hereby we reduce risk of bias due to involuntary job changes, which have limited explanatory power on a person's intrinsic mobility. In 32 cases where no specific city is mentioned for the place of birth of a CEO, we take the geographic mean of a country as the best proxy. In most of these cases, the countries of birth essentially differed from the country of company headquarters location resulting in a low deviation from the true distance in relative terms. For all our calculations we apply standard OLS methodology to examine the effect of CEO and firm characteristics on our respective dependent variables.

## 3.5 Results

### 3.5.1 Descriptive Statistics

*Table 3.4* shows the descriptive CEO statistics of our sample and contains the median, mean, minimum, maximum, and standard deviation of our variables. Summary statistics of average CEO distances are also provided in the same table.

**Table 3.4: Descriptive Statistics - CEOs**

| | N | Min | Max | Median | Average | Standard Deviation |
|---|---|---|---|---|---|---|
| **CEO Age** | 759 | 36 | 82 | 54 | 54.39 | 7.23 |
| **Firm Tenure** | 741 | 1 | 53 | 14 | 16.21 | 10.94 |
| **CEO Tenure** | 753 | 0 | 53 | 5 | 7.97 | 7.96 |
| **Dummy- Bachelor** | 785 | 0 | 1 | 0 | 0.34 | 0.47 |
| **Dummy- Master** | 785 | 0 | 1 | 0 | 0.45 | 0.50 |
| **Dummy- MBA** | 785 | 0 | 1 | 0 | 0.18 | 0.38 |
| **Dummy- PhD** | 785 | 0 | 1 | 0 | 0.11 | 0.32 |
| **Total Compensation** | 563 | 1 | 59,780,769 | 1,188,966 | 2,649,424 | 4,447,863 |
| **Salary** | 563 | 1 | 5,778,135 | 603,230 | 686,555 | 448,197 |
| **CEO_KM** | 785 | 2.33 | 38,740.50 | 391.10 | 2,534.09 | 4757.90 |
| **CEO_BORDERS** | 785 | 0 | 4 | 0 | 0.47 | 0.78 |
| **CEO_KM_AVG** | 668 | 2.33 | 16,903.72 | 281.52 | 1,330.72 | 2,177.00 |
| **Distance Place of Birth-Firm** | 452 | 2.33 | 16,672.24 | 322.136 | 2,126.61 | 2,409.69 |
| **Distance BA-Firm** | 258 | 8.95 | 13,430.52 | 339.46 | 1,969.78 | 3,067.10 |
| **Distance MA-Firm** | 335 | 3.99 | 18,470.91 | 201.45 | 838.65 | 2,086.06 |
| **Distance MBA-Firm** | 141 | 10.77 | 12,703.42 | 2,153.06 | 3,305.98 | 3,163.95 |
| **Distance PhD-Firm** | 94 | 10.63 | 9,240.34 | 191.71 | 851.48 | 1,920.96 |
| **Distance Residence-Firm** | 252 | 1.69 | 9,711.74 | 25.17 | 453.46 | 1,518.28 |

The average CEO of our full sample is 54 years old and has 8 year tenure as CEO in her or his company. The average salary is $686,550; the median salary is $603,230 which indicates a relatively symmetric distribution. This is comparable to the median cash compensation of Croci et al. (2012) that list a value of €642,628 in their analysis of 14 Continental European countries. The mean distance a CEO covers in her or his path of life is 2,534 kilometres, though the median distance is apparently smaller (391km) indicating the existence of some singular extreme values

of pre-job mobility. 34% of all managers have a bachelor degree, 45% have a master degree, and only 11% have finished a PhD programme. Due to an international orientation including the U.S. and European countries, we have a tendency towards fewer CEOs with MBA degrees (18%) in our sample compared to the U.S. data sample of Ryan and Wang (2012) indicating 36% of managers with a MBA degree. While 23% (33%) of managers completed their Bachelor (Master) degree in the same country where firms headquarter is situated, only 10% of PhD degrees were gained in the same country. The median distance between CEOs place of birth and the firm is 320 kilometres, while the distance between place of bachelor education and the firm is 339 kilometres; the average value is around 2,000 kilometres for both cases. The distance from places of Master as well as PhD education to the firm is equally round about 850 kilometres on average, while the median is approximately 200 kilometres in both cases. It is apparent that the location of MBA education is on average most far away from firms´ headquarters (~3,300 km) as MBA schools are mainly located in the United States.
Descriptive statistics after the exclusion of outliers of respective firms are provided in *Table 3.5*.

The average size of firms in our sample measured in total assets (TA) is nearly $13 billion, while the average sales are nearly $9.5 billion. Mean (median) Tobin´s Q is 1.62 (1.33) and mean (median) leverage is 0.23 (0.22). While insiders (i.e., directors and officers) own on average 10.06% of firm´s stock in our sample, CEOs own 4.64%. The average firm has approximately 4.24 business segments and 5.04 geographic segments. This is quite comparable to the median (with 4 business segments and 5 business segments) indicating no major bias by extremely diversified firms. The majority of firms operates in SIC8 (Business Services: 41%) and SIC4 industries (Transportation: 27%).[46]

[46] As average values are higher than median values for firm size and age, we acknowledge that our data is potentially skewed towards bigger and older firms. Though, in unreported regressions we reduce our sample more restrictively regarding older and bigger firms and receive similar results.

**Table 3.5: Descriptive Statistics - Firms**

| | N | Min | Max | Median | Average | Standard Deviation |
|---|---|---|---|---|---|---|
| **Total Assets (in mm$)** | 688 | 33 | 240,035 | 2,268 | 13,414 | 29,133 |
| **Total Revenues (in mm$)** | 691 | 0,00 | 194,106 | 1,907 | 9,461 | 20,122 |
| **Firm Age** | 599 | 0.00 | 345.00 | 64.00 | 77.42 | 59.22 |
| **Log (Firm Age)** | 598 | 0.60 | 2.54 | 1.81 | 1.74 | 0.38 |
| **Return on Assets (RoA)** | 674 | -28.00 | 26.90 | 4.39 | 4.81 | 5.13 |
| **Tobin´s Q** | 679 | 0.66 | 7.12 | 1.33 | 1.62 | 0.87 |
| **Leverage** | 688 | 0.00 | 0.84 | 0.22 | 0.23 | 0.16 |
| **Liquidity** | 589 | 0.08 | 10.62 | 1.32 | 1.65 | 1.18 |
| **Volatility** | 683 | -3.97 | 3.47 | 0.14 | 0.21 | 0.53 |
| **Business Segments** | 692 | 1.00 | 16.00 | 4.00 | 4.24 | 2.42 |
| **Geographic Segments** | 652 | 1.00 | 26.00 | 5.00 | 5.04 | 3.28 |
| **Growth** | 663 | -51.20 | 95.70 | 4.57 | 6.12 | 13.85 |
| **External Directors (in %)** | 146 | 9.52 | 100.00 | 83.33 | 78.35 | 16.90 |
| **Insiders Owned (in %)** | 555 | 0.00 | 79.58 | 0.64 | 10.06 | 17.79 |
| **CEO Owned (in %)** | 405 | 0.00 | 75.56 | 0.07 | 4.64 | 13.02 |
| **CEO/Chairman Duality** | 383 | 0.00 | 1.00 | 0.00 | 0.26 | 0.44 |

A more detailed overview of main firm variables across different legal systems can be found in *Table 3.6.* In total, our sample consists of 206 firms from German Civil Code countries (26% of total firms), 257 firms from French Civil Code countries (33%), and 322 firms from Common Law countries (41%). Firm size measured in total assets as well as financial performance is on average higher in UK and U.S. firms. We can observe similar median levels of leverage across firms from different corporate governance systems with values between 0.22 and 0.23. While the mean business diversification is quite comparable for firms in all legal systems, the mean geographical diversification is slightly higher in firms from French Civil Code (5.05 geographic segments) and German Civil Code countries (5.63 geographic segments). To control if results are

driven by U.S. firms, we exclude them from our sample and rerun our regressions for a European subsample in the robustness section 3.5.3.

**Table 3.6: Descriptive Statistics - Firms in Different Legal Systems**

| | **Common Law countries** *(U.S./UK)* N=322 / 41% | | | **German Civil Law countries** *(Germany/ Austria/ Switzerland)* N=206 / 26% | | | **French Civil Code countries** *(France/Netherlands)* N=257 / 33% | | |
|---|---|---|---|---|---|---|---|---|---|
| | Average | Median | Std. Deviation | Average | Median | Std. Deviation | Average | Median | Std. Deviation |
| Total Assets | 19,968 | 3,619 | 45,511 | 11,188 | 1,895 | 27,030 | 10,824 | 1,375 | 28,430 |
| Total Revenues | 14,335 | 3,059 | 30,575 | 8,011 | 1,708 | 17,032 | 7,133 | 1,046 | 18,464 |
| RoA | 6.749 | 5.940 | 5.338 | 3.857 | 3.820 | 5.945 | 3.785 | 3.585 | 6.136 |
| Growth | 8.050 | 6.300 | 14.930 | 7.002 | 3.820 | 15.770 | 4.515 | 2.855 | 15.926 |
| Leverage | 0.226 | 0.220 | 0.159 | 0.221 | 0.221 | 0.155 | 0.253 | 0.229 | 0.215 |
| Tobin´s Q | 1.903 | 1.578 | 1.123 | 1.577 | 1.274 | 0.877 | 1.441 | 1.196 | 0.900 |
| Firm Age | 79.388 | 72.000 | 59.932 | 86.356 | 81.000 | 63.356 | 98.146 | 48.000 | 241.000 |
| Business Segments | 4.474 | 4.000 | 2.632 | 4.385 | 4.000 | 2.170 | 3.845 | 4.000 | 2.276 |
| Geographic Segments | 4.578 | 4.000 | 3.183 | 5.625 | 5.000 | 3.100 | 5.045 | 5.000 | 3.441 |

### 3.5.2 Univariate Analysis

This section presents the empirical results. For our initial univariate analysis, we divide our sample into quartiles according to the mobility of corresponding CEOs (using *CEO_BORDERS_AVG* as classification variable). The first quartile includes firms with least mobile CEOs, while the fourth quartile includes firms with the most mobile CEOs. Values for these quartiles as well as differences in means are reported in *Table 3.7*.

**Table 3.7: Univariate Analysis - Comparison of Means**

This table contains comparison of means. Firms are divided into quartiles with respect to their mobility of CEOs using CEO_BORDERS_AVG as classification variable. The first quartile (1st) includes firms with least mobile CEOs, while the 4th quartile includes firms with the most mobile CEOs. Difference of means is reported in the third column. All variables are defined as explained in *Table 3.1*. A T-test for difference in means is applied. Asterisks denote statistical significance at the 0.01(***), 0.05(**) and 0.10(*)-level.

| Variables | 1st Quartile | 4th Quartile | Diff. (1st – 4th) |
|---|---|---|---|
| Salary | 618,808 | 805,578 | -186,770*** |
| Total Compensation | 1,839,720 | 3,597,405 | -1,757,684*** |
| RoA 2009 | 5.210 | 5.661 | -0.450 |
| RoS | 0.049 | 0.073 | -0.181 |
| RoA 2010 | 6.507 | 6.946 | -0.439 |
| Total Assets (in mm$) | 12,144 | 17,493 | -5,348 |
| Leverage | 0.265 | 0.209 | 0.056** |
| Growth | 6.725 | 5.808 | 0.916 |
| Liquidity | 1.725 | 1.694 | 0.031 |
| Business Segments | 4.360 | 4.435 | -0.075 |
| Geographic Segments | 5.119 | 5.635 | -0.516 |

Compensation levels are significantly higher for CEOs with higher levels of international knowledge, both in terms of salaries and total compensation. CEOs with a high degree of international knowledge (in the 4th quartile) receive on average $186,000 more as salary and nearly 1.76 million dollars more in terms of total compensation. With regard to performance, no significant differences can be observed between the first and the fourth quartile for return on assets, return in assets in the subsequent year (2010) and return on sales. In addition, we find that leverage levels tend to be higher in firms with less mobile CEOs.

### 3.5.3 Multivariate Analysis

In the next step, we run a multivariate analysis to back up our preliminary findings. Thus, we look at firm performance using return on assets in year 2009 (*RoA*) as dependent variable. Results are displayed in *Table 3.8.*

## Table 3.8: OLS Regressions Results (Return on Assets)

This table contains OLS regressions with *return on assets (RoA)* as dependent variable. All variables are defined as explained in *Table 3.1*. A constant term, whose value is not reported, is included in all regressions. T-statistics are reported in parentheses. All regressions control for industry and country fixed effects whose coefficient estimates are suppressed for brevity. Asterisks denote statistical significance at the 0.01(***), 0.05(**) and 0.10(*)-level.

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| Size | -0.047 (-0.772) | -0.105 (-1.612) | -0.029 (-0.442) | -0.018 (-0.268) | -0.075 (-0.527) | -0.041 (-0.670) | -0.034 (-0.521) | -0.038 (-0.598) |
| Growth | 0.264*** (5.403) | 0.308*** (5.530) | 0.278*** (4.880) | 0.204*** (3.554) | 0.312*** (3.850) | 0.285*** (5.734) | 0.217*** (4.112) | 0.218*** (4.127) |
| Firm Age | 0.022 (0.439) | -0.065 (-1.131) | -0.040 (-0.696) | -0.015 (-0.270) | -0.080 (-0.904) | 0.020 (0.386) | -0.019 (-0.358) | -0.018 (-0.335) |
| Leverage | -0.151*** (-2.999) | -0.153*** (-2.778) | -0.152*** (-2.770) | -0.147*** (-2.617) | -0.243** (2.168) | -0.154*** (-3.034) | -0.153*** (-2.907) | -0.150*** (-2.847) |
| Liquidity | 0.089* (1.660) | 0.048 (0.875) | 0.061 (1.107) | 0.132** (2.257) | -0.056 (-0.594) | 0.087 (1.617) | 0.121** (2.158) | 0.117** (2.097) |
| Volatility | -0.170*** (-3.615) | -0.181*** (-3.470) | -0.200*** (-3.762) | -0.172*** (-3.241) | -0.307*** (-3.687) | -0.168*** (-3.509) | -0.168*** (-3.387) | -0.172*** (-3.464) |
| Business Segments | 0.069 (1.424) | 0.094* (1.653) | | 0.044 (0.832) | -0.036 (-0.427) | 0.057 (1.165) | 0.071 (1.406) | 0.070 (1.388) |
| Geographic Segments | | | -0.128** (2.307) | | | | | |
| Distance Place of Birth-Firm | | -0.121** (-2.184) | -0.103* (-1.871) | | | | | |
| Distance Edu-Firm | | | | -0.007 (-0.132) | | | | |
| Distance Residence-Firm | | | | | 0.105 (1.291) | | | |
| Country Birth=Firm | | | | | | 0.114** (2.048) | | |
| Country BA=Firm | | | | | | -0.034 (-0.603) | | |
| Country MA=Firm | | | | | | 0.021 (0.386) | | |
| Country PhD =Firm | | | | | | -0.059 (-1.161) | | |
| Country MBA=Firm | | | | | | -0.051 (-1.055) | | |
| Country Residence=Firm | | | | | | -0.066 (-1.359) | | |
| CEO_BORDERS_AVG | | | | | | | -0.072 (-0.162) | |
| CEO_KM _AVG | | | | | | | | -0.043 (-0.868) |
| Industry Controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Countries | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| N | 343 | 267 | 253 | 274 | 122 | 339 | 313 | 353 |
| $R^2$ | 0.344 | 0.365 | 0.436 | 0.366 | 0.465 | 0.365 | 0.356 | 0.359 |
| F-Stat. (p-Value) | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

**Firm Performance:** Model 1 shows a basic regression without the inclusion of any mobility or proximity variables. We control all our models for industry and country effects. Consistent with Capon et al. (1990) and Masulis et al. (2009) we find that high leverage levels and high volatility significantly lower firm performance. In addition, sales growth is positively correlated with firm performance (see Rapp et al. 2009). In Model 2, we include geographical remoteness measured in physical distance from CEOs place of birth to firm headquarters and find that it significantly (at the 5 percent level) and negatively influences firm performance.[47] If we substitute geographic diversification (measured in number of geographical segments) for business diversification in Model 3, we still we find a significant and negative relationship to firm performance. Hence, we confirm H1. In contrast, proximity to educational locations or to CEO´s current residence does not have any significant influence on firm performance (see Model 4 and Model 5). Alternatively, in Model 6 we use several dummies to check if place of birth or educational institutions are located in same country as firm headquarters. We expect results to be stronger for firms mainly operating in countries connected to CEOs origin. Similar to Model 2, results point to the fact that firms significantly (at the 5 percent level) perform better if the CEO was born and potentially grew up in the country of her or his later firm. One could expect that spending certain years in a specific region during university education should also enhance levels of local knowledge. But again, there are no indications that close location of educational institutions or residence is connected to an increased firm performance. We argue that managers are able to learn the most about business specifics of the country of their origin. During many years, they are able to accumulate a high level of experience about country specific regulations, politics and culture which results in higher degrees of valuable local knowledge (as argued by Dahl and Pedersen 2004 and Gupta and Govindajaran 1991).[48] Subsequent models include average border crossings (Model 7) as well as average distance travelled (Model 8) as proxies for CEO mobility. Although the number of crossed borders (ß=-0.072) and the average distance covered (ß=-0.043) exhibit a negative correlation to firm performance, neither shows any statistical significance. Thus, we reject H2. Throughout all our models, control variables remain qualitatively the same. With regard to these results, we would argue that international knowledge is valuable in diversified firms but that on-the-job programs and management trainings in other firms succeed in at least partly counterbalance these advantages of CEOs´ personal traits. Alternatively, we would suggest that these managers use their personal traits to cushion negative diversification discount effects that would even impair more severely without proper intervention.

[47] We refrain from including several proximity variables into the same regression to avoid multicollinearity as these independent variables show significant correlation.

[48] To address reverse causality we argue as follows: Successful firms can choose from a variety of managers on the job market and therefore are not forced to pick a CEO that is geographically close to the firm. Thus, we suppose that proximity of CEOs to firm headquarters influences firm performance and not vice versa.

Due to the effects the financial crisis had on RoA in 2009, we consider whether the identified significant effects for some characteristics and the lack thereof for others could be biased by the financial crisis. To control for crisis effects, the alternative dependant variables Tobin's Q from 2009 and RoA from 2010 were employed in robustness analyses. These analyses confirmed the initial results. Tobin's Q in 2009 is expected to be less influenced by the crisis since stock market effects for the crisis were most pronounced in 2008 in contrast to actual firm performance, which suffered most from the crisis in 2009.

In the second part of our analysis, we examine if CEOs can bargain from higher knowledge levels in terms of higher compensations. Hence, in *Table 3.9* we use CEO salary as our dependent variable.

**Compensation:** Model 9 shows our basic model. As expected firm size has a significant positive influence on executive compensation (see Core et al. 1999 and Brick et al. 2006). In the next step, we control for legal systems and CEO characteristics (see M10). Firm tenure as well as the existence of Master and MBA degrees have a positive and significant influence on compensation. We include two mobility variables in the following models - border crossings in Model 11 (ß=0.092) and average distance covered in Model 12 (ß=0.130). Both exhibit a positive, significant correlation indicating that managerial pre-job mobility (i.e., international knowledge) pays off in terms of compensation. Therefore, we confirm H3. In Model 13 we incorporate dummy variables that indicate if certain stations of CEO´s path of life are in the same country as the firm. Although variables are slightly negative, none of them shows any statistical significant relevance. In alternative, not reported regressions we include further distance variables (*DISTANCE "X"- FIRM*) which do not yield significant results. Ergo, we cannot confirm H4. No further control variables are significantly related to CEO compensation. As our dependent variable only can take positive values, we apply additional Tobit estimation approaches (see Tobin 1958). The results remain similarly significant and unchanged (not reported here for brevity).

In total, while we can confirm hypotheses H1 and H3, we cannot find evidence for the support of hypotheses H2 and H4.

**Table 3.9: OLS Regressions Results (Compensation)**

This table contains regressions with *CEO salary* as dependent variable. All variables are defined as explained in *Table 3.1*. A constant term, whose value is not reported, is included in all regressions. T-statistics are reported in parentheses. Asterisks denote statistical significance at the 0.01(***), 0.05(**) and 0.10(*)-level.

| | (9) | | (10) | | (11) | | (12) | | (13) | |
|---|---|---|---|---|---|---|---|---|---|---|
| Size | 0.588*** | (14.339) | 0.552*** | (11.360) | 0.522*** | (10.352) | 0.523*** | (10.440) | 0.549*** | (11.432) |
| RoA | 0.044 | (1.052) | 0.039 | (0.887) | 0.047 | (0.992) | 0.049 | (1.032) | 0.042 | (0.930) |
| Leverage | -0.051 | (-1.208) | -0.051 | (-1.182) | -0.031 | (-0.687) | -0.031 | (-0.672) | -0.039 | (-0.883) |
| Liquidity | -0.017 | (-0.407) | -0.001 | (-0.011) | 0.083* | (1.686) | 0.006 | (0.129) | -0.001 | (-0.028) |
| Volatility | -0.007 | (-0.172) | 0.005 | (0.112) | -0.004 | (-0.085) | 0.005 | (0.105) | -0.001 | (-0.017) |
| Business Segments | 0.069* | (1.700) | 0.053 | (1.289) | 0.058 | (1.343) | 0.055 | (1.279) | -0.057 | (1.351) |
| Female | | | -0.008 | (-0.209) | -0.013 | (-0.303) | -0.014 | (-0.335) | -0.007 | (-0.180) |
| Firm Tenure | | | 0.010 | (0.217) | 0.019 | (0.381) | 0.023 | (0.477) | 0.017 | (0.365) |
| CEO Age | | | 0.080* | (1.800) | 0.110** | (2.337) | 0.097** | (2.067) | 0.088* | (1.953) |
| Dummy - BA | | | -0.042 | (-0.871) | -0.074 | (-1.376) | -0.075 | (-1.395) | -0.013 | (-0.194) |
| Dummy -MA | | | 0.097** | (2.022) | 0.092* | (1.810) | 0.095* | (1.894) | 0.153** | (2.141) |
| Dummy- MBA | | | 0.032 | (0.753) | 0.006 | (0.141) | 0.006 | (0.146) | 0.030 | (0.659) |
| Dummy - PhD | | | 0.012 | (0.267) | 0.011 | (0.237) | 0.015 | (0.327) | 0.017 | (0.333) |
| CEO_BORDERS_AVG | | | | | 0.092** | (2.084) | | | | |
| CEO_KM_AVG | | | | | | | 0.130*** | (2.979) | | |
| Country Birth=Firm | | | | | | | | | -0.049 | (-0.953) |
| Country Bachelor=Firm | | | | | | | | | -0.049 | (-0.704) |
| Country Master=Firm | | | | | | | | | -0.059 | (-0.815) |
| Country MBA=Firm | | | | | | | | | -0.015 | (-0.353) |
| Country PhD=Firm | | | | | | | | | -0.014 | (-0.271) |
| Country Residence=Firm | | | | | | | | | 0.056 | (1.335) |
| Industry Controls | Yes | | Yes | | Yes | | Yes | | Yes | |
| Legal Systems | No | | Yes | | Yes | | Yes | | Yes | |
| N | 406 | | 388 | | 353 | | 353 | | 385 | |
| $R^2$ | 0.389 | | 0.434 | | 0.443 | | 0.450 | | 0.445 | |
| F-Stat. (p-Value) | 0.000 | | 0.000 | | 0.000 | | 0.000 | | 0.000 | |

### 3.5.4 Robustness Tests

We run a variety of robustness tests:

*Additional robustness tests on performance*

The results of our various robustness tests on firm performance are shown in *Table 3.10*. First, as large U.S. firms in our sample outperform European firms, we test if our results hold for the exclusion for U.S. firms (see M14). We still find that distance between place of birth and corporate headquarter exhibits a significant (at the 5 percent level) and inverse relation to firm performance. Second, we control if our results are driven by CEOs that have founded the firm, and potentially from the first possess a higher degree of local knowledge. Thus, we exclude 24 CEOs from our sample that have founded the firm, and rerun our regressions with this reduced subsample. Results shown in M15 remain virtually the same. In an additional model specification (M16), we exclude CEOs that hold their position for 1 year or less. These CEOs should have fewer opportunities to significantly influence the firm´s performance. As expected, we can confirm our main results. Third, we include both, variables indicating local knowledge as well as variables indicating international knowledge (*CEO_BORDERS_AVG* and *CEO_KM_AVG*), in the same model specification together. With the mobility variables still insignificant, our main approximation for local knowledge remains virtually the same (though only significant at the 10 percent level) in both model specifications (M17 and M18). Fourth, we include educational variables as further controls for personal characteristics of managers. With regard to CEO educational level there is some mixed empirical evidence in the recent literature: Jalbert et al. (2002) examine the educational background of CEOs of the Forbes800 list and find a positive and significant relation between the educational level and respective firm performance as measured by ROA and Tobin´s Q. In contrast, Bhagat et al. (2010) find that CEO education just slightly influences hiring decisions of a firm, but they do not find any significant link between CEO education and firm performance. Similarly, we do not find any significant relation of education variables on firm performance (see M19). Finally, results remain quantitatively unchanged and still significant if we use alternative dependent performance variables like Tobin´s Q in 2009 in Model 20 or return in assets in the subsequent year (2010) in Model 21 as dependent variable.

## Table 3.10: OLS Regressions - Robustness Tests (Firm Performance)

This table contains our robustness tests with *firm performance* as dependent variable. Model 14 – Model 18 are with *return on assets in 2009*, M19 is with Tobin´s Q, and M20 is with *return on assets in 2010* as dependent variable. All variables are defined as explained in *Table 3.1*. A constant term, whose value is not reported, is included in all regressions. T-statistics are reported in parentheses. All regressions control for industry and country fixed effects whose coefficient estimates are suppressed for brevity. Asterisks denote statistical significance at the 0.01(***), 0.05(**) and 0.10(*)-level.

| | (14) **(excl. U.S.)** | | (15) **(excl. Founder)** | | (16) **(excl. <1 year)** | | (17) | | (18) | | (19) | | (20) **(Tobin´s Q)** | | (21) **(RoA 2010)** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Size | -0.153** | (-1.891) | -0.123** | (-2.173) | -0.147** | (-2.085) | -0.104 | (-1.596) | -0.103 | (-1.586) | -0.097 | (-1.453) | -0.113* | (-1.724) | -0.215*** | (-3.151) |
| Growth | 0.306*** | (-6.122) | 0.348*** | (4.896) | 0.251*** | (4.108) | 0.308*** | (5.517) | 0.308*** | (5.532) | 0.301*** | (5.363) | 0.185*** | (3.297) | 0.166*** | (2.826) |
| Firm Age | -0.097 | (-1.495) | -0.087 | (-1.501) | -0.073 | (-1.182) | -0.065 | (-1.122) | -0.068 | (-1.176) | -0.059 | (-1.015) | -0.089 | (-1.531) | -0.130** | (-2.144) |
| Leverage | -0.147** | (-2.555) | -0.142** | (-2.354) | -0.120* | (-2.015) | -0.154*** | (-2.766) | -0.151*** | (-2.715) | -0.137** | (-2.455) | -0.137** | (-2.461) | -0.137** | (-2.352) |
| Liquidity | -0.042 | (-1.564) | 0.086 | (-0.634) | 0.071 | (1.183) | 0.047 | (0.852) | 0.054 | (0.961) | 0.061 | (1.086) | 0.244*** | (4.414) | 0.115** | (1.987) |
| Volatility | -0.202** | (-2.050) | -0.110*** | (-3.422) | -0.179*** | (-3.158) | -0.181*** | (-3.451) | -0.181*** | (-3.465) | -0.175*** | (-3.317) | -0.099* | (-1.888) | -0.172*** | (-3.137) |
| Business Segments | 0.143** | (-1.566) | 0.093 | (2.181) | 0.094 | (1.498) | 0.094 | (1.622) | 0.097* | (1.698) | 0.098* | (1.706) | 0.012 | (0.205) | 0.123** | (2.046) |
| Distance Place of Birth -Firm | -0.126** | (-2.053) | -0.114** | (-1.976) | -0.130** | (-2.120) | -0.119* | (-1.947) | -0.154** | (-1.979) | -0.122** | (-2.168) | -0.136** | (-2.448) | -0.119** | (-2.049) |
| CEO_BORDERS_AVG | | | | | | | -0.005 | (-0.087) | | | | | | | | |
| CEO_KM _AVG | | | | | | | | | 0.043 | (0.600) | | | | | | |
| Dummy- BA | | | | | | | | | | | -0.050 | (-0.809) | | | | |
| Dummy- MA | | | | | | | | | | | -0.066 | (-1.163) | | | | |
| Dummy -MBA | | | | | | | | | | | 0.082 | (1.478) | | | | |
| Dummy- PhD | | | | | | | | | | | -0.047 | (-0.774) | | | | |
| Business Edu | | | | | | | | | | | -0.051 | (-0.903) | | | | |
| Industry Controls | Yes | | Yes | | Yes | | Yes | | Yes | | Yes | | Yes | | Yes | |
| Countries | Yes | | Yes | | Yes | | Yes | | Yes | | Yes | | Yes | | Yes | |
| N | 218 | | 243 | | 232 | | 267 | | 267 | | 267 | | 267 | | 267 | |
| $R^2$ | 0.410 | | 0.451 | | 0.413 | | 0.415 | | 0.416 | | 0.427 | | 0.407 | | 0.351 | |
| F-Stat. (p-Value) | 0.000 | | 0.000 | | 0.000 | | 0.000 | | 0.000 | | 0.000 | | 0.000 | | 0.000 | |

The following robustness tests concerning CEO pre-job mobility are not shown for brevity. First, we substitute *CEO_BORDERS_AVG* by number of different countries visited as alternative mobility variable in M8. Similar to the main models, it shows a negative but not significant relation. Second, as argued by Magnusson and Boggs (2006), international knowledge should be useful especially for geographically diversified firms that have a multinational orientation (i.e., subsidiaries in many countries). These firms in particular need CEOs with a broad background and extended knowledge of different business regions in order to manage existing operations and access new markets (Carpenter et al. 2001 and Buckley and Casson 1998). Thus, we interact *CEO_KM_AVG* with *GEOGRAPHIC SEGMENTS* and include it as independent variable. Although the interacted variable is slightly positive, again the interacted variable has no statistical significance

*Additional robustness tests on compensation*

For further robustness tests on compensation, we include additional Corporate Governance variables into our models (namely *CEO/CHAIRMAN DUALITY, BOARD SIZE, CEO PARTICIPATION* and *INSIDERS OWNED*). Though, none of the mentioned variables increases explanatory power of our regressions on compensation. Next, using CEO total compensation (including performance-related bonuses and stock) instead of CEO salary as dependent variable does not yield any significant results for above mentioned mobility variables. As argued before, total compensation is dependent on many firm and industry fixed effects (i.e., stock price, firm and peer performance) and does not optimally reflect the importance of CEO personal characteristics on compensation levels. Finally, we also run Tobit regressions (see Tobin 1958), as our dependent variable salary only can take positive values, and receive similarly significant findings. Results are not shown for brevity reasons.

## 3.6 Conclusion

In our cross-sectional study in this chapter, we examine European and U.S. CEO local connectivity to their firm and measure pre-job mobility by specifying important stations on managerial path of life including place of birth, educational institution, and residence. We measure geographical distances from these stations to corporate headquarter and apply a knowledge-based managing concept of the firm. We differentiate between two types of managerial knowledge – local and international knowledge – that are helpful to manage the business activities of the firm. First, we argue that a high level of local knowledge should be useful to steer core business processes related to corporate headquarter and manage relationships to close stakeholders. Second, we assume that international knowledge should be helpful to

allocate resources among subsidiaries more efficiently. Overall, we contribute to the literature on how personal characteristics of CEOs influence firm performance and compensation.

Local connectivity can help managers to better understand, communicate, and make business with closest stakeholders of the firm. Overall, our cross-country results indicate that CEOs with a high level of local knowledge significantly increase performance. This is particularly true for managers that were born and grew up close to headquarters of their later firm as they had the opportunity to gain region specific knowledge during many years. In contrast, in our sample we do not find any significant connection between geographical proximity of educational institutions or CEO residences to firm´s headquarter and firm performance. Furthermore, we cannot document an impact of CEO´s local connectivity on compensation levels. Contrary to expectations, CEO pre-job mobility does not have a significant influence on firm performance. Beside the potential influence of omitted personal characteristics of managers (e.g., social skills and risk attitudes), one possible explanation is that firms at least partly can alter CEO mobility with on-the-job programs. Furthermore, it is a complex task for a firm to employ a CEO that is perfectly suiting to all the regions a firm is operating in. This could result in imperfect CEO-firm matches and limited performance gains. In spite of these arguments, our results document that mobile CEOs receive a significantly higher compensation than non-mobile managers.

In total, our findings show that pre-job mobility (i.e., the level of international knowledge) mainly benefits the manager by increased remuneration levels, though no performance gains can be found. In contrast, local connectivity of managers does not affect remuneration levels positively, though firms significantly benefit from local knowledge in terms of increased firm performance. This can be seen as biased assessment of the importance of international knowledge compared to the importance of local knowledge in a globalized and international business environment. Managers with international experience are perceived as more valuable by the firm though this personal trait does not enhance firm performance per se. As our findings indicate, taking the role of local connectivity stronger into account could be a promising approach for firms in the CEO selection process**.**

Beside this, our study has some limitations. It is not possible for us to track down CEOs residence before taking up and after completing education (i.e., the location of their professional activities as databases only mention the identity of the firm but not the concrete city where the manager is stationed). Therefore, it would be interesting for future studies to get a detailed map of CEO´s complete path of life to analyze the full impact on firm performance. Furthermore, an analysis of further managers of the board of directors in terms of pre-job mobility and local connectivity could yield interesting results.

# 4 General Conclusion

This thesis investigates if geographical proximity to stakeholders affects firms´ financial policy and performance. It combines several streams of literature (finance, geographical economics, knowledge management, and personal economics) and contributes to the question if "distance still matters" (Butler 2008, Ghemawat 2001, and Petersen and Rajan 2001) in a globalized business environment. Geographical remoteness is connected with higher transportation costs, higher levels of informational asymmetries, a lower density of social networks, and lower levels of trust (see, e.g., Chhaochharia et al. 2012 and Alcacer 2006).

We run several empirical analyses on cross-sectional data sets of major public firms in the United States and Europe and investigate different facets of stakeholder proximity. Here, we focus on corporate headquarters as major nexus of communication and stakeholder interaction and main spatial representation of firms (Davis and Henderson 2008). Further, this approach helps to avoid potential endogeneity problems as headquarter relocations represent an expensive and rare corporate event (Pirinsky and Wang 2006).

First, we analyze the effects of geographic proximity to a comprehensive set of stakeholders on firm performance. Specifically, we find that spatial proximity to major customers as well as remoteness to competitors exhibits a positive and highly significant impact on firm performance, while we cannot find similar effects for other stakeholders. Further, we present evidence that these effects are especially predominant in non-service as well as relationship industries. Second, we show that remoteness to major customers increases the leverage level of firms. We argue that firms adapt their capital structure (i.e., business risk) to counterbalance increased uncertainty and higher costs of information acquisition of more remote customers (Chhaochharia et al. 2012, Alam et al. 2011, and Butler 2008). Finally, we show further results that underline the impact of geographic proximity even if we abstract from distances between corporate entities and focus on proximity between CEOs and the firm. That is to say, we present empirical evidence that CEOs exhibiting a closer geographic connection to the location of corporate headquarters significantly enhance firm performance. These findings can be interpreted as a consequence of improved local knowledge of the firm, its closely situated stakeholders, and local market conditions.

The findings of this thesis are limited as follows. As we focus on spatial proximity, a more comprehensive approach regarding cultural, lingual, technological, or psychic proximity to stakeholders could yield further interesting insights. Finally, we leave an expanded analysis of

stakeholder networks in a dynamic framework (including the relocation of headquarters and subsidiaries) for future research.

In sum, we document a strong and significant influence of geographic proximity to stakeholders on firm performance and financial policy that has implications for capital structure decisions, location management of headquarters and subsidiaries, diversification processes, and the CEO selection process.

# Appendix

**Appendix A: Distribution of Corporate Headquarters in Federal States**

| Rank | State | Number Firms | Rank | State | Number Firms |
|---|---|---|---|---|---|
| 1 | California | 425 | 27 | Kansas | 14 |
| 2 | New York | 203 | 28 | Kentucky | 13 |
| 3 | Massachusetts | 128 | 29 | Arkansas | 10 |
| 4 | Texas | 128 | 30 | Rhode Island | 10 |
| 5 | Illinois | 97 | 31 | South Carolina | 10 |
| 6 | New Jersey | 89 | 32 | Idaho | 9 |
| 7 | Florida | 85 | 33 | Iowa | 9 |
| 8 | Pennsylvania | 85 | 34 | Louisiana | 9 |
| 9 | Ohio | 81 | 35 | New Hampshire | 9 |
| 10 | Minnesota | 79 | 36 | Nebraska | 8 |
| 11 | Virginia | 61 | 37 | Oklahoma | 7 |
| 12 | Georgia | 58 | 38 | Alabama | 6 |
| 13 | Colorado | 57 | 39 | District of Columbia | 4 |
| 14 | Michigan | 48 | 40 | South Dakota | 4 |
| 15 | Connecticut | 47 | 41 | Delaware | 3 |
| 16 | Washington | 45 | 42 | Hawaii | 3 |
| 17 | North Carolina | 42 | 43 | Mississippi | 3 |
| 18 | Maryland | 40 | 44 | Montana | 3 |
| 19 | Missouri | 35 | 45 | Alaska | 2 |
| 20 | Wisconsin | 34 | 46 | Maine | 2 |
| 21 | Arizona | 32 | 47 | Vermont | 2 |
| 22 | Indiana | 27 | 48 | New Mexico | 1 |
| 23 | Tennessee | 25 | 49 | West Virginia | 1 |
| 24 | Utah | 23 | 50 | Wyoming | 1 |
| 25 | Oregon | 21 | 51 | North Dakota | 0 |
| 26 | Nevada | 20 | | | |

**Appendix B: Knowledge Intensive Industries according to Legler and Frietsch (2006)**

| 2-digit SIC | Description |
|---|---|
| **Knowledge Intensive manufacturing industries** | |
| 24 | Chemical Industry |
| 29 | Mechanical Engineering |
| 30 | Manufacture of office machines, data processing machines and data processing facilities |
| 31 | Manufacture of equipment for electricity generation, electricity distribution |
| 32 | Broadcasting, television engineering, communications engineering |
| 33 | Medical, measurement engineering, control engineering, optics |
| 34 | Manufacture of motor vehicles and motor vehicle parts |
| 35 | Other vehicle construction |
| **Knowledge intensive further manufacturing industries** | |
| 11 | Extraction of crude petroleum and natural gas, Provision of related services |
| 23 | Cokery, mineral oil processing, fertile material |
| 40 | Energy supply |
| 41 | Water supply |
| **Knowledge intensive commercial services** | |
| 21-22 | Publishing industry, printing industry, reproduction |
| 64 | Communication industry |
| 65 | Credit business |
| 66 | Insurance industry |
| 67 | Credit business and insurance industry |
| 72 | Data handling and databanks |
| 73 | Research and Development |
| 74 | Provision of services for companies |
| 85 | Healthcare, veterinary services, social services |
| 92 | Culture, sport, and entertainment |

## Appendix C: Technology Intensive Industries (according to the Classification of OECD 2009)

| SIC-Codes | Description |
|---|---|
| **High-Technology** | |
| 2423 | Manufacture of pharmaceutical products |
| 30 | Manufacture of office machines, data processing machines and data processing facilities |
| 32 | Broadcasting, television engineering, communications engineering |
| 33 | Medical, measurement engineering, control engineering, optics |
| **Medium-High-Technology** | |
| 24 (excl.2423) | Chemical industry without pharmaceutical products |
| 29 | Mechanical Engineering |
| 31 | Manufacture of equipment for electricity generation, electricity distribution |
| 34 | Manufacture of motor vehicles and motor vehicle parts |
| 352/359 | Other vehicles, rail industry |
| **Medium-Low-Technology** | |
| 23 | Cokery, mineral oil processing, fertile material |
| 25 | Manufacture of plastic and rubber |
| 26 | Manufacture of mineral products |
| 27-28 | Metal production and processing |
| 351 | Shipbuilding and boatbuilding |
| **Low-Technology** | |
| 15-16 | Manufacture of foodstuff, semiluxury food, manufacture of tobacco products |
| 17-19 | Textile, clothing, shoes and leather |
| 20 | Manufacture of wooden products, basketware, wickerwork, cork products |
| 21-22 | Publishing industry, printing industry, reproduction |
| 36-37 | Other manufacturing industry and recycling |

Source: OECD (2009): OECD Science, Technology and Industry Scoreboard 2009, OECD Publishing.

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