Management Science

Publication details, including instructions for authors and subscription information:
http://pubsonline.informs.org

Capital Markets and Firm Organization: How Financial Development Shapes European Corporate Groups

Sharon Belenzon, Tomer Berkovitz, Luis A. Rios,

To cite this article:
Sharon Belenzon, Tomer Berkovitz, Luis A. Rios, (2013) Capital Markets and Firm Organization: How Financial Development Shapes European Corporate Groups. Management Science 59(6):1326-1343. http://dx.doi.org/10.1287/mnsc.1120.1655

MANAGEMENT SCIENCE
Vol. 59, No. 6, June 2013, pp. 1326–1343
ISSN 0025-1909 (print) | ISSN 1526-5501 (online)

http://dx.doi.org/10.1287/mnsc.1120.1655

Capital Markets and Firm Organization: How Financial Development Shapes European Corporate Groups

Sharon Belenzon
Fuqua School of Business, Duke University, Durham, North Carolina 27708, sb135@duke.edu

Tomer Berkovitz
Graduate School of Business, Columbia University, New York, New York 10027, tb2122@columbia.edu

Luis A. Rios
Fuqua School of Business, Duke University, Durham, North Carolina 27708, luis.rios@duke.edu

We investigate the effect of financial development on the formation of European corporate groups. Because cross-country regressions are hard to interpret in a causal sense, we exploit exogenous industry measures to investigate a specific channel through which financial development may affect group affiliation: internal capital markets. Using a comprehensive firm-level data set on European corporate groups in 15 countries, we find that countries with less developed financial markets have a higher percentage of group affiliates in more capital-intensive industries. This relationship is more pronounced for young and small firms and for affiliates of large and diversified groups. Our findings are consistent with the view that internal capital markets may, under some conditions, be more efficient than prevailing external markets, and that this may drive group affiliation even in developed economies.

Key words: corporate groups; financial development; internal capital markets
History: Received May 19, 2009; accepted June 13, 2012, by Bruno Cassiman, business strategy. Published online in *Articles in Advance* December 19, 2012, and updated February 1, 2013.

1. Introduction

This study seeks to deepen our understanding of firm organization and boundaries by examining how regional institutional differences affect the propensity of companies to form groups within 15 Western European countries. We focus on one specific channel through which incentives to band together may operate: internal capital markets (ICMs).[1] In our setting, federations of firms (for example, the German *konzern*) are usually referred to as *corporate groups* (Faccio et al. 2010). We test and quantify the effect of ICMs on group formation by ranking industries according to their level of external capital needs while also ranking countries according to their relative levels of financial development. Then we compare how the distributions of group-affiliated firms across industries vary across nations. Thus we test empirically whether firms in industries that are more dependent on external capital are more likely to be group affiliates, especially in countries with a low level of financial development.

The formation of groups is often viewed as an intermediating organizational response to missing or inefficient markets (Leff 1978). This is an appealing argument with important strategy and policy implications, but its examination poses three significant empirical challenges. First, although it predicts that group formation should be driven by market development, groups themselves may actually restrain the development of the institutions they mimic (Khanna and Yafeh 2007). Thus, groups that may have arisen for reasons other than a response to inefficient markets may go on to hamper subsequent financial development by limiting arms-length transactions. Second, omitted or latent macro variables can be correlated with both financial development and the prevalence of groups. Third, group affiliates are often privately held corporations under intricate ownership arrangements, rendering many groups "relatively invisible" (Granovetter 1995). This is particularly likely in the face of regulatory pressure to be discrete about the

[1] Section 2 relates our work to prior studies on groups and ICMs (e.g., Khanna and Palepu 2000, Khanna and Yafeh 2005, Almeida and Wolfenzon 2006, Cestone and Fumagalli 2005, Morck et al. 2005).

internal reallocation of resources, which may be perceived as detrimental to minority shareholders (Scharfstein and Stein 2000) or even anticompetitive.

This paper is the first to tackle all three of these challenges. First, we mitigate the reverse causality concern by focusing on a specific mechanism—internal capital markets. If groups replace inefficient financial markets, we would expect (i) a higher probability of group affiliation within capital-intensive industries, where affiliates are more likely to benefit from a group's ICM, and (ii) this relationship to be stronger in countries with less developed financial institutions. A pure reverse causality argument is unlikely to explain the interaction effect between these two because a country's financial development is constant across industries, and it is not likely to account for within-country systematic differences in group affiliation between high- and low-dependence industries. We employ a difference-in-differences strategy to determine whether the difference in group affiliation between higher and lower external dependence industries is more stark for countries with lower financial development.

Second, we develop a comprehensive data set on group affiliation and financial information covering over 139 thousand (mostly private) European firms. Our estimation strategy allows us to substantially mitigate unobserved industry and country heterogeneity, in addition to controlling for both country and industry fixed effects, by performing more refined tests of whether variation in the relationship between external dependence and financial development among firms is consistent with the ICM theory.

Third, to mitigate the invisibility problem, we construct detailed ownership and control hierarchies for groups by exploiting the strict reporting requirements of the European Union (EU), where both public and private firms have to file annual reports detailing ownership and financial information.

Because ICM transactions themselves are hard to observe, we employ an indirect approach (e.g., Dahl et al. 2002) to capture the impact of ICMs. We identify conditions where internal capital should be more beneficial and systematically test whether these conditions are associated with higher propensity for firms to be organized in groups. One advantage of our indirect approach is that it relies on the revealed preferences of firms, rather than on reporting which may be polluted by firms' self-serving interests.

We follow the methodology employed by Rajan and Zingales (1998) to rank industries according to their dependence on external sources of funding, taking into consideration external funds dependence and trade credit. Then we rank the 15 Western European countries in our sample according to their level of financial development using World Bank indices, which consider the stock market and banking systems for each country (Beck et al. 2000; data updated in 2007). Though our focal countries are relatively wealthy and enjoy developed legal environments, they nonetheless exhibit measurably different levels of financial institution development according to these fine-grained indices. To supplement the accounting measures of financial development, we also use measures from the World Economic Forum Executive Opinion Survey, 2006–2007 (Claessens and Laeven 2003), which capture local access to equity and loan markets.

Our findings strongly support the ICM hypothesis. We find that high-dependence industries have disproportionately more group affiliated firms than low-dependence industries, and that this difference declines as financial development increases. This result suggests that less developed markets disproportionately foster the formation of corporate groups in sectors where internal capital markets are especially beneficial. Consistent with the view that small and young firms are likely to face higher costs for outside capital (Gompers 1995), our results also show that the effect of financial development on group affiliation is more significant for smaller and younger firms. Our results are also strong for firms affiliated with larger and more diversified groups, where ICMs are likely to be more substantial.

2. Empirical Setting

2.1. European Corporate Groups

Group definition is important in our study because there are many incongruous conceptualizations of what a group is. Since Leff's (1978) seminal work, scholars have found many different examples of "firms bound together in some formal and/or informal ways, characterized by an 'intermediate' level of binding" (Granovetter 1995, p. 95). Mostly within the context of emerging economies, the business-group literature has emphasized features such as concentrated ownership, reciprocal trading arrangements, and familial control (Khanna and Rivkin 2001, 2006; Kester 1992). Concurrently, the "pyramidal groups" literature has focused mainly on formal ownership structures and the often darker sides of group organization within developed and developing economies (Almeida and Wolfenzon 2006, Morck 2005).

We do not take a position on the extent to which these streams map onto one another, nor do we claim that our empirical sample overlaps directly with any of these types of groups. We are, however, very precise in defining what our subjects are. Our paper focuses on a set of Western European economies that (i) have consistently defined groups, based on historical, institutional, and economical traditions; (ii) exist

within a narrow range of economic development, so that we do not commingle developed and developing economies; and (iii) still have enough heterogeneity in their financial institutions and mix of industries, so that we may observe the impact of interactions between industry capital demand and country economic development.

We rely on the ownership-based EU definition of groups to ensure the consistent criteria needed for our empirical strategy. The concept of corporate groups within a Western European context is codified in legal, cultural, and economic institutions, which reduces our reliance on theoretical assumptions about boundary conditions for group membership.[2] Thus, our goal in this paper is not so much to show whether groups exist in Europe as it is to explore whether the heterogeneity in their prevalence across countries and industries provides evidence of an ICM mechanism behind their formation.

Though prior work has found ownership links to be tepid determinants of group membership in emerging markets (Khanna and Rivkin 2006), there are strong reasons to believe that they reliably demarcate group membership in our setting. In the EU, courts and government agencies specifically emphasize the concept of control as a condition for group affiliation. This refers to the direct and indirect ownership stakes the controlling shareholder has in each of the corporate group affiliates (Windbichler 2000). Additionally, the notion of corporate groups is part of the economic environment in the EU. For example, Figure 1 shows the ownership structure of a representative group, Berge y Compania, which describes itself as one of the major Spanish corporate groups.[3] Similarly, a vast number of firms in our sample feature their affiliation as part of their corporate identity, by including, for example, the name of the corporate group in their letterheads, websites, and logos. Also, it is common to highlight their association with other group members in their communication materials.

The EU definition is also consistent with much academic work that focuses on corporate groups (e.g., Deloof 1998, Morck 2005, Smångs 2006, Cestone and Fumagalli 2005). Following previous work, we classify a firm as a group affiliate if it satisfies at least one these three criteria: (i) the firm is a subsidiary (that is, it has a controlling parent company), (ii) it controls another firm (that is, it has at least one subsidiary), and (iii) it has the same controlling shareholder as at least one other firm.

It is important to note that we do not attempt to capture every single firm or every single group within our focal countries. For our empirical strategy to work, it is only necessary that our sampling is representative of the distribution of industries within a given country, along the dimensions of external dependence and country financial development, and that it is not biased by systematic misrepresentation of firms missing ownership or financial information. Section 3 details our data construction and methodology for characterizing firms as group affiliates, including a detailed discussion of our mitigation of potential bias issues. We also perform a battery of tests to ensure that our results are robust to alternate sample inclusion criteria.

Our focused empirical approach may limit the generalizability of our study, because groups (in the broader context) are heterogeneous across time and place (Khanna and Rivkin 2001). Nonetheless, because our study focuses on how relative market efficiency drives the partial internalization of transactions within groups, rather than within discrete firms, our findings should be relevant in other settings where "the group is an integral part of the resource allocation mechanism," (Goto 1982, p. 60). As well, we document conditions under which, despite conventional wisdom in strategy, financial capital may be a valuable resource even in developed economies.

2.2. Internal Capital Markets

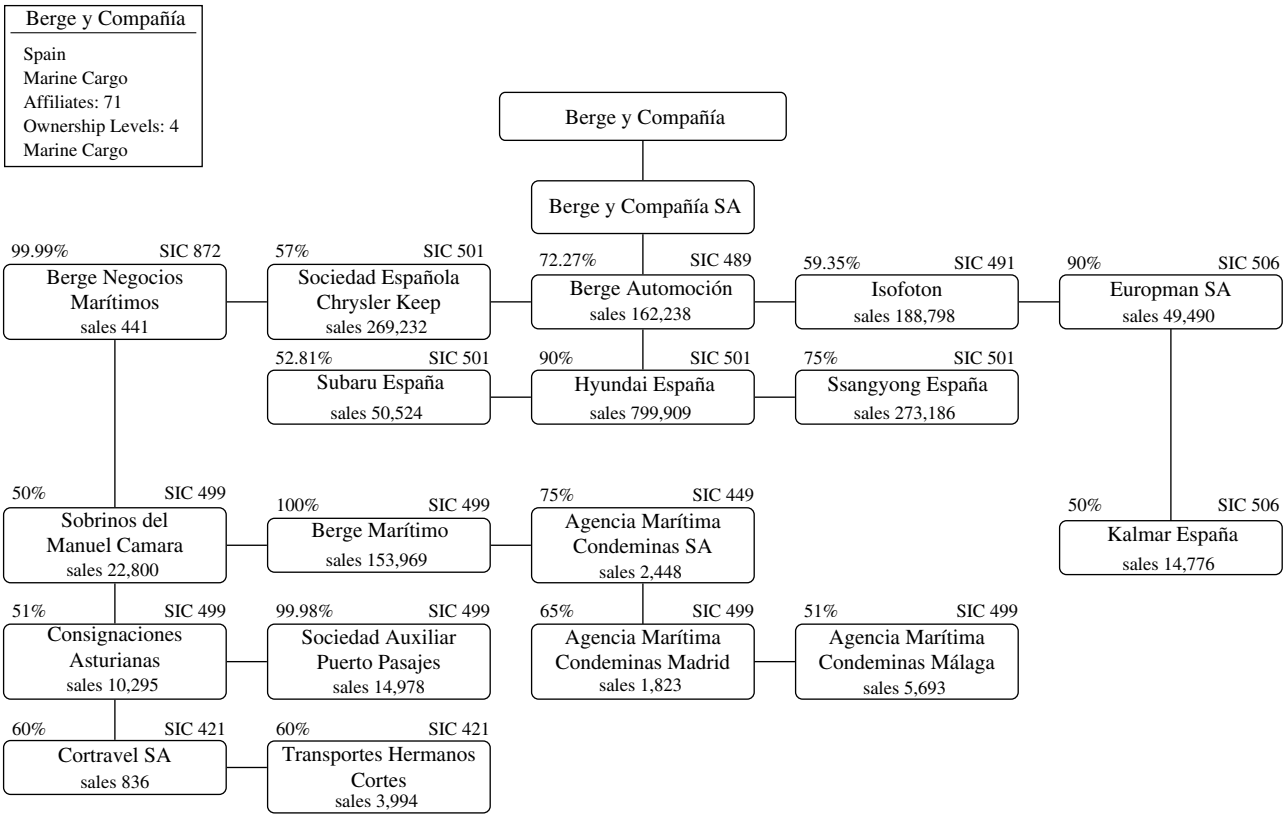
ICMs have been observed in hybrid organizations ranging from loosely tied groups to vertically integrated conglomerates, albeit for reasons that vary (e.g., Perotti and Gelfer 2001, Cestone and Fumagalli 2005, Gopalan et al. 2007). For example, a 2011 metastudy of the broad group literature (Carney et al. 2011) found that financial infrastructure development generally moderates group affiliation negatively, which lends support to the ICM hypothesis. Similarly, ICMs have been found to lower the cost of capital for many types of groups and give them access to financial institutions (Khanna and Palepu 2000, Gertner et al. 1994, Weinstein and Yafeh 1998). But ICMs need not arise solely as a response to missing or significantly underdeveloped markets.[4] Even in countries with

[2] Direct references to corporate groups are found throughout the EU governing documents, for example, the Fourth Directive of the Council of European Communities (1978), where accounting reporting regulations for groups are stipulated: "Whereas, when a company belongs to a group, it is desirable that group accounts giving a true and fair view of the activities of the group as a whole be published" (http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31978L0660:en:HTML, accessed November 28, 2012).

[3] See the Berge corporate website main page: http://www.bergeycia.es.

[4] An issue beyond the scope of this paper is whether companies could "migrate" to the most efficient financial environments within Europe and circumvent the deficiencies of their home country systems. The current consensus on firm mobility in Europe is that it is still rare, as it is largely constrained by taxation and jurisdiction issues (Bratton et al. 2009).

Figure 1 Example of a European Corporate Group's Ownership Strucutre



Notes. Data are as of 2007. A representative sample is shown. Units are in thousands of dollars. Horizontal lines: companies are on the same level; vertical lines: top company owns the bottom company.

well-developed financial institutions, ICMs can still provide access to capital under more favorable terms (Cetorelli and Goldberg 2012), mitigate asymmetric information between firms and capital sources (Myers and Majluf 1984), or provide better governance mechanisms via ownership than would be possible under lending relationships (Wulf 2009). Furthermore, these are likely to be more pronounced within countries where financial institutions are less sophisticated and information and transparency are reduced, even if overall capital liquidity is not substantially lower.

However, direct evidence of ICM remains scarce, especially within European corporate groups (De Haas and Van Lelyveld 2010). Often, ICM transactions occur between sophisticated corporate group members and involve valuable yet intangible capital resources such as loan guarantees or deposit smoothing (Cremers et al. 2011), which are inherently difficult to observe and quantify. This intangibility may be exacerbated by institutional pressures to be discrete regarding internal reallocations of resources, because these may be detrimental to minority shareholders (Scharfstein and Stein 2000) or even anticompetitive.

Within the relatively developed countries in our study, where sophisticated legal and financial instruments are common, we would then expect ICM to work both through subtle mechanisms such as guarantees for capital raising and through more direct ones, like funding one affiliate using cash flow from another (this is often called "corporate socialism"). Often, a corporate group may have financing subsidiaries in various markets, which are able to raise capital on favorable terms as a result of guarantees provided by the controlling firm. For example, Novartis' subsidiaries regularly issue debt that is guaranteed by the parent, such as a $2 billion issue by Novartis Capital Corp., the $3 billion issued by the group's Bermuda unit, Novartis Securities Investment, and the €1.5 billion issued by Novartis Finance (Luxemburg). In all three cases, the debt was guaranteed by the parent and accompanied by statements that obliquely acknowledged the ICM nature of these transactions, such as, "proceeds will be used for intercompany refinancing purposes in connection with the pending . . . acquisition, as well as for general corporate purposes."

Additional direct evidence on the functionality and prevalence of ICM transactions within corporate groups can be found in Thompson Reuter's DealScan database. By manually sifting through this database, we were able to identify numerous instances of loan guarantees made by the group parent for the benefit

of an affiliate. We did not perform statistical analysis on these data, because a systematic treatment of these is beyond the scope of our paper. However, our exploratory findings in the data set were consistent with what we would expect. Many of the transactions were in industries with a high level of external capital dependency (e.g., shipping and energy). More detailed searches to track down original filings for a random sample of these transactions also revealed intricate mortgage agreements and securitization documents. For example, M. J. Maillis, SA, an industrial manufacturing group reported in its 2011 filings that "the parent company has given guarantees for a total of 4.2 million Euro toward obligations of the Group's subsidiary companies." Similarly, Cadence Design Systems' 2006 10-Q filings report that it "unconditionally guaranteed" the obligations amounting to $160 million of its Irish subsidiary Castlewilder for it to obtain a loan, and Fred Olsen Energy guaranteed a $1.5 billion loan made to its subsidiary Dolphin International. Given the intricacy of these arrangements, it is not surprising that within academic work ICMs are often documented through inference, such as by observing correlated credit patterns (e.g., Dahl et al. 2002) or relying on financial statement analysis (Deloof 1998).

Our central question then is whether the benefits of ICM themselves foster group formation, or whether these well-documented ICM channels merely reflect an ancillary benefit of group affiliation. To properly address this, we systematically document the distributions of groups across industries and countries, and expect groups to be more prevalent wherever ICM would be more valuable.

3. Methods

3.1. Empirical Strategy

We study the effect of financial development on group affiliation by testing whether corporate groups substitute for less developed financial institutions. Here, reverse causality between group formation and financial development poses a serious identification challenge. This is because we might expect lower overall incentives for financial markets to improve in regions where groups already facilitate financing. Thus, groups may actually hamper financial development rather than be a response to lower development (Khanna and Yafeh 2007). An additional issue is that simply examining a firm-specific proxy for external financial dependence would measure external funding set in equilibrium rather than the *demand* for external funding, and thus suffer from endogeneity problems. The use of aggregate and exogenous industry variation should be especially advantageous in this setting.

To deal with these issues, we analyze a key channel through which financial development affects group affiliation: internal capital markets. If groups form as a substitute for underdeveloped financial markets, we should observe a higher probability of group affiliation for firms with a higher external financing needs, because they would benefit more from access to internal capital markets. This should be more pronounced in countries with relatively low financial development, because these countries have more limited alternatives to raising capital. We follow the methodology of Rajan and Zingales (1998) and rank the degree of reliance on external capital for all major industries using data from the United States. The logic behind this strategy is this: (i) The United States has the most advanced capital markets in the world, where publicly traded firms face the least friction in accessing finance. Thus, the amount of external finance used by these companies is a good measure of their industry's intrinsic (e.g., technological) demand for external finance. (ii) Strict disclosure requirements result in comprehensive data on funding sources. (iii) Although U.S. industry data are exogenous to European firms, the major industries are structurally and technologically similar, so an industry's dependence on external funds, as measured in the United States, is likely to be a good measure of that industry's dependence on external funds for the countries in our setting (for example, chemicals are capital intensive, regardless of locale). (iv) Groups are virtually nonexistent in the United States, so U.S. firms' demand for external funds is a good proxy for industry-driven capital demands in the absence of options for group ICMs.

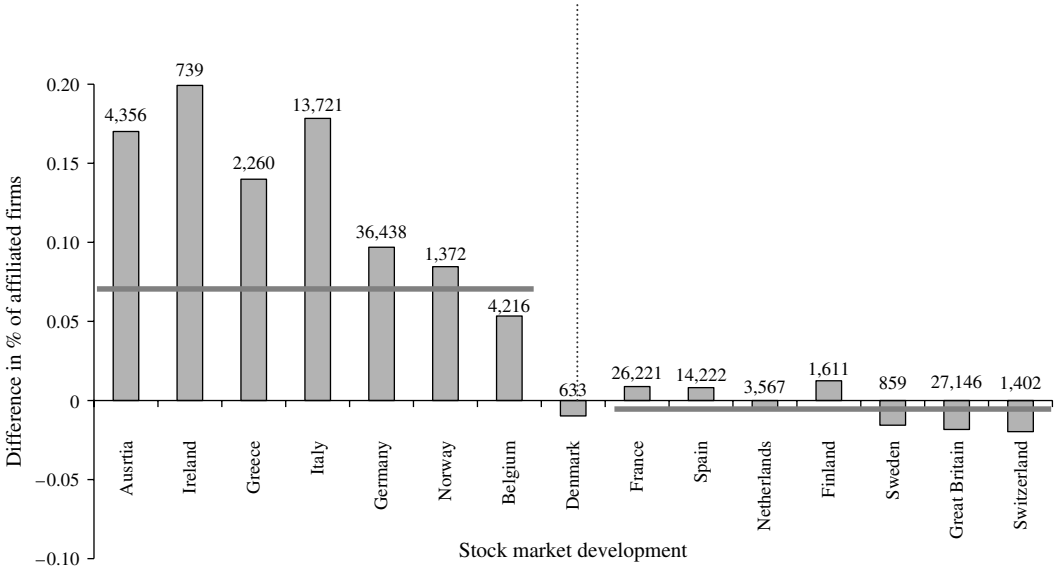
Two main assumptions are needed for our identification strategy to work: that technological differences explain why some industries rely on external funds more than others, and that these differences are relatively stable across countries and orthogonal to regional financial development.

Figure 2 shows the logic behind our empirical strategy. We can readily see that nations with lower scores in terms of stock market development also have considerably larger shares of group-affiliated firms in industries with high external capital dependence (we define the measures used in the next section). Though in our regressions we introduce a number of controls to better understand these unconditional relationships, this nonparametric pattern is prima facie consistent with the hypothesis that groups provide an alternative source of capital within less developed financial markets.

3.2. Data

Our data set relies on detailed ownership links and accounting information from the 2007 version

Figure 2 Differences in Group Affiliation Between Industries with High and Low External Financial Dependence Across Countries



Notes. This figure describes the difference in the percentage of affiliates between the highest and lowest quartiles of external financial dependence across countries. Countries are ranked according to their financial development in ascending order. Financial development is based on Beck et al. (2000; data updated in 2007) and is the average of stock market value traded and stock market capitalization over GDP (averaged over the period 2003–2005). External finance dependence is computed at the three-digit SIC level based on Compustat firms in 1980–2004, and is defined as the ratio between capital expenditures minus cash flow from operations and capital expenditures. The number above each bar indicates the number of firms. The horizontal lines represent the sample difference in percentage of affiliated firms between high and low external dependence for below- and above-median country stock market development.

of Amadeus, a comprehensive European database by Bureau van Dijk (BVD), which covers both private and public firms. The main tests in this paper exploit cross-sectional variation across firms, industries, and countries. For robustness, we also employ an alternate panel estimation approach. BVD has developed a format that standardizes financial items across the various countries' filing regulations, balanced with a realistic representation of European company accounts. A key advantage of these data is that by including private as well public firms, we capture a wide range of firm sizes. Because Amadeus includes information for industrial firms only, we add information for financial institutions from BankScope, which provides ownership information for about ten thousand banks. The final estimation sample includes 139,254 firms, 50.6% of which are affiliated with 26,711 groups.[5]

3.2.1. Sample Construction. In this section, we delineate our three-step methodology for constructing the data and describe our sample. We first identify which of the dyadic interfirm ownership links reported in Amadeus or BankScope represent a controlling interest. Then we use this information to map hierarchies of ownership and infer group structure. Finally, we reclassify or drop some firms and groups according to a set of refining criteria.

Ownership Links. To ensure that the ownership links we observe represent actual control, they must include a minimum share of voting rights. For private firms, a link is considered controlling if it has at least 50% of the voting rights. For public firms, which typically have a more dispersed ownership, the threshold is set at 20%, consistent with previous literature on public firms (e.g., La Porta et al. 1999, Faccio and Lang 2002). Our results are not sensitive to alternative plausible specifications of these thresholds. It is important to note that links between firms need not be direct. For example, if firm A owns 50% of firm B, and firm B owns 50% of firm C, then firm A has a 25% ownership link to C.

Corporate Group Definition. We define a *corporate group* as a set of at least two legally distinct firms where one of them is a controlling ultimate owner according to the ownership links identified above. Specifically, this means that for a firm to be a *group affiliate*, it must meet at least one of these criteria: (i) the firm is a subsidiary (that is, it has a controlling parent company), (ii) it controls another corporation (that is, it has at least one subsidiary), or (iii) it has the same controlling shareholder as at least one other corporation.

Estimation Sample Selection. We impose two additional conditions before finalizing our baseline estimation sample. First, banks are excluded, because they

[5] One has to be cautious when comparing these percentages with previous studies on business groups (e.g., La Porta et al. 1999, Faccio and Lang 2002) because our sample includes private firms; previous studies focused on public firms.

are likely to face much different capital considerations when joining groups (the affiliation decisions of financial institutions are beyond the scope of this paper).

Second, we deal with the fact that many countries in our sample differ in their mandatory reporting requirements for small firms. Because our empirical approach investigates the interaction between industry and country measures, while controlling for country- and industry-level effects, our results should not be sensitive to this type of cross-country variation in reporting patterns. Furthermore, there is no reason to expect within-country systematic variation in reporting patterns *across industries*. This would be a case where in a given country small firms in one industry would comply with voluntary reporting, but somehow small firms in the same country but in a different industry would not comply. Nonetheless, we mitigate any potential bias of voluntary disclosure by eliminating all firms that generate less than \$10 million in annual sales. This is a conservative threshold based on our research on BVD's data collection processes, which included multiple interviews with their experts and top executives. We perform a number of robustness checks to ensure that our size thresholds do not introduce sample bias.

3.2.2. Industry External Dependence. To thoroughly explore the interactions between financial development and external dependence, we use several measures of each and interact them in various combinations. For external dependence we use three distinct measures. *External funds dependence* is calculated as the ratio between capital expenditures net of cash flows from operations and capital expenditures. This measure captures the fraction of the firm's investment that is not financed using internal cash flows. We construct *trade credits* following Nilsen (2002) and Fisman and Love (2003) by using suppliers' provision of funds. This is the ratio between accounts payable and total assets.[6] Finally, we take into account *investment intensity*, computed as capital expenditures over total assets. All measures are calculated using American Compustat firms from 1980 to 2000 at the three-digit SIC level (163 industries).

3.2.3. Financial Development. As we emphasized earlier, all of the Western European countries in our sample would be considered "developed" nations, in the broader sense of the word. Thus, some scholars may consider the differences we measure as capturing *different types* of development, eschewing the ordinal connotations implied by terms such as "level of development" (Carlin and Mayer 2003). However, our use of the word "development" in this context is consistent with extant work (e.g., Almeida and Wolfenzon 2006), and we stress that whether a country's level of development along any measure is higher or lower merely reflects whether that channel is more or less conducive to industrial firms' access to external capital.[7]

We use four accounting measures and four survey measures of financial development. To capture the relative development of various types of financial institutions within a country, we rely on World Bank indices (following Beck et al. 2000; data updated in 2007), which reflect the development of a country's stock markets and banking systems. Our empirical approach independently evaluates the interaction of each of these measures with each of the measures of external capital dependence. This is because our various measures for development need not be perfectly correlated—for example, a country may have an exceptionally well-developed banking system, but stock markets that are only average relative to other countries. Therefore, a composite measure of development that aggregates all measures might attenuate important variation.

For stock market development, we use (i) *stock market volume/gross domestic product* (*GDP*) and (ii) *stock market capitalization/GDP*. We define *stock market volume* as the value of total shares traded on the stock exchange (a "flow" measure aiming at capturing stock market liquidity), and *stock market capitalization* as the value of all stocks listed on the equity markets, aiming at capturing the size of production organized in publicly listed firms. For the banking system, we use *private credit/GDP*, the ratio of private credit by deposit money banks and other financial institutions to GDP, and *bank deposits/GDP,* the ratio of bank deposits to GDP, where bank deposits are the demand, time, and savings deposits in money banks.

Our four survey-based measures come from the World Economic Forum Executive Opinion Survey (Claessens and Laeven 2003), updated for 2006–2007. This captures *access to loan market*, a measure based on the question, How easy is it to obtain a bank loan in your country with only a good business plan and no collateral? *Financial system sophistication* is based on the question, How sophisticated are the financial markets in your country? *Access to venture capital* is based on the question, In your country, how difficult is it for entrepreneurs with innovative but risky projects to find venture capital? *Access to equity markets* is based on the question, How difficult is it to raise money by issuing shares on the stock market in your country?

3.3. Descriptive Statistics

Panel A of Table 1 provides summary statistics for firms in our sample. On average, they have 392 employees

[6] For a detailed discussion of the theory of trade credit provision, see Fisman and Love (2003).

[7] We thank an anonymous reviewer for this suggestion.

Table 1 Summary Statistics for Main Firm and Group Variables

Variable	No. of firms/groups	Mean	Std. dev.	Distribution 10th	50th	90th
			Panel A: Firm level			
Sales ($, thousands)	138,770	172,808	2,408,520	11,831	27,569	181,881
Employess	122,477	392	3,919	14	77	478
Assets ($, thousands)	109,129	194,489	3,135,302	4,988	18,593	156,511
Firm age	133,678	25	24	5	18	54
Cash flow ($, thousands)	104,116	19,584	923,785	−81	1,120	12,155
			Panel B: Corporate group level			
No. of affiliates	26,672	12	40	2	4	21
Sales ($, millions)	26,672	2,612	28,225	20	92	1,320
Assets ($, millions)	26,672	6,521	200,710	4	52	995
Cash flow ($, millions)	26,672	193	3,132	0	3	61
Industry concentration index (*HHI*)	26,672	0.68	0.24	0.38	0.66	1

Notes. This table provides summary statistics on main firm and group variables in the estimation sample. In panel A, the unit of observation is a firm, and in panel B, the unit of observation is a corporate group. Firms are included in the estimation sample if they have nonmissing sales and ownership information, and generate at least $10 million in annual sales. *HHI, Herfindahl–Hirschman Index.*

(77 median) and generate $173 million in annual sales ($28 million median). Panel B reports corporate group characteristics. Our affiliated firms belong to 26,672 unique groups with 12 affiliates on average. Groups in our sample have abundant resources: the average group holds approximately $6.5 billion in assets; however, this seems to be driven by groups at the highest end of the distribution, because the mean is $52 million, and the 90th percentile is $1 billion.

Table 2 presents summary statistics separately for group affiliated firms and stand-alone firms. Affiliates tend to be larger in terms of the number of employees, sales, assets, and cash flow, but quite similar in terms of age. In our econometric tests, we check whether very large firms in our sample are driving the results.

Table 3 presents the variation in external dependence for a number of industries. Examples of high external dependence industries include chemicals, research and development, information technology, and drugs, whereas low external dependence industries include concrete, metal and minerals, textiles, and transportation equipment.

3.4. Econometric Specification

We estimate a linear probability model for the likelihood that a firm is affiliated with a group. The econometric specification is

$$\Pr(Affiliate_i = 1) = \beta_1 Sales_i + \beta_2 FinDev_c \times ExtDep_j + \beta_3 Sales\ share_{jc} + \varphi_j + \eta_c + \epsilon_i, \quad (1)$$

where i denotes firm (the unit of observation), $Sales_i$ is annual sales of firm i, $FinDev_c$ is financial development for country c, $ExtDep_j$ is external dependence for industry j, φ_j and η_c are complete sets of industry and country dummies, and ϵ_i is an independent and identically distributed error term. Following Rajan and Zingales (1998), we control for the share of industry sales in each country using $Sales\ share_{jc}$, which is the share of total sales of industry j (in which the focal firm operates) in country c. This measure is computed using all firms in the complete sample where we make no restrictions on sales volume. Share of industry sales controls for potential bias arising from systematic country–industry correlation; for example, a disproportionate representation of some industries

Table 2 Firm Characteristics: Affiliates vs. Stand-Alones

Variable	Affiliates − stand-alones	Affiliates No. of firms	Affiliates Mean	Affiliates Median	Affiliates Std. dev.	Stand-alones No. of firms	Stand-alones Mean	Stand-alones Median	Stand-alones Std. dev.
Sales ($, thousands)	206,216**	70,058	274,916	37,941	3,328,597	68,712	68,700	21,791	630,547
Employees	444**	63,281	607	103	5,334	59,196	163	58	1,124
Assets ($, thousands)	252,243**	61,959	303,519	25,347	4,134,177	47,170	51,276	13,514	506,205
Firm age	0.14**	67,847	25.1	18	23.4	65,831	24.9	18	24.1
Cash flow ($, thousands)	27,977**	58,697	31,789	1,539	1,229,523	45,419	3,812	816	46,255

Notes. This table reports mean comparison tests for affiliates and stand-alones. The unit of observation is a firm.
**The difference in means between affiliates and stand-alones is significant at the 1% level.

Table 3 External Dependence for Selected Industries

Industry name	No. of firms	External funds dependence	Trade credit	Investment intensity
Chemicals (SIC 283)	1,088	1.01	0.17	0.35
Research and development (SIC 873)	802	0.82	0.21	0.36
Information technology (SIC 737)	4,491	0.60	0.25	0.50
Drugs (SIC 512)	2,119	0.31	0.34	0.33
Industry machinery (SIC 355)	1,395	0.19	0.18	0.32
Heavy construction (SIC 162)	1,066	0.09	0.17	0.33
Rubber and plastic (SIC 30)	2,718	−0.07	0.18	0.24
Transportation equipment (SIC 371)	1,617	−0.21	0.21	0.23
Textille (SIC 22)	651	−0.22	0.17	0.22
Commercial printing (SIC 275)	1,217	−0.16	0.23	0.22
Metals and minerals (SIC 505)	3,346	−0.31	0.24	0.17
Concrete (SIC 327)	1,063	−0.34	0.11	0.18

Notes. This table reports industry external dependence values for selected industries. External funds dependence is the difference between capital expenditures minus cash flow from operations over capital expenditures. Trade credit is account receivables over total assets. Investment intensity is the ratio of capital expenditures to total assets. These industry measures are computed at the three-digit SIC code level using Compustat firms for the period 1980–2000.

in some countries. However, in unreported specifications we find that excluding this variable does not yield different results.

Consistent with the hypothesis that the difference in share of affiliated firms between high and low external dependence industries would be larger in countries with lower financial development, we expect $\hat{\beta}_2 < 0$. The interpretation of $\hat{\beta}_2$ can be easily explained in terms of difference in differences. Taking the first difference in probability of affiliation with respect to external dependence, holding country financial development fixed, yields $\Delta P_c = \hat{\beta}_2 FinDev_c \times \Delta ExtDep$. Next, taking the difference in ΔP_c between high and low country financial development yields $\Delta P = \hat{\beta}_2 \Delta FinDev \times \Delta ExtDep$. Therefore, $\hat{\beta}_2$ measures how much higher the likelihood of affiliation is at a high level of external dependence with respect to an industry at a low dependence level when the firm is located in a country with a high level of financial development rather than in a country with a low level of development. In the tables that present the estimation results, we refer to ΔP as the *differential in affiliation probability*. This is our main metric of quantification, and in our regressions it measures how much higher the likelihood of affiliation is at the 90th percentile level of external dependence with respect to an industry at the 10th percentile level, *and* if the firm were located in a country with the highest relative to the lowest level of financial development.

4. Estimation Results

4.1. Baseline Estimation

Table 4 reports the baseline estimation results for the interaction between our accounting measure of financial development and industry external dependence, and Table 5 presents the estimation results using the survey measures. For each specification we calculate and report the *differential in affiliation probability* (ΔP). The pattern of results is consistent with our hypothesis: the coefficient estimate on the interaction terms between industry external dependence and country financial development ($\hat{\beta}_2$) is negative and highly significant for the various combinations of dependence and development. In unreported results we run the entire battery of tests using a probit specification, which consistently yields similar findings. We report the linear probability model here because it allows a more straightforward interpretation.[8]

We show in Table 4 that the estimated effect of financial development on group affiliation varies for different development measures, ranging from −11.9% for stock market capitalization to −2.6% for bank deposits. However, most measures have an effect between −5% and −8%, compared to a sample mean of affiliation of 50.5. Table 5 reports similar, though somewhat smaller, estimates for the survey-based measures of financial development. We suspect that the survey measure may be noisier than the direct measures, resulting in some attenuation bias.

An important concern is that industry specialization may be systematically related to country financial development. For example, countries may specialize in certain industries (e.g., more labor intensive) as a response to the level of financial development (e.g., if wages are low). If this were the case we would expect economic production in these countries to be heavily concentrated in specific industries. We check the sensitivity of our results to such potential industry specialization by excluding industries with country sales share above 2.5%—the 75th percentile of the industry sales share distribution. The results are not sensitive to dropping dominant industries. For instance, estimating specification (1) of Table 4 with this restriction yields as coefficient estimate of −0.023 (a standard error of 0.004) on the interaction term between stock market volume and external funds dependence, compared with −0.018 without the restriction.

Our results are also robust to excluding very large firms using various different size thresholds.

[8] See Zelner (2009) for a detailed treatment of the potential issues associated with using interactions in probit specifications, as well as a method for mitigating these issues.

Table 4 Financial Development and Group Affiliation

	Dependent variable: Dummy for *group affiliation*											
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Financial development:	*Stock market volume/GDP*			*Stock market capitalization/GDP*			*Private credit/GDP*			*Bank deposits/GDP*		
Industry measure:	External funds	Trade credit	Invest intensity	External funds	Trade credit	Invest intensity	External funds	Trade credit	Invest intensity	External funds	Trade credit	Invest intensity
Financial development × *Industry*	−0.018**	−0.108**	−0.090**	−0.057**	−0.047**	−0.147**	−0.042**	−0.254**	−0.249**	−0.034*	−0.325**	−0.288**
	(0.004)	(0.019)	(0.015)	(0.010)	(0.016)	(0.042)	(0.012)	(0.063)	(0.049)	(0.015)	(0.080)	(0.061)
ln(*Sales*)	0.101**	0.102**	0.101**	0.101**	0.101**	0.101**	0.101**	0.101**	0.101**	0.101**	0.101**	0.101**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Industry sales share	−0.714**	−0.779**	−0.737**	−0.729**	−0.750**	−0.769**	−0.709**	−0.762**	−0.701**	−0.734**	−0.770**	−0.728**
	(0.141)	(0.142)	(0.141)	(0.141)	(0.142)	(0.141)	(0.142)	(0.142)	(0.142)	(0.141)	(0.142)	(0.141)
Country dummies (15)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Three-digit SIC dummies (163)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Differential in affiliation probability (%)	−5.9	−6.5	−7.8	−11.9	−5.9	−8.1	−4.0	−4.4	−6.2	−2.6	−4.5	−5.7
% affiliated	50.5	50.5	50.5	50.5	50.5	50.5	50.5	50.5	50.5	50.5	50.5	50.5
Pseudo-R^2	0.167	0.167	0.167	0.167	0.167	0.167	0.167	0.167	0.167	0.167	0.167	0.167
Observations	138,770	138,770	138,770	138,770	138,770	138,770	138,770	138,770	138,770	138,770	138,770	138,770

Notes. This table reports the results of linear probability model regressions that examine the effect of financial development on corporate group affiliation. The estimation is cross-sectional (at the firm level) and is based on the 2007 ownership structure. Sales data are for 2006 or the most recent year for which data are available. The estimation sample includes firms that have nonmissing ownership information and annual sale values greater than $10 million. *Industry sales share* is three-digit industry sales as a share of total country sales, computed over all firms in the estimation sample. Differential in affiliation probability measures how much higher the likelihood of affiliation is at the 90th percentile level of external dependence with respect to an industry at the 10th percentile level when it is located in a country with the highest level of financial development rather than in one with the lowest level of financial development. Standard errors (in parentheses) are robust to arbitrary heteroskedasticity and allow for serial correlation through clustering by ultimate owner (for stand-alone firms the ultimate owner is the firm itself).

*Significant at 5%; **significant at 1%.

Estimating specification (1) in Table 4 using the sample where we remove firms with more than $100 million in annual sales yields even stronger results compared with the baseline sample, where we do not restrict the sample of maximal sales. Under these conditions, the coefficient estimate on the interaction between stock market volume and external funds dependence is −0.023 (a standard error of 0.004). The next section further investigates how our results vary by firm size.

4.2. Firm Age and Size

We next explore whether the variation in country–industry interactions for different firm and group subsamples is consistent with the ICM theory. We focus on two fundamental firm characteristics: size and age. Stock market development is likely to play an important role in financing smaller and private firms for three main reasons. The first is direct financing, because smaller firms with insufficient collateral often have a hard time raising debt money via secured financing.[9] The second reason is that stock market development increases private equity, venture capital funds, and angels, because these investors' exits rely on initial public offerings (IPOs) and divestitures, which are both positively correlated with stock market activity (Black and Gilson 1998, Celikyurt and Sevilir 2010). The third reason is through competition effects. In countries with less developed equity or debt public markets, small and young firms have to compete for capital with more established firms. With limited capital supply, raising funds would be harder for small and young firms in less developed financial markets.

Small and young firms should have, on average, more to gain by accessing a group's ICM under conditions of lower external financial development. Small firms typically do not have substantial internal resources and thus are more likely to rely on outside capital to finance their operations and compete in the market place. Young firms face the "liability of newness" (Freeman et al. 1983) and are typically

[9] The London Stock Exchange Alternative Investment Market (AIM) is one example of how stock markets provide direct financing for small firms. It allows small firms (average market capitalization of $65 million relative to $1.1 billion in the NASDAQ) to raise equity financing in the stock market. More than 3,000 firms have raised financing through the AIM. Between 1995 and 2008 this amounted to GBP 64.4 billion, and averaged GBP 21.6 million per firm. The importance of AIM for small-firm financing was especially clear during the 2008–2009 global financial crisis, as 138 firms were still able to raise GBP 8.5 billion.

Table 5 Financial Development and Group Affiliation (Survey)

	Dependent variable: Dummy for *group affiliation*											
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Financial development:	*Financial system sophistication*			*Aceess to venture capital*			*Aceess to equity market*			*Access to loan market*		
Industry measure:	External funds	Trade credit	Invest intensity	External funds	Trade credit	Invest intensity	External funds	Trade credit	Invest intensity	External funds	Trade credit	Invest intensity
Financial development × *Industry*	−0.027**	−0.110**	−0.120**	−0.024**	−0.037**	−0.107**	−0.050**	−0.074**	−0.209**	−0.013*	−0.026**	−0.069**
	(0.007)	(0.038)	(0.031)	(0.007)	(0.012)	(0.031)	(0.015)	(0.024)	(0.064)	(0.006)	(0.010)	(0.025)
ln(*Sales*)	0.101**	0.101**	0.101**	0.100**	0.101**	0.101**	0.101**	0.101**	0.101**	0.101**	0.101**	0.101**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Industry sales share	−0.709**	−0.746**	−0.730**	−0.705**	−0.728**	−0.715**	−0.724**	−0.738**	−0.735**	−0.720**	−0.733**	−0.722**
	(0.145)	(0.145)	(0.145)	(0.145)	(0.145)	(0.145)	(0.145)	(0.145)	(0.145)	(0.145)	(0.145)	(0.145)
Country dummies (15)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Three-digit SIC dummies (163)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Differential in affiliation probability (%)	−5.5	−4.1	−6.4	−4.6	−4.3	−5.4	−6.2	−5.5	−6.8	−2.8	−3.4	−3.9
% affiliated	50.6	50.6	50.6	50.6	50.6	50.6	50.6	50.6	50.6	50.6	50.6	50.6
Pseudo-R^2	0.166	0.166	0.166	0.166	0.166	0.166	0.166	0.166	0.166	0.166	0.166	0.166
Observations	135,877	135,877	135,877	135,877	135,877	135,877	135,877	135,877	135,877	135,877	135,877	135,877

Notes. This table reports the results of linear probability model regressions that examine the effect of financial development on corporate group affiliation. The estimation is cross-sectional (at the firm level) and is based on the 2007 ownership structure. Sales data are for 2006 or the most recent year for which data are available. The estimation sample includes firms that have nonmissing ownership information and annual sale values greater than $10 million. *Industry sales share* is three-digit industry sales as a share of total country sales, computed over all firms in the estimation sample. Differential in affiliation probability measures how much higher the likelihood of affiliation is at the 90th percentile level of external dependence with respect to an industry at the 10th percentile level when it is located in a country with the highest level of financial development rather than in one with the lowest level of financial development. Standard errors (in parentheses) are robust to arbitrary heteroskedasticity and allow for serial correlation through clustering by ultimate owner (for stand-alone firms the ultimate owner is the firm itself).

*Significant at 5%; **significant at 1%.

more dependent on external financing than older firms (Levinthal 1991, Rajan and Zingales 1998). Firm age is commonly associated with higher levels of asymmetric information between the firm and outsiders, such as lenders (Ritter 1984, Oliner and Rudebusch 1992). Thus, the ICM theory predicts that the country–industry interactions would be particularly strong when comparing small stand-alone firms to small affiliated firms. The same reasoning applies to the respective comparison by firm age.

Our results are consistent with these conjectures. Table 6 presents the estimation results for breaking the sample by quartiles of firm sales and age. We aggregate quartiles 2 and 3 as "medium" firms. In columns (1) and (2) we see a large and significant coefficient on the interaction between industry dependence and country development for small and medium firms (average sales of $12.6 million versus $31.4 million). The differential effect for small firms is −6.9; for medium-size firms it is −8.9%. In sharp contrast, the interaction effect is effectively zero for large firms (fourth quartile of sales; average annual sales of $616 million).

The large firm sample includes very large firms, which are almost always affiliated with a group. In unreported specifications we drop all firms with over $100 million in annual sales to examine whether the lack of results for large firms is driven by outliers. This exclusion reduces average sales for large firms from $616 million to $80.3 million. However, the industry–country interaction remains insignificant (a coefficient estimate of −0.010 and a standard error of 0.011). Thus, we conclude that the lack of significant results for large firms is not driven by the presence of very large firms in this subsample.

In columns (4)–(6) we report very similar findings for firm age. For young and middle-aged firms the coefficient estimate on industry–country interaction is large and is highly significant; however, it is completely muted for mature firms.

4.3. Group Size and Industry Diversification

We next examine how our results vary by different group characteristics. We focus on group size and industry diversification as measures of the potential internal resources available to affiliates. But whereas larger size can intuitively be associated with more resources, diversification is less straightforward. We argue that diversification is likely to be positively associated with a more active ICMs because a group with affiliates in diverse industries is more likely to have a mix of low-capital-intensive

Table 6 Variation by Firm and Group Characteristics

	Dependent variable: Dummy for *group affiliation*											
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Firm level						Group level					
	Sales			Age			Total assets			Industry diversification		
Sample:	Small	Medium	Large	Young	Middle aged	Mature	Small	Medium	Large	Low	Medium	High
Stock market volume/GDP × *External funds dependence*	−0.021**	−0.027**	−0.006	−0.013*	−0.025**	−0.000	−0.003	−0.016**	−0.016**	−0.008	−0.017**	−0.016**
	(0.008)	(0.005)	(0.006)	(0.006)	(0.006)	(0.008)	(0.003)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
ln(*Sales*)	0.091**	0.129**	0.064**	0.085**	0.107**	0.104**	0.001	0.087**	0.123**	0.071**	0.098**	0.099**
	(0.019)	(0.005)	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)
Industry sales share	−0.616*	−0.991**	−0.156	−0.514*	−0.787**	−0.769**	0.049	−0.874**	−0.647**	0.025	−0.648**	−1.078**
	(0.272)	(0.203)	(0.196)	(0.226)	(0.191)	(0.276)	(0.112)	(0.157)	(0.178)	(0.150)	(0.171)	(0.180)
Country dummies (15)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Three-digit SIC dummies (163)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Differential in affiliation probability (%)	−6.9	−8.9	—	−4.3	−8.2	—	—	−5.3	−5.3	—	−5.6	−5.3
% affiliated	36.8	47.6	69.9	51.8	50.9	53.3	7.1	36.3	27.0	18.6	32.8	23.0
Pseudo-R^2	0.141	0.130	0.105	0.142	0.163	0.227	0.051	0.141	0.284	0.098	0.151	0.227
Observations	34,698	69,380	34,692	37,267	64,030	32,381	73,981	107,919	94,066	84,438	102,235	73,981

Notes. This table reports the results of linear probability model regressions examining how the effect of financial development on corporate group affiliation varies by firm and group characteristics. The estimation is cross-sectional (at the firm level) and is based on the 2007 ownership structure. Sales data are for 2006 or the most recent year for which data are available. The baseline estimation sample includes firms that have nonmissing ownership information and annual sale values greater than $10 million. *Differential in affiliation probability* measures how much higher the likelihood of affiliation is at the 90th percentile level of external dependence with respect to an industry at the 10th percentile level when it is located in a country with the highest level of financial development rather than in one with the lowest level of financial development. Standard errors (in parentheses) are robust to arbitrary heteroskedasticity and allow for serial correlation through clustering by ultimate owner.

*Significant at 10%; **significant at 5%.

affiliates from which to appropriate (supply) and high-capital-intensive affiliates with better investment opportunities (demand). Of course, from a purely risk-sharing perspective, groups with homogenous affiliates would still provide ICM benefits as long as any external shocks affect some but not all affiliates (Khanna and Yafeh 2005). Nonetheless, redistributive benefits should accrue especially to diversified groups.

Group size and diversification are often related, with larger groups more likely to be more diversified. Thus, as with the size/age effects we discussed in the prior section, we do not fully disentangle the role of large groups versus the role of diversified groups versus the role of large diversified groups. Nonetheless, we expect both of these attributes to be beneficial for affiliates in high-dependency industries, so these effects should move in the same direction. Columns (7)–(9) in Table 6 break the sample to compare stand-alone firms to affiliates of small, medium, and large groups (based on total group assets quartiles, again with quartiles 2 and 3 considered "medium"). The pattern of results is consistent with the ICM theory. The industry–country interaction is zero when comparing stand-alone firms to affiliates of small groups, but it is large when comparing to affiliates of medium and large groups (a coefficient estimate of −0.016 and a standard error of 0.005, for both group categories, with a differential effect of −5.3%).

We find the same pattern of results in columns (10)–(12), where we split the sample by group industry diversification. For specialized groups (where all group sales are within a single three-digit SIC code), the coefficient estimate on the industry–country interaction is insignificant, but for medium and highly diversified groups the interaction is large and significant (differential effects of −5.6% and −5.3%, respectively).

There is evidence that banks play an important role in ICM dynamics. Two hundred and seventy-two of our groups (which collectively have 3,105 affiliates) include a bank. We examine the distribution of these banks by group size and industry diversification. Fifty-eight percent of the banks belong to groups in the highest size (assets) quartile, whereas only 5% of the banks belong groups in the lowest quartile. A less extreme pattern holds when examining bank distribution by group diversification, with 42% of banks belonging to groups in the top quartile of diversification. These patterns would be consistent with the view that the observed patterns of affiliation to large groups may also be related to the presence of banks in these groups. Evidence that our findings

are at least partially driven by the presence of financial institutions in the group would strengthen our argument of ICMs. It would also provide more clarity on the mechanism through which the group ICM is accessed by affiliated firms. However, such fine-grained analysis is beyond the scope of our paper. Future work should focus not just on banks, but also on other highly liquid entities, such as life insurance and utility companies, which may be prevalent in large corporate groups, and may provide steady sources of capital to affiliates.

4.4. Robustness Checks

Table 7 presents estimation results for several robustness tests. First, we include the linear effect of external dependence by not controlling for industry fixed effects. As expected, the interaction effect between external dependence and development remains negative and significant, and the level effect is positive and significant. Then we explore whether the effect of countries' financial development on affiliation varies nonlinearly across industries' external dependence. We do this by splitting industries into quartiles of external dependence and interacting each quartile dummy separately with our external dependence measure (Table 7, column (2)). We find negative and significant interaction coefficients for quartiles 2–4 (relative to the baseline quartile 1). However, the coefficient for the highest quartile of external dependence is almost twice that for the second and third quartiles.

Table 7 Robustness Tests

	Dependent variable: Dummy for *group affiliation*								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
				Compustat firms			Estimation sample		
Sample:	All	All	Excluding acquired affiliates	Specialized	Below-median years from IPO	Above-median years from IPO	No restrictions	Sales > $1 million	Inc. missing ownership
Stock market volume/GDP × *External funds dependence*	−0.010** (0.004)		−0.019** (0.004)	−0.013** (0.004)	−0.017** (0.004)	−0.018** (0.004)	−0.024** (0.002)	−0.018** (0.003)	−0.019** (0.003)
External funds dependence Interacted:									
2nd quartile		−0.011** (0.004)							
3rd quartile		−0.010** (0.004)							
4th quartile		−0.018** (0.004)							
Industry sales share	−1.732** (0.108)	−0.731** (0.142)	−0.720** (0.144)	−0.725** (0.141)	−0.705** (0.141)	−0.710** (0.141)	−0.387** (0.077)	−0.646** (0.099)	−0.247** (0.072)
External funds dependence	0.033** (0.009)								
ln(*Sales*)	0.104** (0.001)	0.101** (0.001)	0.103** (0.001)	0.101** (0.001)	0.101** (0.001)	0.101** (0.001)	0.075** (0.001)	0.104** (0.001)	0.087** (0.001)
Country dummies (15)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Three-digit SIC dummies (163)	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Differential in affiliation probability (%)	−3.3	−5.9	−6.3	−4.3	−5.6	−5.9	−9.0	−5.9	−5.9
% affiliated	50.5	50.6	49.9	50.5	50.5	50.5	19.4	27.0	40.5
Pseudo-R^2	0.147	0.167	0.167	0.166	0.167	0.167	0.257	0.232	0.288
Observations	138,770	138,770	135,032	138,561	138,211	138,561	814,132	488,012	172,916

Notes. This table reports the results of linear probability model regressions examining the robustness of the effect of financial development on group affiliation. The estimation is cross-sectional (at the firm level) and is based on the 2007 ownership structure. Sales data are for 2006 or the most recent year available. Columns (1)–(6) include only firms with annual sales over $10 million. Column (7) includes all firms with nonmissing sales and ownership information. Column (8) includes only firms with sales over $1 million. Column (9) adds firms with no ownership information (classified as stand-alones) to the baseline sample (at least $10 million in sales). Differentials in affiliation probability measure the change in likelihood of affiliation at the 90th percentile level of external dependence with respect to an industry at the 10th percentile level when it is located in a country with the highest level of financial development rather than in one with the lowest level of financial development. Standard errors (in parentheses) are robust to arbitrary heteroskedasticity and allow for serial correlation through clustering by ultimate owner.

**Significant at 1%.

When we exclude acquired firms that have been with the group less than five years (column (3)), we find the coefficient for the financial development and industry dependence interaction to be moderately larger than the baseline. This would be consistent with a view where long-term ties are more conducive to ICMs.

In columns (4)–(7) we investigate the robustness of our results to different samples of Compustat firms, focusing on industry diversification and age. We use Compustat line-of-business data to characterize the extent to which firms operate in more than one three-digit industry code. The results remain robust to including only specialized firms, which we can more accurately assign to specific industries (column (4)). To check for firm life-cycle effects, we calculate external dependence based on firms with below- and above-median years since IPO (columns (5) and (6)). The results remain similar for both firm samples.

In our main specifications, we restrict our sample to firms that have at least \$10 million in sales. This is to ensure that we concentrate on firms that are unlikely to shirk on their reporting responsibilities. However, we also check our results by including all firms regardless of sales volume (this increases the sample to over 815 thousand firms). As shown in column (7), the same pattern of results continues to hold. Actually, the coefficient estimate on the industry–country interaction and respective differential effect are larger in the unrestricted sample, compared with the baseline estimation sample (where firms are required to have at least \$10 million in annual sales). In column (8) we restrict the sample to firms that generate at least \$1 million in annual sales (an intermediate size threshold). The results continue to hold.

Lastly, column (9) addresses a different selection concern: the availability of ownership information. Our baseline sample excludes firms with no ownership information. These firms are likely to be stand-alones, as ownership coverage tends to be much better for firms that are affiliated with groups, even when the firms themselves are small. If the availability of ownership information systematically varies by industry external dependence and country financial development, our results may be biased. To check whether our results are sensitive to missing ownership information, we add to our baseline sample those firms with no ownership information, which we classify as stand-alones (so that measurement error should bias our results downward). As shown in column (9), there is no substantial change in the estimated coefficient on the industry–country interaction. This strongly suggests that ownership information does not systematically vary along the external dependence and financial development dimensions. We repeat the same procedure for an unrestricted sample (not reported in the table). We include all firms in the Amadeus database with nonmissing ownership information, totalling 1.9 million firms (of which 8.4% are group affiliated). We estimate the same specification as in column (9) using this very large sample and find essentially the same coefficient estimate (-0.018 and a standard error of 0.002).

In unreported estimations, we address the concern that our findings are driven by specific countries. Using our baseline specification, we systematically remove, one by one, each country in our sample, and find that overall no single country drives our results. The coefficients on the interaction between stock market volume/GDP and external funds dependence are very consistent, ranging from -0.017 to -0.026. All estimations yield significant and comparable differential effects.

4.5. Panel Estimation

We estimate a panel specification of the effect of financial development on affiliation probability in order to control for country-industry effects. Here we exploit time variation in country financial development. Our approach investigates whether new firms are more likely to be established as stand-alones or affiliates when financial markets become more developed, especially in industries with high external dependence. Our unbalanced panel covers the period from 1980 to 2007. We start with 2007 ownership structure and use mergers and acquisitions (M&A) data to determine whether firms were originally incorporated as stand-alones or as affiliates. Because firms can change their ownership structures either by joining a group or by separating from one, the M&A history helps us recover the structure of the firm at incorporation.

We make the following assumptions: For firms that appear as stand-alones in 2007, we assume that they were incorporated as stand-alones unless our M&A data indicate that the firm has divested of affiliates in the past, in which case it is reclassified as group incorporated. For firms that are classified as affiliates in 2007, we assume that they were incorporated as affiliates of the same group unless we find evidence of their having joined a group after incorporation. We use BVD's Zephyr database and SDC Platinum to identify approximately five thousand firms that joined groups in our sample in 1980–2007.

Our econometric specification is

$$\Pr(\mathit{Affiliate}_i = 1) = \beta_1 \mathit{FinDev}_{ct} \times \mathit{ExtDep}_j + \varphi_{jc} + \tau_t + \epsilon_{it}, \quad (2)$$

where φ_{jc} and τ_t are complete sets of *industry* × *country* and year of incorporation dummies, respectively;

$FinDev_{ct}$ is country c level of financial development at year of incorporation t. Stock market volume is available for 1988–2006, and private credit is available for 1980–2006. Because sales information is available only for the period 1997–2006, we do not control for firm sales. However, the results are robust to controlling for average firm sales, firm-maximum sales (the highest level of the sales the firm obtained in the period 1997–2006), and firm-year sales (conditioning the sample period to 1997–2006).

Table 8 presents the estimation results. The general pattern of results continues to hold. For financial development (stock market volume), controlling only for linear industry and country effects, the coefficient on the interaction with external dependence is −0.052 and is highly significant (with a standard error of 0.005). Controlling for *industry* × *country* effects only slightly lowers the coefficient estimate (−0.047), which remains highly significant. We find even stronger results for *bank credit/GDP*, with a coefficient estimate on the interaction with external dependence is −0.081. Controlling for *industry* × *country* effects, this coefficient estimate increases to −0.091, and is highly significant. These results imply that as financial markets improve over time, new firms are more likely to be established as standalones, rather than as corporate group affiliates.

We perform a number of robustness tests on our panel estimation, in line with those reported in the previous section. We find that reducing the sales threshold from \$10 million to \$1 million has a negligible effect (columns (3) and (10)). Consistent with our results in §4.3, we also find that most of our findings are driven by affiliates of large groups (columns (4), (5), (11), and (12)). However, using the panel estimation, the difference between affiliates of specialized and diversified groups is less stark (columns (6), (7), (13), and (14)). Nonetheless, the coefficient on diversified groups is still 15% to 20% larger than for specialized groups.

5. Discussion and Conclusion

This paper uses a comprehensive firm-level data set to study the determinants of group affiliation in 15 Western European countries. Our results indicate that the interaction between country financial development and industry demand for external capital may affect the formation of corporate groups. We find that even in Western European economies, countries with relatively less developed financial markets have a disproportionately higher percentage of group affiliates in industries with high levels of external dependence. This implies that firms are more likely to be part of corporate groups when access to their internal capital markets should be most beneficial.

Our results underscore the role that internal capital markets may play in the organization decision of firms across nations and industries in Western Europe. We thus complement and extend previous research on corporate groups (e.g., Faccio and Lang 2002, Deloof 1998, Morck et al. 2005), as well as document robust empirical patterns that are consistent with the view that ICMs play an important role in driving group affiliation. An interesting implication of this is the possibility that capital may be a valuable resource even within developed nations, to the extent that ICMs can be more efficient than the prevailing external markets for capital. These findings may stimulate further work in broader and more general settings where resource allocation is an important function. Although in this paper we focus on capital, this is only one of the many resources that may shape organizational boundaries, since human capital, knowledge, and reputation (to name a few) are likely to also factor in affiliation decisions. Thus, future research could adopt our empirical approach to look at other dimensions of resource allocation, both across markets and within firms.

There is compelling anecdotal evidence in support of our findings. For example, J.P. Morgan estimated that the portion of total synergies in M&A transactions attributed to financial resources (such as decreased cost of capital, tax shields, and financial flexibility) increased from 21% in 2007 to 40% during the 2008–2009 financial crisis, a period of sharply reduced financial development for European countries (Zenner et al. 2009). Consistent with our results, the increase in financial synergies was more pronounced for smaller and less diversified firms with lower credit ratings.

This paper also relates to the broader literature on groups, which includes "business groups" (Granovetter 1995, Khanna and Rivkin 2006) as well as "pyramidal groups" (Morck et al. 2005, Cestone and Fumagalli 2005, Almeida and Wolfenzon 2006, Faccio and Lang 2002). One of the key issues in this line of research continues to be the ambiguity in determining "what defines group boundaries?" (Khanna and Rivkin 2006, p. 1). Because our large-scale study provides a high degree of resolution on a major piece of this eclectic mosaic, it serves as a useful reference point for others to locate their empirical domain, whether their groups conceptually border, overlap, or radically differ from ours.

Our findings have several strategic implications. We find that in some settings firms organize into groups despite the many potential costs of group membership, such as governance problems, tax avoidance, market power, and concentrated political influence (Almeida and Wolfenzon 2006, Cestone and Fumagalli 2005, Morck et al. 2005). Although there

Table 8 Panel Estimation: The Formation of Newly Established Firms

	Dependent variable: Dummy for *group affiliation*													
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Financial development:	*Stock market volume/GDP*							*Private credit/GDP*						
Firms:	All	All	Sales >$1 million	Small-group affiliates	Large-group affiliates	Specialized-group affiliates	Diversified-group affiliates	All	All	Sales >$1 million	Small-group affiliates	Large-group affiliates	Specialized-group affiliates	Diversified-group affiliates
Financial development × External funds dependence	−0.052** (0.005)	−0.047** (0.006)	−0.040** (0.008)	0.001 (0.002)	−0.028** (0.005)	−0.019** (0.004)	−0.022** (0.004)	−0.081** (0.008)	−0.091** (0.011)	−0.097** (0.015)	−0.002 (0.005)	−0.067** (0.011)	−0.040** (0.009)	−0.050** (0.009)
Industry sales share	0.191** (0.076)	—	—	—	—	—	—	0.215** (0.072)				—	—	—
Fixed-effects														
Country	Yes	—	—	—	—	—	—	—	—	—	—	—	—	—
Three-digit SIC	Yes	—	—	—	—	—	—	—	—	—	—	—	—	—
Year of incorporation	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country × Industry	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo-R^2	0.116	0.137	0.150	0.128	0.137	0.065	0.120	0.123	0.144	0.152	0.136	0.140	0.066	0.125
Observations	624,115	624,115	343,122	536,436	555,937	554,491	558,060	682,260	682,260	393,105	581,100	605,312	601,951	607,518

Notes. This table reports the results of linear probability model regressions examining the effect of financial development on group affiliation for a panel of firms. We focus on the fraction of newly established firms that are formed as group affiliates. The dependent variable is a group affiliation dummy that equals one for firms that are affiliates to groups and equals zero for stand-alone firms. The panel is constructed in the following way: We include firms that were incorporated in 1980–2007. We use the 2007 ownership structure to determine whether these firms were incorporated as stand-alones or as part of a group. We use M&A data from Zephyr and SDC Platinum to eliminate firms that changed their ownership structure in 1980–2007. Values for *stock market value traded* and *private credit* are for 1980–2007. *Industry sales share* is three-digit industry sales as a share of total country sales per year, computed over all firms in the estimation sample. Standard errors (in parentheses) are robust to arbitrary heteroskedasticity and allow for serial correlation through clustering by ultimate owner.

**Significant at 1%.

are other documented benefits to group membership, our results are strongly consistent with the view that internal capital markets are at least partially offsetting the costs of group association.

This study has also implications for M&A strategy. First, it may be relevant to firms engaged in the valuation of group-affiliated targets. If separating a target firm from its group deprives it of valuable resources, this may in turn reduce its future performance. Second, reliance on ICMs may lead group affiliates to maintain less liquidity and reduce market transparency, thus hampering investment and perpetuating market inefficiencies (Teece et al. 2000). Finally, M&A is an important mechanism that leads to group affiliation, and this process requires approval by shareholders, who must weigh the pros and cons of remaining independent versus tapping into the resources available to group members. Several notorious cases, such as the protracted negotiations between VW and Porsche or KLM and Alitalia, highlight the importance of appeasing both major and minor shareholders who stand in the way of bringing a firm into a group. Often, stakeholders cannot adequately weigh the trade-offs involved in such a transaction, and this calls for a much more nuanced understanding of the complex trade-offs involved in group membership. Integral to these efforts will be the need to better document and quantify the transfer of subtle but valuable assets such as loan guarantees and even reputation.

To the extent that these trade-offs vary across nations within the EU, our results highlight the challenge in finding the right balance between shareholder protections, antitrust policy, and incentives to growth. Similarly, there are potential tensions between individual countries' specific constraints and collective EU goals. Hence, it is possible that, even in a very narrowly defined Western European context, no simple answer will arise to the question of whether groups are "paragons" or "parasites" (Khanna and Yafeh 2007).

Acknowledgments

All authors contributed equally to this project. The authors express special gratitute to Patrick Bolton, Francisco Perez-Gonzalez, Mark Schankerman, and John Van Reenen for numerous helpful discussions. They are also grateful for valuable comments from Ashish Arora, Nick Bloom, Will Mitchell, Daniel Paravisini, Tano Santos, Catherine Thomas, Daniel Wolfenzon, Yishay Yafeh, and three anonymous referees. The authors thank Liat Oren for invaluable assistance with the programming of the ownership algorithm. All remaining errors are the authors' own.

References

Almeida HV, Wolfenzon D (2006) A theory of pyramidal ownership and family business groups. *J. Finance* 61(6):2637–2680.

Beck T, Demirgüç-Kunt A, Levine R (2000) A new database on the structure and development of the financial sector. *World Bank Econom. Rev.* 14(3):597–605. (Data updated in 2007.)

Black B, Gilson R (1998) Venture capital and the structure of capital markets: Banks versus stock markets. *J. Financial Econom.* 47(3):243–277.

Bratton WW, McCahery JA, Vermeulen EPM (2009) How does corporate mobility affect lawmaking? A comparative analysis. *Amer. J. Comparative Law* 57(2):347–386.

Carlin W, Mayer C (2003) Finance, investment, and growth. *J. Financial Econom.* 69(1):191–226.

Carney M, Gedajlovic ER, Heugens PP, Van Essen M, Van Oosterhout JH (2011) Business group affiliation, performance, context, and strategy: A meta-analysis. *Acad. Management J.* 54(3):437–460.

Celikyurt U, Sevilir M (2010) Going public to acquire? The acquisition motive in IPOs. *J. Financial Econom.* 96(3):345–363.

Cestone G, Fumagalli C (2005) The strategic impact of resource flexibility in business groups. *RAND J. Econom.* 36(1):193–214.

Cetorelli N, Goldberg LS (2012) Follow the money: Quantifying domestic effects of foreign bank shocks in the great recession. National Bureau of Economic Research, Cambridge, MA.

Claessens S, Laeven L (2003) Financial development, property rights, and growth. *J. Finance* 58(6):2401–2436.

Cremers KJM, Huang R, Sautner Z (2011) Internal capital markets and corporate politics in a banking group. *Rev. Financial Stud.* 24(2):358–401.

Dahl D, Shrieves RE, Spivey MF (2002) Financing loan growth at banks. *J. Financial Services Res.* 22(3):189–202.

De Haas R, Van Lelyveld I (2010) Internal capital markets and lending by multinational bank subsidiaries. *J. Financial Intermediation* 19(1):1–25.

Deloof M (1998) Internal capital markets, bank borrowing, and financing constraints: Evidence from Belgian firms. *J. Bus. Finance and Accounting* 25(7–8):945–968.

Faccio M, Lang L (2002) The ultimate ownership of Western European corporations. *J. Financial Econom.* 65(3):365–395.

Faccio M, Lang L, Young L (2010) Pyramiding versus leverage in corporate groups: International evidence. *J. Internat. Bus. Stud.* 41(1):88–104.

Fisman R, Love I (2003) Trade credit, financial intermediary development, and industry growth. *J. Finance* 58(1):353–374.

Freeman J, Carroll GR, Hannan MT (1983) The liability of newness: Age dependence in organizational death rates. *Amer. Sociol. Rev.* 48(5):692–710.

Gertner RH, Scharfstein DS, Stein JC (1994) Internal versus external capital markets. *Quart. J. Econom.* 109(4):1211–1230.

Gompers PA (1995) Optimal investment, monitoring, and the staging of venture capital. *J. Finance* 50(5):1461–1489.

Gopalan R, Nanda V, Seru A (2007) Affiliated firms and financial support: Evidence from Indian business groups. *J. Financial Econom.* 86(3):759–795.

Goto A (1982) Business groups in a market economy. *Eur. Econom. Rev.* 19(1):53–70.

Granovetter M (1995) Coase revisited: Business groups in the modern economy. *Indust. Corporate Change* 4(1):93–130.

Kester WC (1992) Industrial groups as systems of contractual governance. *Oxford Rev. Econom. Policy* 8(3):24–44.

Khanna T, Palepu K (2000) Is group affiliation profitable in emerging markets? An analysis of diversified Indian business groups. *J. Finance* 55(2):867–891.

Khanna T, Rivkin JW (2001) Estimating the performance effects of business groups in emerging markets. *Strategic Management J.* 22(1):45–74.

Khanna T, Rivkin JW (2006) Interorganizational ties and business group boundaries: Evidence from an emerging economy. *Organ. Sci.* 17(3):333–352.

Khanna T, Yafeh Y (2005) Business groups and risk sharing around the world. *J. Bus.* 78(1):301–340.

Khanna T, Yafeh Y (2007) Business groups in emerging markets: Paragons or parasites? *J. Econom. Literature* 45(2):331–372.

La Porta R, López-de-Silanes F, Shleifer A (1999) Corporate ownership around the world. *J. Finance* 54(2):471–517.

Leff NH (1978) Industrial organization and entrepreneurship in the developing countries: The economic groups. *Econom. Development Cultural Change* 26(4):661–675.

Levinthal DA (1991) Organizational adaptation and environmental selection-interrelated processes of change. *Organ. Sci.* 2(1):140–145.

Morck R (2005) *How to Eliminate Pyramidal Business Groups: The Double Taxation of Inter-Corporate Dividends and Other Incisive Uses of Tax Policy* (MIT Press, Cambridge, MA).

Morck R, Wolfenzon D, Yeung B (2005) Corporate governance, economic entrenchment, and growth. *J. Econom. Literature* 43(3):655–720.

Myers SC, Majluf NS (1984) Corporate financing and investment decisions when firms have information that investors do not have. *J. Financial Econom.* 13(2):187–221.

Nilsen JH (2002) Trade credit and the bank lending channel. *J. Money, Credit Banking* 34(1):226–253.

Oliner SD, Rudebusch GD (1992) Sources of the financing hierarchy for business investment. *Rev. Econom. Statist.* 74(4):643–654.

Perotti EC, Gelfer S (2001) Red barons or robber barons? Governance and investment in Russian financial–industrial groups. *Eur. Econom. Rev.* 45(9):1601–1617.

Rajan R, Zingales L (1998) Financial dependence and growth. *Amer. Econom. Rev.* 88(3):559–586.

Ritter J (1984) The "hot issue" market of 1980. *J. Bus.* 57(2):215–240.

Scharfstein DS, Stein JC (2000) The dark side of internal capital markets: Divisional rent-seeking and inefficient investment. *J. Finance* 55(6):2537–2564.

Smångs M (2006) The nature of the business group: A social network perspective. *Organization* 13(6):889–909.

Teece DJ, Rumelt R, Dosi G, Winter S (2000) Understanding corporate coherence. Dosi G, ed. *Innovation, Organization and Economic Dynamics: Selected Essays* (Edward Elgar Publishing, Cheltenham, UK), 264–293.

Weinstein DE, Yafeh Y (1998) On the costs of a bank-centered financial system: Evidence from the changing main bank relations in Japan. *J. Finance* 53(2):635–672.

Windbichler C (2000) "Corporate group law for Europe:" Comments on the forum Europaeum's principles and proposals for a European corporate group law. *Eur. Bus. Organ. Law Rev.* 1(02):265–285.

Wulf J (2009) Influence and inefficiency in the internal capital market. *J. Econom. Behav. Organ.* 72(1):305–321.

Zelner BA (2009) Using simulation to interpret results from logit, probit, and other nonlinear models. *Strategic Management J.* 30(12):1335–1348.

Zenner M, Berinstein B, Berkovitz T, Bansal A (2009) A shifting landscape for synergies: How financial considerations are affecting value creation in mergers and acquisitions. Corporate Finance Advisory Publications, J.P. Morgan, New York. Accessed November 28, 2012, http://www.jpmorgan.com/cm/BlobServer?blobkey=id&blobwhere=1158616133064&blobheader=application%2Fpdf&blobcol=urldata&blobtable=MungoBlobs.

CORRECTION

In this article, "Capital Markets and Firm Organization: How Financial Development Shapes European Corporate Groups" by Sharon Belenzon, Tomer Berkovitz, and Luis A. Rios (first published in *Articles in Advance*, December 19, 2012, *Management Science*, DOI: 10.1287/mnsc.1120.1655), the fourth and tenth rows of the first column of Table 7 have been corrected to read "*External funds dependence*" and the term "External equity dependence" and its definition have been removed from Table 3 notes.