

What Determines the Number of Bank Relationships? Cross-Country Evidence¹

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We investigate the determinants of multiple-bank relationships using a new data set comprising 1079 firms across 20 European countries. We document large cross-country variation in the average number of bank relationships per firm, uncovering a richness in European financial systems that extends beyond the standard description of being “bank-dominated.” After controlling for a variety of firm-specific characteristics, we find that firms maintain more bank relationships, on average, in countries with inefficient judicial systems and poor enforcement of creditor rights. Firms also maintain more relationships in countries with unconcentrated but stable banking systems and active public bond markets. *Journal of Economic Literature* Classification Numbers: G21, C41 © 2000 Academic Press

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1. INTRODUCTION

In the seminal paper by Diamond (1984), a bank arises as the optimal mechanism for channeling funds from investors to firms when costly information asymmetries exist between the investors and project insiders. The investors delegate the responsibility to the bank for monitoring firm cash flows, thereby avoiding both duplication of monitoring and free-riding. The efficient monitoring by the bank, in turn, leads to lower cost financing for the firm. Many other information-based theories of financial intermediation build on the similar idea that by coordinating investors, a bank reduces both costly informational frictions and problems associated with renegotiation.² According to these theories, a firm in need of “one-shot” bank financing will optimally choose to borrow from one bank.

With repeated lending, a single bank relationship may not be optimal. Sharpe (1990) and Rajan (1992) argue that superior information enables a single bank to extract monopoly rents through future loans to the firm. They show that competition from an additional informed bank eliminates such “hold-up” costs. The implication from the Sharpe (1990) and Rajan (1992) papers is that firms should maintain, at most, only a few bank relationships. Thakor (1996) obtains a similar result. In his paper, firms seek financing from multiple banks to reduce the chance of being denied credit. However, the probability of being denied credit by a bank increases with the number of banks included in the firm’s search. Therefore, firms limit their search to relatively few banks. Petersen and Rajan (1994), Ongena and Smith (1999), and Harhoff and Körting (1998b) report statistics consistent with the “one-to-few” bank theories. Each reports the median number of bank relationships per sample firm to be one, and finds that multiple bank relationships, when they occur, involve relatively few banks.

By way of contrast, our paper demonstrates that these popular theories do not satisfactorily describe many observed bank relationships. Using a new data set of 1079 large firms from 20 European countries, we document that single-bank relationships are relatively uncommon and that many firms maintain relationships with *many* banks. For example, less than 15% of the firms in our sample maintain single-bank relationships, but 20% use eight or more banks. Moreover, the distribution of the number of bank relationships per firm varies considerably across countries. For instance, *no* sample firm in Sweden or Norway maintains more than six bank relationships, while the *majority* of firms in Italy, Portugal, and Spain maintain at least six bank relationships.

Why do we see such variation across countries in the number of bank relationships per firm? Is it simply due to the types of firms within a country? Or do the legal and institutional characteristics of a country influence the choice of number of bank relationships? Using firm-, industry-, and country-level data, we

² For instance, coordination is valuable when screening loan candidates (Boyd and Prescott (1986); Diamond (1991)), when monitoring *ex ante* project choice (Ramakrishnan and Thakor (1984); Boot and Thakor (1997)) and under *ex post* renegotiation (Boot and Thakor (1994); von Thadden (1995)).

seek to answer these questions. We begin by investigating whether the composition of firms *within* a country explains the variation *across* countries. We find that though some firm-level characteristics, such as size, significantly impact the choice of number of bank relationships, they cannot alone explain the distribution of multiple-bank relationships across countries. We therefore turn to investigating the “residual” cross-country variation not explained by firm characteristics. We argue that firms in some countries may have incentive to diversify across bank relationships, may benefit from lack of coordination across creditors, or may simply use banks as multiple transaction centers. We examine these conjectures by choosing variables related to the legal environment, banking system, and development of capital markets within a country.

Our country-level variables turn out to explain a large proportion of the variation left unexplained by the firm and industry variables. We show that firms maintain more bank relationships in countries with decentralized and healthy banking systems, in countries with inefficient judicial systems, and in countries where the enforcement of creditors’ rights is weak. Moreover, the average number of bank relationships is positively related to the relative importance of a country’s public debt markets but negatively related to the importance of its equity markets.

Our study is related to previous papers that incorporate number of bank relationships into investigations of the value of bank relationships. Petersen and Rajan (1994), Houston and James (1996), Cole (1998), Harhoff and Körting (1998b), and Ongena and Smith (1999) all use the number of bank relationships as a proxy for the intensity of bank competition. However, none of these studies examine the determinants of number of relationships. Moreover, all of these studies are conducted for countries where firms maintain relatively few bank relationships. Thus, they miss much of the variation present in our cross-country data set. A paper closer in spirit to ours is Detragiache *et al.* (1999). Motivated by the observation that Italian firms tend to maintain many bank relationships while US firms maintain relatively few, they develop a theory of choice of number of bank relationships that depends on the institutional framework of the economy in which firms operate. However, their empirical analysis is limited to data from one country. As part of our analysis, we test the cross-country predictions of the Detragiache *et al.* (1999) model.

Our cross-country analysis also places our paper in the growing literature on financial system architecture. In particular, like La Porta *et al.* (1997, 1998), Demirgüç-Kunt and Maksimovic (1998), and Levine (1999), we focus on the legal and institutional frameworks of a country as an explanation for the variation we observe in financial systems across countries. As a method for exploring the cross-country correlation in average number of bank relationships, we group countries according to the legal origin taxonomy of La Porta *et al.* (1997). We find that legal origin alone explains some, but not all, of the variation in average number of bank relationships.

The rest of the paper is organized as follows. The next section introduces the cross-country survey data. Section III motivates the choice of the explanatory

variables used in the firm-level and cross-country regressions. Section IV presents the results. Section V concludes.

2. CROSS-COUNTRY DATA

2.1. *The Survey Data*

Our primary source of firm-level information is *GlobalCash-Europe96*, a survey of treasury and cash managers conducted in 1996 across 20 European countries under the auspices of The Bank Relationship Consultancy and the School of Management at the University of Bath.³ The aim of the survey is to study the cash management and electronic banking practices of large European corporations. Its main vehicle is a 12-page questionnaire containing 60 questions and made available in 10 different languages. The 1996 questionnaire was mailed to cash managers in 5800 companies and completed by 1129 respondents, yielding a 19.5% response rate. For verification purposes, all questionnaires were followed up with phone interviews. More detailed, in-depth interviews were conducted with 60 of the respondents. Questions from the survey cover a variety of topics including organization of the cash management unit within the company, details of payments and collections systems, liquidity management, bank cash management services, electronic banking systems, and perceptions of quality.

2.2. *Number of Bank Relationships by Country and Size*

The survey asked participants to list the number of banks they use for cash management purposes within their own country.⁴ Of the original 1129 respondents, 1079 answered this question. We take their response as our measure of number of bank relationships. We will justify its use in the next section. First, we summarize in Table I the distribution of the 1079 responses. According to the survey, the bulk of the firms maintain more than one bank relationship; only 14.5% of the firms report having a single bank relationship. Among those firms that maintain multiple bank relationships, many use a large number of banks. 47% of the firms maintain between three and seven bank relationships, and another 19.7% use more than seven banks. Across all countries, the mean number of relationships is 5.6 and the median is 3.

Somewhat more interesting is the variation in the distribution of number of relationships across countries. In Table I, we rank by average number of bank relationships per firm, the 20 countries and two “coordination” centers, included in our data set. Italy represents one end of the spectrum. The median firm in Italy

³ The 20 countries are Austria, Belgium (including Belgian Coordination Centers), The Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland (including Irish Financial Service Centers), Italy, Luxembourg, The Netherlands, Norway, Poland, Portugal, Spain, Sweden, Switzerland, and the United Kingdom.

⁴ The specific question is, “How many banks does your company use for domestic cash management, in your home country?”

TABLE I
Overview of Number of Bank Relationships, by Country

Country	N	Number of relationships			%Firms with n bank relationships			
		Average	Median	Maximum	$n = 1$	$n = 2$	$n = 3$ to 7	$n > 7$
Italy	64	15.2	12	70	3.1	3.1	23.4	70.3
Portugal	39	11.5	10	40	5.1	2.6	30.8	61.5
France	24	11.3	9	50	4.2	4.2	33.3	58.3
Belgium	8	11.1	7	30	0.0	25.0	25.0	50.0
Spain	68	9.7	7	60	1.5	7.4	44.1	47.1
Germany	63	8.1	5	29	15.9	7.9	39.7	36.5
Greece	37	7.4	6	19	0.0	8.1	51.4	40.5
Austria	36	5.2	3	22	19.4	13.9	44.4	22.2
Luxembourg	7	5.0	4	18	28.6	0.0	57.1	14.3
Czech Republic	58	4.7	4	14	3.4	10.3	70.7	15.5
BCCs	92	4.6	3	29	22.8	16.3	43.5	17.4
Hungary	43	4.0	3	10	14.0	7.0	74.4	4.7
Switzerland	36	3.6	2	40	41.7	19.4	30.6	8.3
Finland	86	3.6	3	26	1.2	29.1	67.4	2.3
Denmark	49	3.5	3	20	10.2	26.5	61.2	2.0
Netherlands	48	3.5	3	20	14.6	25.0	58.3	2.1
IFSCs	18	3.3	2	10	22.2	33.3	33.3	11.1
Poland	13	3.3	3	5	7.7	15.4	76.9	0.0
Ireland	63	3.2	2	20	23.8	34.9	31.7	9.5
United Kingdom	138	2.9	2	10	23.2	27.5	45.7	3.6
Sweden	48	2.5	2	5	22.9	33.3	43.8	0.0
Norway	41	2.3	2	6	26.8	34.1	39.0	0.0
Sample	1079	5.6	3	70	14.5	18.8	47.0	19.7

Note. N is the number of observations. BCCs: Belgian Coordination Centers. IFSCs: Irish Financial Service Centers.

maintains 12 bank relationships. Only 3.1% of the firms maintain a single bank relationship, 70.3% maintain more than seven bank relationships, and one firm uses 70 bank relationships. But Italy is not an outlier. In Portugal, the median firm uses 10 banks, in France the median is 9 banks, and in Belgium and Spain the median is 7. On average, only 2.7% of the firms in these four countries use one bank, while 54.2% use more than seven banks. In contrast, single-bank relationships are common in Norway, Sweden, the United Kingdom, and Ireland. On average, 24.2% of the firms in these countries use only one bank, the median firm uses two banks, and only 3.3% of the firms maintain more than seven bank relationships. The remaining countries fall somewhere in between these two groupings. For example, with 91.9% of its firms maintaining more than two bank relationships, and 40.5% maintaining more than seven, Greece is closer to the high-number countries. Switzerland, with a median of two bank relationships and 41.7% of its firms maintaining one bank relationship, is similar to the low-number countries.

Table II reports the distribution of number of bank relationships according to the reported total domestic sales of the sample firm. We use sales as a proxy for firm

TABLE II
Overview of Number of Bank Relationships, by Home Sales

Average home sales (in millions of U.S.\$)	Number of observations	Number of relationships			%Firms with n bank relationships			
		Average	Median	Maximum	$n = 1$	$n = 2$	$n = 3$ to 7	$n > 7$
Not Specified	54	6.7	4	40	16.7	22.2	38.9	22.2
0	61	4.2	2	29	18.0	32.8	39.3	9.8
<100	232	4.5	3	24	18.1	19.0	49.6	13.4
101–250	140	5.3	3	70	13.6	16.4	52.9	17.1
251–500	151	5.1	3	35	11.9	24.5	45.7	17.9
501–1000	140	6.2	3	40	10.7	16.4	48.6	24.3
1001–2000	110	5.1	3	30	13.6	18.2	46.4	21.8
2001–5000	86	6.5	3	50	19.8	15.1	38.4	26.7
5001–10000	49	8.2	5	40	8.2	14.3	46.9	30.6
>10000	56	8.4	4	60	10.7	7.1	51.8	30.4

size. Firms in the survey do not report exact sales figures. Instead, they categorize their total domestic sales into one of eight intervals, beginning with “less than \$100 million” and ending with “greater than \$10 billion”. Our sample firms are evenly distributed across the eight categories, with the median firm reporting sales of between \$1 billion and \$2 billion. By comparison, the firms in our sample are larger than those studied by Petersen and Rajan (1994) (with median assets of approximately \$300,000) and about the same size as the publicly traded firms in Houston and James (1996) (with median sales of \$1.37 billion).⁵

Larger firms may require more bank relationships because, as they grow, they exceed the service and financing capacity of their existing banks. Consistent with this idea, Houston and James (1996) find that multiple-bank firms tend to be larger than single-bank firms. We find this to be true in our sample as well, though the number of bank relationships does not increase uniformly across all size categories. For example, the median number of bank relationships is 3 for all categories except the smallest (median = 2) and the two largest (median = 5 and 4 relationships, respectively). But the mean number of relationships increases in category size, as the number of relationships becomes skewed to the right for larger firms. Only 13.4% of firms with sales less than \$100 million use more than seven banks; for firms with sales greater than \$5 billion, the proportion is roughly 30%. If growth in size forces firms to seek multiple relationships, then firms in countries with relatively small banks should maintain more relationships than firms in countries with banks able to cater to larger firms. We address this possibility later in Section 4.5.

Overall, the distribution of number of bank relationships across the countries suggests several stylized facts. First, multiple-bank relationships are common across all countries studied in this data set. Second, large firms tend to maintain more bank relationships. Third, single-bank relationships or relationships with

⁵ Houston and James (1996) do not report sales figures directly. We thank Joel Houston for making this number available to us.

only a few banks are common in some countries, but in other countries single-bank relationships are exceptionally rare and multiple-bank relationships consist of *many* banks. For the latter countries, it is unlikely that monopoly bank relationships are optimal, and it does not appear that the motive for holding multiple-bank relationships originates simply from the desire to mitigate holdup costs.

Beginning in Section III, we explore possible reasons for why we observe such variation in number of bank relationships across countries. Before doing so, we discuss in more detail our definition of a bank relationship.

2.3. Definition of Bank Relationship

Because banking theories typically focus on *lending* relationships, our definition in terms of cash management services appears mismatched with the theory. On the contrary, responses to the survey suggest that short-term lending is one of the most important activities in cash management. Table III groups, by country, response rates to the question, “What operations come under the heading of cash management in the company in which you are working?” 90.2% of the sample firms list at least one of three “lending-related” activities—short-term funding (up to one year), trade finance, and managing creditors, payables, and payments—as part of their cash management operations. These choices as a group are second in popularity only to the group “liquidity-related” activities. Out of the 11 individual activities, “short-term funding (up to one year)” is the second most popular choice, after “liquidity management.”⁶

Short-term credit is the predominant form of bank financing in Europe (see Rajan and Zingales (1995), Table II). This suggests a large overlap between explicitly credit-based relationships and our cash management relationships. Comparisons of our numbers with available statistics from European studies that focus on credit relationships support this belief. Drawing on data from the Central Credit Registry of Italy, Pagano *et al.* (1998) report the median number of bank credit relationships per firm to be 11 and the mean to be 13.9. By comparison, the Italian firms in Table I maintain a median of 12 bank relationships and a mean of 15.2.⁷ Our statistics are also closely aligned with numbers reported by Elsas and Krahnen (1998) for Germany. Using firms similar in size to our German firms, they report a median of 5 bank relationships, exactly matching our median, and a mean of 6.0, compared with 8.1 in Table I.⁸ Moreover, for a sample of large Swedish firms, Berglöf and

⁶ The 11 activities are liquidity management, account and balance management, payments, reconciliation of bank statements, short-term investment (up to one year), managing debtors, receivables and collections, short-term funding (up to one year), trade finance, managing creditors, payables, and payments, foreign exchange transactions, and hedging.

⁷ Detragiache *et al.* (1999) report a sample median of 5 bank relationships for Italian firms with less than 500 employees. In an earlier version of their paper that includes firms of similar size to the Italian firms in our data set, they report the median and mean number of banks to be 13 and 16.4, respectively.

⁸ Harhoff and Körting (1998a) also study German firms and report the mean number of bank relationships to be 2.0. However, the Harhoff and Körting (1998a) firms are considerably smaller than the firms studied here.

TABLE III
Overview of Firm and Relationship Characteristics, by Country

Country	Average sales (in millions of U.S.\$)	% of firms that list activity as cash management					Bank relationship importance
		Bank relationship	Liquidity-related	Investment-related	Lending-related	FX-related	
Italy	1500	88.2	97.1	92.9	95.7	71.4	4.5
Portugal	750	95.3	100.0	90.7	95.3	86.0	3.5
France	1500	92.0	96.0	92.0	92.0	88.0	3.4
Belgium	3500	100.0	90.0	80.0	70.0	90.0	4.4
Spain	1500	94.1	98.5	92.6	94.1	86.8	3.9
Germany	3500	80.6	100.0	88.1	88.1	61.2	4.4
Greece	750	53.8	90.2	90.2	90.2	80.5	2.8
Austria	1500	86.5	100.0	97.3	91.9	70.3	4.1
Luxembourg	375	100.0	100.0	100.0	100.0	87.5	2.4
Czech Republic	<100	89.7	96.6	88.1	91.5	81.4	2.3
BCCs	1500	85.6	93.6	83.0	87.2	81.9	3.2
Hungary	175	86.0	95.5	88.6	93.2	59.1	3.4
Switzerland	3500	84.2	94.9	89.7	82.1	79.5	3.3
Finland	750	85.9	95.5	89.9	87.6	78.7	2.7
Denmark	750	81.3	94.1	78.4	88.2	78.4	3.3
Netherlands	1500	80.9	95.9	79.6	93.9	87.8	3.1
IFSCs	750	71.4	95.5	86.4	90.9	86.4	3.0
Poland	175	53.8	100.0	76.9	92.3	46.2	4.8
Ireland	750	79.1	95.5	83.6	95.5	86.6	3.4
United Kingdom	1500	74.3	98.6	90.8	90.8	80.3	2.7
Sweden	1500	71.1	90.0	68.0	74.0	70.0	3.4
Norway	750	87.5	97.6	80.5	92.7	78.0	3.0
Sample average	750	82.4	96.3	87.0	90.2	78.2	3.3

Note. N is the number of observations. BCCs: Belgian Coordination Centers. IFSCs: Irish Financial Service Centers. Average sales is the sum of the midpoints of total of domestic and world-wide sales categories, measured in millions of US\$. Each category under “% of firms that list activity as cash management” reports the percentage of respondents in a country that lists an activity as being part of cash management. “Bank relationship” is a separate category for firms listing bank relationship management as a cash management activity. “Liquidity management” is counted if a respondent lists at least one of the following activities: liquidity management, account and balance management, payments, and reconciliation of bank statements. “Investment-related” includes short term investment (up to one year) and managing debtors, receivables, and collections. “Lending-related” includes short term funding (up to one year), trade finance, and managing creditors, payables, and payments. “Foreign exchange” includes foreign exchange transactions and hedging. “Relationship importance” is the average assessment, according to survey respondents, of the relative importance of a bank relationship, out of a set of eight criteria, when allocating business between existing banks (0 = least important, 5 = most important).

Sjögren (1995) report the median number of bank relationships to be 1, compared with 2 for Swedish firms in our data set, and Ongena and Smith (1999) report a median of 1 and mean of 1.4 for Norwegian firms, compared with a median of 2 and mean of 2.3 for Norwegian firms in Table I. With sales of \$250 million, the

average firm in Ongena and Smith (1999) is half the size of the average Norwegian firm in Table I.⁹

Some of the recorded bank relationships in our data set may not include lending. A strong and valuable bank relationship can exist without lending. Indeed, the breadth of bank services used by a firm is a measure of the strength of the relationship, in terms of its *scope*. Cash management requires an array of classic banking services beyond lending, such as the collection of deposits, the management of bank balances and overdrafts, foreign exchange management, and the brokering of many other financial activities. These bank-related activities are only specific to cash management because they are limited to the short term. As part of our analysis in Section IV, we discuss the sensitivity of our results to dropping the non-lending-related relationships.

Table III indicates that a substantial proportion of cash managers believe a bank relationship is important. Of the surveyed managers, 82.4% select the activity “bank relationship management” as an important part of the cash management function. Moreover, managers in many countries also prefer to do business with the banks they maintain a relationship with. The last column of Table III lists the average numerical ranking by managers within a country of “the importance of a bank relationship,” among a set of eight possible criteria, when choosing to allocate business across banks. The ranking takes on an integer value between 0 and 5, with 0 corresponding to “least important” and 5 being “most important.”

3. MOTIVATION AND DESCRIPTION OF EXPLANATORY VARIABLES

3.1. *Theory*

In early information-based theories of banking (Diamond (1984), Ramakrishnan and Thakor (1984), and Boyd and Prescott (1986)), banks arise as coalitions of investors devoted to reducing monitoring, screening, or renegotiation costs. Within the static framework of these theories, firms find it optimal to borrow from only one bank. However, a sole bank will also have monopoly access to private information about the firms it lends to. In a dynamic setting, a bank can exploit its monopoly power, either by charging the firm higher interest on new loans or by threatening not to extend additional credit. Sharpe (1990), Rajan (1992), and von Thadden (1995) argue that firms can avoid these holdup costs by establishing a relationship with another bank. Still, Petersen and Rajan (1995) argue that a single bank relationship may be optimal in a repeated-lending setting if competition from other banks impedes the ability of the monopoly bank to adopt accommodative pricing arrangements.

Because these theories imply that we should observe single-bank relationships or multiple-bank relationships with relatively few banks, they cannot adequately

⁹ When we directly match the survey sample to firms from the Ongena and Smith (1999) data set, we cannot reject the hypothesis that the average number of bank relationships across the two samples is equal.

explain all of the data described here. We now consider three arguments as to why firms may want to maintain many bank relationships.

3.1.1. Diversification of bank relationships. Firms may have incentive to diversify across many bank relationships when the risk of losing a given bank relationship is high. For example, Detragiache *et al.* (1999) consider the impact of exogenous bank defaults on a firm's choice of number of bank relationships. They show that a firm will insure itself against the loss of value-relevant information, in case of bank default, by maintaining more than one inside bank relationship. Moreover, as long as the banking system is not "too fragile," the optimal number of bank relationships held by a firm will be positively related to the fragility of a country's banking system. However, if the likelihood of bank default is too high, the net benefit of an inside relationship drops to the point where only one bank is optimal.¹⁰

Detragiache *et al.* (1999) also conjecture that a more efficient bankruptcy process increases the net liquidation value of a borrowing firm, which in turn makes it less costly for a given bank to finance the firm. They therefore predict the number of bank relationships to be positively related to the efficiency of a country's bankruptcy procedure.

3.1.2. Lack of coordination of investors. The legal environment of a country may influence the benefits and costs to lending through investor coalitions. In fact, for some countries, a lack of coordination among investors may actually help align the incentives of firm managers with the investors in a firm. For instance, Hart (1995) and Bolton and Scharfstein (1996) argue that borrowing from multiple lenders reduces the incentive for a manager to strategically default on a loan. If a firm defaults, the manager must coordinate a restructuring plan with multiple claimants, each of whom can free ride or hold up the negotiation process. Bolton and Scharfstein (1996) derive an expression for the optimal number of creditors that trades off the benefits of preventing strategic defaults with the cost of foregoing efficient liquidations. Dewatripont and Maskin (1995) apply similar logic to studying the impact of bank concentration on the investment incentives of manager in borrowing firms. They argue that decentralized banking systems mitigate wasteful investment in long-term projects, because disperse banks, with limited capital, are unable to coordinate a sharing rule for joint financing. This in turn motivates managers to forego wasteful long-term projects that would be available under more concentrated banking systems.

¹⁰ This nonlinearity arises because Detragiache *et al.* (1999) assume firms can also borrow from a "spot" public market that pools all borrowers. When the probability of bank default is low, adverse selection costs make the pooling rate relatively high because borrowers without a bank are more likely to be bad borrowers. As the probability of bank default increases, this public pooling rate falls as more good borrowers from failed banks are forced to seek outside financing. Once the pooling rate falls to a certain point, the cost of insuring through extra bank relationships outweighs their benefit, making one bank relationship optimal.

Holding other characteristics constant, the above arguments imply that maintaining relationships with multiple creditors will be most beneficial in countries where company managers are protected under bankruptcy regulations or where the costs of bankruptcy are low. Bankruptcy procedures in some countries impose an “automatic stay” that prevents senior creditors from gaining possession of company assets and allows managers to remain in control of the firm. Other bankruptcy codes, such as Chapter 11 in the U.S., explicitly protect incumbent managers from creditor actions during bankruptcy. We would expect value-maximizing firms in these countries to maintain more bank *credit* relationships in order to help prevent strategic defaults. By similar reasoning, multiple bank credit relationships should be more important in countries where the deadweight costs of bankruptcy are low.

3.1.3. Banks and securities markets. La Porta *et al.* (1997) argue that lower bankruptcy costs, together with stronger investor protections, also foster highly developed securities markets. Because they offer an alternative source for both short-term investment and financing, prominent public capital markets may influence the number of bank relationships a firm chooses to use. For instance, if multiple-bank lending serves as a substitute for securities market financing, which typically involves many lenders, then we should observe economies with stronger capital markets having on average, fewer bank relationships per firm.

3.2. *Explanatory Variables*

Our cross-sectional analysis of the number of bank relationships encompasses the use of firm-specific and country-level variables. We describe and motivate these variables below. Table IV contains detailed variable definitions and Table V reports the values of the country-level variables.

3.2.1. Firm-specific and industry dummy variables. Given the patterns observed in Table II, we include as a measure of firm size Home Sales, defined in Section II.A. We add a similarly defined categorical variable, World-Wide Sales, that measures a firm’s nondomestic sales. Managing cash flows from foreign sales should increase the demand for the financial services of banks. However, a company with large foreign operations may also rely more heavily on foreign bank relationships, which are not included in our definition of number of bank relationships.

We also include two firm-specific variables that weigh the importance of bank relationships. We define Relationship Scope to be the total number of activities listed by the respondent when asked, “What operations come under the heading of cash management in the company in which you are working?” If banks are limited in the range of services they can offer, then number of bank relationships should be positively related to Relationship Scope. As a direct measure of the perceived importance of a bank relationship to a cash manager, we include as our fourth firm-specific variable Relationship Importance. As described in Section II.C, this

variable is the numerical ranking of the importance of a bank relationship among a set of eight possible criteria, when choosing to allocate business across banks. If banks serve only as transaction centers for firms with many bank relationships, then the number of bank relationships should be negatively related to Relationship Importance.

Finally, we also include at the firm level industry dummies for 46 specific industries. Industries have varying external financing requirements; some industries may be more reliant on bank financing than others (see Rajan and Zingales (1995)). We use the industry dummies to control for such variation.

TABLE IV
Description of Variables for Cross-Sectional Analysis

Variable	Description
Dependent Variable	
Number of bank relationships	Number of domestic cash management relationships.
Country and industry dummies	
Industry dummies	Forty-six industry dummies (no dummy for nonspecified industries). See Appendix 1 for identity of industries.
Country dummies	Twenty-one country dummies (no dummy for Norway).
Firm-specific characteristics	
Home sales	Annual home country sales.
World-wide sales	Annual world-wide sales. Both sales variables take the value of 0 if there are no (home ore world-wide) sales, 1 if sales are less than 100 million of U.S.\$, 2 if sales is between 101 and 250, 3 if it is between 250 and 501, 4 if it is between 501 and 1000, 5 if between 1001 and 2000, 6 if between 2001 and 5000, 7 if between 5001 and 10000, and 8 if over 10 billions of US\$.
Relationship scope	An index aggregating the activities that a survey respondent includes under the heading of "cash management." The index is formed by adding 1 for each of the following responses: bank relationship management, liquidity management, account/balance management, payments, reconciliation of bank statements, short-term investment (up to one year), managing debtors/receivables/collections, short-term funding (up to one year), trade finance, managing creditors/payables/payments, foreign exchange transactions, and foreign exchange hedging.
Relationship importance	Assessment by the survey respondent of the relative importance of a bank relationship in allocating business between existing banks among a set of eight other specified criteria and an open-ended "other" criterion (0 = least important, 5 = most important).
Fragility of the banking sector	
Bank fragility	Average credit rating of tracked banks within a country. Scale from 0 to 10, with lower scores implying less bank default risk. Sources: <i>Moody's Investors Service 1996 : 5</i> and <i>Credit Ratings International 1995 : IV (FT Financial Publishing)</i> .

TABLE IV—*Continued*

Variable	Description
Legal variables	
Judicial efficiency	Assessment of the “efficiency and integrity of the legal environment as it affects business, particularly foreign firms,” produced by <i>Business International Corporation</i> . Average between 1980 and 1983. Scale from 0 to 10, with lower scores implying lower efficiency levels. Source: Mauro (1995).
Creditor rights	Description from La Porta <i>et al.</i> (1997), Table I: “An index aggregating creditor rights. The index is formed by adding 1 when (1) the country imposes restrictions, such as creditors’ consent or minimum dividends, to file for reorganization; (2) secured creditors are able to gain possession of their security once the reorganization petition has been approved (no automatic stay); (3) the debtor does not retain the reorganization; (4) secured creditors are ranked first in the distribution of the proceeds that result from the disposition of the assets of a bankrupt firm. The index ranges from 0 to 4.” Source: La Porta <i>et al.</i> (1997).
Rule of law	Description from La Porta <i>et al.</i> (1997), Table I: “Assessment of the law and order tradition in the country. Average of the months of April and October of the monthly index between 1982 and 1995. Scale from 0 to 10, with lower scores for less tradition for law and order.” Source: La Porta <i>et al.</i> (1997).
Dependence on public capital markets	
Equity market/GNP	The ratio of the stock market capitalization, held by small shareholders, to gross national product for 1994. “Small shareholders” is the average percentage of common shares not owned by the top three shareholders in the 10 largest nonfinancial, privately owned domestic firms in a given country. Source: La Porta <i>et al.</i> (1997).
Bond market/GNP	Ratio of the market value of domestic private sector debt securities to GNP at the end of 1995. Source: <i>International Capital Markets 1997:11</i> , Table 12 (International Monetary Fund).
Banking industry structure	
Concentration ratio	Percentage of commercial banking assets accounted for by the largest three banks in 1993. Sources: Nordal and Nærlund (1995) (Table 2b) and Barth <i>et al.</i> (1997) (Table 2).

3.2.2. Country-level variables. Motivated by the diversification arguments in Detragiache *et al.* (1999), we include a variable that measures the fragility of a country’s banking system. The variable Bank Fragility is the average credit rating in 1995 across banks rated within a country. We assume that the *ex ante* likelihood of bank failure is higher for banks with a low credit rating. Our primary source for these data is *FT Financial Publishing’s Credit Ratings International 1995*. We use the *Moody’s Investors Service 1996* manual for Poland and Hungary. We construct the variable to range between 0 and 10, with lower values corresponding to less default risk. Because Detragiache *et al.* (1999) argue that the relationship between number of bank relationships and bank fragility is nonmonotonic, we also include

TABLE V
Country-Level Variables

	Bank fragility	Judicial efficiency	Creditor rights	Rule of law	Equity market/ GNP	Bond market/ GNP	Concentration Ratio
Austria	3.9	9.5	3	10	0.06	0.45	61.4
Belgium	4.5	9.5	2	10	0.17	0.61	44.4
Czech Republic	9	—	—	—	—	—	—
Denmark	5.25	10	3	10	0.21	1.09	63.7
Finland	6.21	10	1	10	0.25	0.39	93.8
France	4.63	8	0	8.98	0.23	0.52	63.6
Germany	2.23	9	3	9.23	0.13	0.53	89.5
Greece	9	7	1	6.18	0.07	0.05	98.3
Hungary	7.48	—	—	—	—	—	—
Ireland	4.43	8.75	1	7.80	0.27	0.11	93.6
Italy	5.77	6.75	2	8.33	0.08	0.36	35.9
Luxembourg	4.89	—	—	—	—	0.82	17.2
Netherlands	3.17	10	2	10	0.52	0.46	59.0
Norway	5.89	10	2	10	0.22	0.13	48.8
Poland	7.39	—	—	—	—	—	—
Portugal	5.47	5.5	1	8.68	0.08	0.15	38.1
Spain	4.75	6.25	2	7.80	0.17	0.11	50.1
Sweden	5.7	10	2	10	0.51	0.79	86.6
Switzerland	4.27	10	1	10	0.62	0.12	79.8
United Kingdom	2.63	10	4	8.57	1	0.35	29.1

Note. Country-level variables used in regression analysis. Table IV contains a complete description of each variable.

the squared value of Bank Fragility in our analysis. We predict that the number of bank relationships will be increasing in Bank Fragility and decreasing in (Bank Fragility)².

We adopt two variables for studying the impact of bankruptcy regulations and procedures on the incentive to coordinate creditors. The first, Judicial Efficiency, measures the efficiency and integrity of the business legal environment in a country. *Business International Corporation* produces this assessment, which is a score between 0 (low efficiency) and 10 (high efficiency). We obtain the scores from Mauro (1995). Judicial Efficiency serves as a proxy for the deadweight costs of bankruptcy. The second variable, Creditor Rights * Rule of Law, measures the degree to which creditor rights are protected in a given country. The variable is the product of an index measuring creditor rights and a proxy for the tradition for legal enforcement within a country. Both measures in the product come from La Porta *et al.* (1997). Creditor Rights summarizes a country's laws regarding creditor restrictions on other stakeholders (such as minimum dividends or consent to file for reorganization), automatic stays, guarantees of priority, and who obtains control during bankruptcy. The index ranges between 0 and 4 with a 4 corresponding to the strongest laws favoring creditor rights. Rule of Law is "an assessment for the law and order tradition in a country" (La Porta *et al.* (1997), Table I). It runs on a scale between 0 and 10, with higher values corresponding to a stronger enforcement

tradition. We use the product of the two variables because enforcement of creditor protection laws may be lax in countries with a weak rule of law.¹¹ Based on the arguments of Hart (1995) and Bolton and Scharfstein (1996), we expect the number of bank relationships to be increasing in Judicial Efficiency (for countries with lower bankruptcy costs)) and decreasing in Creditor Rights * Rule of Law (for countries with stronger creditor protection).¹²

To measure the influence of securities market development on the number of bank relationships, we include variables that proxy for the relative importance of equity and bond markets in a given economy. Equity Market/GNP is the ratio of the market value of the stock market held by small shareholders to gross national product (GNP) in 1994. This variable also comes from La Porta *et al.* (1997). Bond Market/GNP is the ratio of the market value of private sector debt securities to gross domestic product (GDP) in 1995, and is taken from *Capital Markets 1997*, published by the International Monetary Fund. If well-developed securities markets function as a substitute for the transaction services of a bank, then firms in economies with stronger capital markets should have fewer bank relationships.

Finally, we control for the degree of bank concentration within a country using the variable Concentration Ratio, defined to be the percentage of a country's commercial banking assets in 1993 accounted for by its three largest banks. In a later section, we check the sensitivity of our results to an alternative definition of the concentration ratio. For Norway, our source for the variable is Nordal and Nærland (1995); for all other countries the source is Barth *et al.* (1997). Firms operating within concentrated banking systems have, by definition, only a few bank relationships to choose from. However, this does not imply that firms maintain more bank relationships in decentralized banking systems. Following Dewatripont and Maskin (1995), we hypothesize that countries with high bank concentration will have fewer bank relationships.

4. CROSS-COUNTRY REGRESSIONS

4.1. Firm-Level Regressions

We begin firm-level regressions of number of bank relationships on firm-specific characteristics, country dummy variables, and country-level variables. The results are in Table VI. Because our dependent variable is discrete-valued and truncated, ordinary least squares (OLS) produce biased estimates of model slope parameters and standard errors. We report estimates of the firm-level model using a Tobit specification. The Tobit specification accounts for truncation of number of bank relationships below one, but assumes the distribution is otherwise continuous. Though not reported, we also run all of our regressions using a "count" model that explicitly

¹¹We thank Enrica Detragiache for pointing this out.

¹²Detragiache *et al.* (1999) also predict that the number of bank relationships should increase as bankruptcy costs fall.

TABLE VI
Firm-Level Tobit Regressions

Explanatory variables\model	(1)	(2)	(3)	(4)	(5)
Constant	3.11***	3.83***	-0.662	-0.816	32.5***
Home sales	0.662***	0.624***	0.347***	0.342***	0.542***
World-wide sales	-0.293***	-0.217**	-0.137	-0.125	-0.172*
Relationship scope	0.259***	0.242***	0.0102	-0.00161	0.0495
Relationship importance	-0.442***	-0.399***	0.00610	0.00173	-0.0759
46 industry dummies	no	yes	yes	yes	yes
Austria			3.67**	3.62**	
BCCs			4.03***	4.02***	
Belgium			10.4***	10.5***	
Czech Republic			4.62***		
Denmark			2.79*	2.82*	
Finland			3.24**	3.34**	
France			10.4***	10.6***	
Germany			7.05***	7.05***	
Greece			7.71***	7.77***	
Hungary			3.47**		
IFSCs			2.64	2.71	
Ireland			1.89	1.85	
Italy			13.9***	13.9***	
Luxembourg			1.94		
Netherlands			2.69*	2.66*	
Poland			2.21		
Portugal			11.3***	11.3***	
Spain			9.41***	9.57***	
Sweden			1.35	1.36	
Switzerland			1.73	1.68	
United Kingdom			1.55	1.62	
Bank fragility					-2.46***
(Bank fragility) ²					0.219***
Judicial efficiency					-2.17***
Creditor rights * rule of law					-0.0927**
Equity market/GNP					-1.72
Bond market/GNP					4.97***
Concentration ratio					-4.93***
Number of observations	1010	1010	1010	898	898
Pseudo-R ²	0.398	0.426	0.565	0.796	0.746
Likelihood ratio test statistic		47.5	279.8***	241.8***	199.2***
(versus model, degrees of freedom <i>d</i>)		(1, 46)	(2, 21)	(2', 18)	(2', 7)

Note. BCCs: Belgian Coordination Centers. IFSCs: Irish Financial Service Centers. Tobit model estimated using maximum likelihood with correction for left truncation at 1. Dependent variable: the number of domestic cash management relationships. The pseudo-R² is $\{L(\theta_i)^{2/n} - L(\alpha)^{2/n}\} / \{L(\theta_i)^{2/n} - L(\alpha)^{2/n}\}$, where $L(\alpha)$ the likelihood value from a regression containing only a constant. The likelihood ratio test statistic (LRT), $-2 \log(L(\theta_i)/L(\theta_j))$, is asymptotically distributed $\chi^2(d)$. The LRT for models (4) and (5) are compared to a version of model (2), containing 898 observation.

***Significant at 1%.

**Significant at 5%.

*Significant at 10%.

controls for the discrete nature of the data. The results from the two specifications are qualitatively similar. We report the Tobit coefficient estimates because they are easier to interpret.¹³

Variation in the types of firms across countries could explain the country differences observed in Table I. For example, if Italy is home to many textile companies, which maintain a median of 7 bank relationships per firm, and these companies are also relatively large, then the high average number of bank relationships in Italy could be due to firm types, not to some identifiable country effect. Models (1) and (2) in Table VI indicate that firm and industry characteristics do describe a significant amount of firm-level variation in number of bank relationships. Model (1) contains Home Sales, World-Wide Sales, Relationship Scope, and Relationship Importance. Model (2) adds in the 46 industry dummy variables without reporting their coefficient estimates. These estimates appear in Appendix 2.

Larger firms, as measured by domestic sales, maintain more bank relationships than small firms do. However, holding domestic sales constant, firms with higher World-Wide Sales maintain fewer domestic bank relationships, suggesting that firms with high foreign sales substitute bank relationships in foreign countries for some domestic bank relationships. The sum of the sales coefficients is positive and statistically significant, suggesting that, overall, the relation between number of bank relationships and size is positive. Later in this section, we examine the sensitivity of our results to alternative measures of size.

Firms that include more activities as part of cash management use more banks, but firms that place a stronger emphasis on the value of a bank relationship maintain fewer bank relationships. The positive coefficient on Relationship Scope could indicate that firms choose each bank for a specific financial service, so firms requiring more cash management services use more banks. The negative estimate associated with Relationship Importance suggests that firms with more bank relationships consider these connections to be more transactions-oriented than relationship-based.

Taken together, the variables in model (1) explain 39.8% of the variation in number of bank relationships. With the addition of the industry dummies, the fit improves to 42.6%. However, a likelihood ratio test cannot reject the hypothesis that the industry dummy coefficients jointly equal zero.¹⁴ Model (3) adds 21 country dummy variables to the specification. To avoid collinearity with the intercept, we omit Norway from the dummy variable list. The country dummies capture substantial variation left unexplained by the firm-level variables, which, with the exception of Home Sales, are no longer statistically significant. Many of the country dummy estimates are large and statistically significant and maintain the ranking of countries present in Table I. Moreover, the fit of the model jumps to 56.5%,

¹³ The count regression estimates must be rescaled before they can be interpreted as slope coefficients. For a general discussion of limited-dependent-variable analysis, see Maddala (1983).

¹⁴ Inspection of Appendix 2 confirms that few of the industry coefficients are significantly different from zero.

a level that easily rejects the null that the additional country dummy coefficients equal zero.

Multiple regression econometrics yields a useful interpretation of the country dummy coefficient estimates. Each country estimate, when added to the intercept, is the average of the residual number of bank relationships left unexplained by firm and industry characteristics in that country.¹⁵ In other words, the coefficients provide us with estimates of the average number of bank relationships per country, cleaned of variation due to the firm-level characteristics. For example, the estimates imply that firms in Italy maintain on average 13 bank relationships, while firms in Sweden maintain 1 relationship, after the influence of the firm-level characteristics is subtracted out. In the analysis to follow, we will refer to the country dummy variable estimates as “country residuals.”

In the last column of Table VI, we replace the country dummies with the country-level variables and compare the fit of the two models.¹⁶ To do so, however, we must first drop four countries from the dummy variable regressions because we lack complete country-level data for the Czech Republic, Hungary, Luxembourg, and Poland. Model (4) contains the “new” dummy variable regression, which now contains only 898 observations. With the removal of the three East European countries and Luxembourg, the fit of the country dummy model increases to 79.6%. The magnitude and significance of the estimates, however, remain the same. According to model (5), firms maintain *more* bank relationships in countries with decentralized, stable banking systems and active bond markets and maintain *fewer* relationships in countries with weak creditor rights enforcement and inefficient judicial systems. Comparing likelihood values from model (5) to a version of model (2) that excludes the missing observations easily rejects the hypothesis that the country-level variables add no explanatory power. More importantly, the pseudo- R^2 in model (5) is 74.6%, only slightly lower than the fit in Model (4). This comparison leaves unclear the extent to which the country-level variables can account for the variation evident in the country residuals. We introduce a more direct method for measuring this association below. But first, we examine to what extent the country residuals vary across groupings according to legal origin.

4.2. Grouping the Country Residuals

The fact that a majority of the country dummy variable estimates in Models (3) and (4) are statistically significant provides little information about their

¹⁵ We measure this average relative to the omitted country (Norway) from the regressions. The intercept is an estimate of the average number of banking relationships for Norway, while each dummy variable estimate represents the average number of *additional* relationships per country above Norway.

¹⁶ To make the comparison, we would ideally prefer to add the country-level variables to model (3) and allow the variables to “compete” for explanatory power. Unfortunately, using both country-level variables and the country dummies in the same regression creates exactly collinear columns of data. A vector of observations on any cross-country variable can be created as a linear combination of the dummy variables and two of the country-level variables.

cross-sectional variation. Common factors across groups of countries could induce correlation in the estimates. There in fact appears to be a common pattern to the ordering of the countries in Table I. Firms from countries in Southern Europe, such as Italy, Portugal, and Spain, all maintain a similarly high number of bank relationships, while firms in northern European countries such as the United Kingdom, Norway, and Sweden maintain few bank relationships. To assess the statistical importance of this common variation, we conduct Wald tests for equivalence across different groupings of the country residuals.

We group countries according to the origin of their legal system. La Porta *et al.* (1997, 1998) note that many countries of the world share one of four common legal heritages created and spread through colonization, conquest, and voluntary adoption. These four traditions are English common law, the French or Napoleonic version of Roman civil law, the Germanic tradition of Roman civil law, and Scandinavian law. We include an additional category not found in La Porta *et al.* (1997) to represent countries formerly influenced by Soviet law, called "Eastern European." This category includes Hungary, the Czech Republic, and Poland. La Porta *et al.* (1997, 1998) argue that a country's legal origin determines the degree to which investors are protected against expropriation from managers and other stakeholders in a firm. They demonstrate that legal origin explains much of the cross-country variation in equity ownership structures and the development of capital markets.

We adopt the La Porta *et al.* (1997, 1998) classification for two reasons. First, we wish to avoid explicit data-snooping biases that may arise by grouping the countries according to an arbitrary measure like "region." The classification provides us with a grouping method external to the patterns we observe in our data. Second, the classification is a logical first step in determining the influence of the legal and institutional framework of a country on the average number of bank relationships.

Table VII contains the results. We first test the joint hypothesis that all of the country residuals are equal. As can be seen in the row labeled "All," this hypothesis is easily rejected. We next test equality of the country residuals within legal origin groupings and across groupings. Within groups, legal origin explains some, but not all of the variation in the country residual estimates. For example, we cannot reject the hypothesis of coefficient equality among countries of English or Eastern European origin. The test of Scandinavian countries produces a χ^2 value rejecting equality at the 10% level. We can more easily reject equality of residual estimates inside the French and German law countries. La Porta *et al.* (1997) show that countries of German and French origin have the weakest investor protections and least-developed capital markets. Our results suggest that these countries also have additional variation in the number of bank relationships that cannot be explained by legal origin alone. In the lower half of Table VII, we report the Wald tests for equality across groupings. To implement these tests, we run the firm-level regressions again using legal origin dummies in place of country dummies. Equality across all legal origin groups is strongly rejected and many pairwise comparisons are also rejected.

TABLE VII
Wald Tests of Country Residual Groupings by Legal Origin

		Number of restrictions			Value of χ^2
Hypothesis tested: Country residuals are equal within grouping					
All		21			320***
Origin of law					
English		2			0.45
French		8			132***
German		2			15.8***
Scandinavian		3			7.31*
Eastern European		2			1.64
Hypothesis tested: Country group residuals are equal across groupings					
All		4			231***
		Pair-wise χ^2 tests across groupings			
Coefficient estimate		French	German	Scandinavian	Eastern Europe
	Origin of law				
−0.369	English	99.8***	11.3***	0.28	3.36*
5.80***	French		25.5***	84.9***	31.8***
2.24***	German			7.64**	0.92
0	Scandinavian				2.16
1.29	Eastern European				

Note. English law origin countries are Ireland, United Kingdom, and the Irish Financial Service Centers. French law origin: Italy, Portugal, France, Belgium, Spain, Greece, Luxembourg, the Netherlands, and the Belgian Coordination Centers. German law origin: Germany, Switzerland, and Austria. Scandinavian law origin: Norway, Finland, Denmark, and Sweden. Eastern European countries are Hungary, the Czech Republic, and Poland. Number of observations: 1010. These tests are conducted on estimates from model (3) in Table VI.

***Significant at 1%.

**Significant at 5%.

*Significant at 10%.

4.3. Country-Level Regressions: Spanning Tests

In this section, we attempt to directly model the variation in the country residuals using OLS regressions of the country residuals on the country-level variables. That is, we run variations of the following regression,

$$\begin{aligned}
 \text{CtryRsid}_i = & \beta_0 + \beta_1 \text{BankFragility}_i + \beta_2 (\text{BankFragility}_i)^2 \\
 & + \beta_3 \text{JudicialEfficiency}_i + \beta_4 (\text{CreditorRights} * \text{RuleofLaw})_i \\
 & + \beta_5 \text{EquityMarket/GNP}_i + \beta_6 \text{BondMarket/GNP}_i \\
 & + \beta_7 \text{ConcentrationRatio}_i + \varepsilon_i,
 \end{aligned} \tag{1}$$

TABLE VIII
Country-Level Regressions: Spanning Tests

	Model		
	(1)	(2)	(3)
Constant	13.6***	26.8***	37.8***
Bank fragility		0.00622	-3.47***
(Bank fragility) ²		0.0256	0.291***
Judicial efficiency		-2.42***	-1.92***
Creditor rights * Rule of law		0.0300	-0.147**
Equity market/GNP	-10.1***		-3.44*
Bond market/GNP	-1.53		6.26***
Concentration ratio	-0.897**		-7.93**
Adjusted R-squared	0.347	0.516	0.713
Number of observations	18	18	18

Note. Standard errors reflect a White (1980) correction for heteroskedasticity.

***Significant at 1%.

**Significant at 5%.

*Significant at 10%.

where CtryRsid_i represents the country residual for the i th country and each β_k ($k = 1, 2, \dots, 7$) is a loading on one of the seven country-level variables. The idea is that such a regression will test whether the seven country-level variables “span” the country dummy variable estimates, in the sense that they explain all of the variation across the countries.

Table VIII contains the results from the cross-country regressions using the 18 countries for which we have data. We report three different specifications. Model (1) excludes the bank fragility and legal variables. By using Equity Market/GNP, Bond Market/GNP, and Concentration Ratio alone, we are able to explain 31.7% of the variation in the country residuals. The estimates suggest that the average number of bank relationships is negatively related both to the importance of a country’s equity market and to the level of concentration within the banking system. The coefficient on Bond Market/GNP is also negative, but not statistically different from zero.

In model (2), we analyze the impact of the bank fragility and legal environment variables alone. Only Judicial Efficiency is statistically significant. However, with an R^2 of 51.6%, Judicial Efficiency alone explains more of the variation in the country residuals than the equity market and bank concentration variables combined. The estimate is negative, implying that firms operating in well-functioning judicial systems maintain fewer bank relationships.

Model (3) includes all seven variables. This specification explains fully 71.3% of the linear variation in the country residuals. In addition, the signs and significance of the variables in the combined regression are similar to those for model 5 in Table VI. That is, all variables are significant at the 5% level or better, with the exception of Equity Market/GNP (significant at the 10% level), and average number of bank relationships is positively related to Bond Market/GNP and (Bank Fragility)², and

negatively related to Bank Fragility, Bank Concentration, Judicial Efficiency, and Creditor Rights * Rule of Law.

4.4. Country-Level Regressions: Discussion

We should be cautious in basing inferences on the cross-country regressions. With only 18 observations, and up to seven right-hand side variables, we have few degrees of freedom for drawing strong conclusions. Moreover, the variables we have chosen are likely to be correlated with other country-level variables not studied here. These omitted variables could be the theoretically “true” determinants of number of bank relationships. For this reason, we avoid making strong causal statements about our findings. Our analysis does provide evidence on how various features of a country’s financial markets jointly interact.

We find firms operating in countries with concentrated banking systems choose to use fewer bank relationships, holding the other characteristics constant. This result is consistent with Dewatripont and Maskin (1995), who argue that firms will find it optimal to maintain more bank relationships in relatively decentralized bank economies. However, the result is not necessarily surprising because a concentrated banking system is likely to have fewer banks to choose from. Moreover, our concentration variable could proxy for bank size within a country. Our finding could then indicate that firms choose fewer banks in countries where banks are large enough to meet all of their financial service needs. We return to this possibility in the next section. We also find that firms maintain more bank relationships in economies with well-developed public debt markets. Boot and Thakor (1999) suggest the possibility of such complementarity. They argue that increased securities market competition can induce banks to shift away from transactions-based lending and invest more in relationship-oriented lending. Banks then compete to provide relationship-oriented services. This competition could increase the number of banks a firm maintains a relationship with.¹⁷ The fact that over 80% of surveyed managers choose “bank relationship management” to be a primary cash management activity suggests that firms indeed consider their bank connections to be relationship-oriented. We also document a negative relation between number of bank relationships and the development of equity markets, but the dependence is weak.

Consistent with the theory in Detragiache *et al.* (1999), we estimate the effect of Bank Fragility on the number of bank relationships to be non-monotonic. However, the relation is the opposite of that predicted by Detragiache *et al.* (1999). When a banking system is relatively stable (low value of Bank Fragility), an increase in the fragility of the system implies a decline in the number of bank relationships. Because the estimate on Bank Fragility is negative, it is this effect that dominates. However, for relatively fragile systems (high value of Bank Fragility), an increase in fragility implies an increase in the number of bank relationships. This pattern,

¹⁷ Boot and Thakor (1999) show that increased competition among banks for relationship-oriented services actually leads to fewer competing banks. However, they do not address the impact this has on the number of bank relationships a firm will choose to maintain.

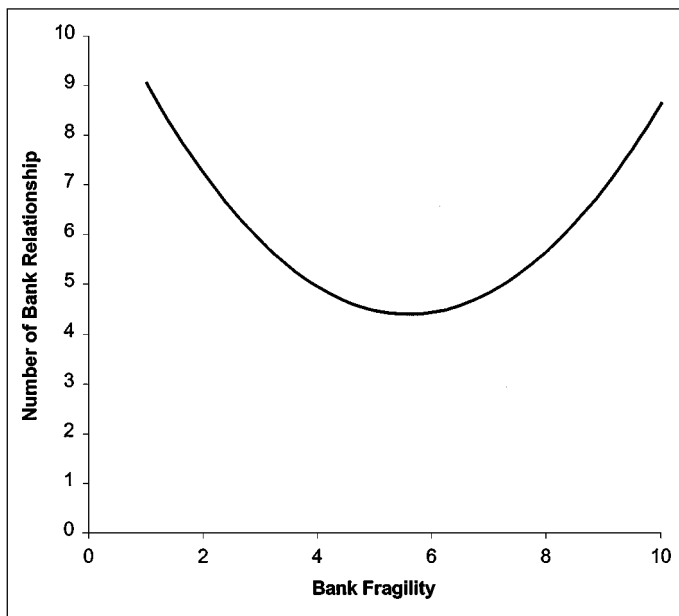


FIG. 1. The number of bank relationships and bank fragility. The figure is constructed using the coefficient estimates on bank fragility and $(\text{bank fragility})^2$ from Table VI, Model (5).

which is graphed in Fig. 1, is consistent with a motive for firms to diversify in highly fragile banking systems. For firms in relatively stable banking systems, an increase in fragility could induce consolidation in services across banks, leading to a decline in the number of bank relationships.

Relative to our earlier conjectures in Section III, the results on the legal variables are mixed. The negative relation between Creditor Rights * Rule of Law and number of bank relationships is consistent with the idea that enforcement of strong creditor protection laws can serve as a substitute mechanism to multiple bank credit relationships for disciplining firm management. However, given this argument, the sign on Judicial Efficiency should also be positive, because more efficient judicial systems should make it less costly for a manager to strategically default on a loan, increasing the need for multiple creditors. Instead the estimate is significantly negative; firms in countries with greater degrees of judicial efficiency maintain fewer bank relationships. Levine (1999) shows that proxies for country financial intermediary development are positively related to the protection and enforcement of creditor rights within a country. Combining our findings with the result in Levine (1999) could imply that firms maintain more bank relationships in countries with less developed financial intermediaries. However, Levine (1999) does not control for the impact of bank system concentration or the development of securities markets in his regressions, making direct comparisons between the two studies difficult.

4.5. Sensitivity Analysis

In this section, we consider the sensitivity of our results to a variety of alterations to the specification of our models. We also check the robustness of our cross-country model by making some out-of-sample forecasts.

In Table VI, we ignore the possibility that the relative size of a firm within a country may be more important than size in absolute dollar terms. To assess the impact of adding measures of relative size to our specification, we first add interaction variables to the regression of model (3) in Table VI, allowing sales to vary by country. We find statistically significant interactions in three countries. Relatively large firms in Italy and Germany maintain significantly more relationships than other large firms in the sample, and large firms maintain relatively fewer bank relationships in Belgium. However, the absolute size measure and country dummy estimates remain significant after the inclusion of the interaction variables. We also separately add Home Sales/GDP and Home Sales/(Total Assets of Banking System) to model (3) in Table VI to check the sensitivity of the estimates to direct measures of relative size. The first variable measures the importance of the firm relative to the country's economy; the second variable measures the size of the firm relative to the size of the banking system as a whole. Neither variable adds explanatory power and all of the original results remain robust.

We examine in more detail the possibility that the relative size of the banks within a country impacts a firm's choice of number of bank relationships. Large firms in countries with relatively small banks may be forced to seek additional bank relationships each time their needs exceed the capacity of their incumbent banks. Conversely, large firms in countries with relatively large banks may require fewer bank relationships. To examine this possibility, we add the variable Number of Big Banks, defined to be the number of banks in a country on the 1995 list of Global Fortune 500 companies, to the cross-country regressions of Table VIII. Each number is weighted to reflect the bank's ranking in the survey, with higher rankings receiving more weight. With the addition of Number of Big Banks, the coefficient estimates on Bank Fragility and (Bank Fragility)² are no longer statistically significant; all other estimates remain unchanged. In addition, Number of Big Banks is estimated to have a positive impact on the number of bank relationships, indicating that firms actually maintain more bank relationships in countries with large banks.

Measuring bank concentration relative to total commercial bank assets—as we do with the variable Concentration Ratio—overstates the concentration of the banking industry in countries where traditionally noncommercial banks play a role in the commercial market. In Germany, for instance, *Landesbanken* are not counted as commercial banks but fulfill many of the functions of a commercial bank. As an alternative measure of bank concentration, we consider the proportion of a country's total bank assets accounted for by the three largest banks within the country. We obtain these numbers, which are averaged over the period 1989–1996,

from Cetorelli and Gambera (1999).¹⁸ Some of the concentration ratios are significantly altered by the new adjustment. For example, Germany's ratio drops from 90% under our original definition to 27% under the new definition, while France's ratio drops from 64% to 28%. Overall, the correlation between the alternative measure of concentration and the original Concentration Ratio is 0.458. Despite the differences in the two measures, we find that the cross-country regressions are basically robust to the new measure except that Bank Fragility and (Bank Fragility)² are no longer statistically significant. The decline in statistical significance may stem from the reduction in the cross-country sample to 15 observations or may indicate that the bank fragility variables are sensitive to the measure of bank concentration.

Because the Finance and Building Societies and Insurance and Pension Fund industries are finance-related, they may maintain bank relationships for reasons other than nonfinancial firms. We therefore re-estimate all models with firms in these industries removed. This procedure does not alter our results. We also drop all firms that do not report "short-term funding (up to one year)" as a cash management activity and rerun all regressions. By eliminating firms not engaged in a short-term lending relationship with a bank, we emphasize the set of firms most closely linked to the theories that focus on lending relationships. All of the results remain robust to this reduced sample.

In attempt to pick up stronger industry effects, we group the 46 industries into seven single-digit NAICS categories (NAICS, which stands for North American Industry Classification System, is similar to the older Standard Industry Classification (SIC) system). Appendix 3 reports the results from firm-level regressions using the industry groupings. Two of the broad industry classifications are statistically significant: Manufacturing, which is negative and significant at the 10% level, and Arts, Entertainment, Accommodation, and Food Services, which is negative and significant at the 5% level. The results on the other variables, including the country variables, are not affected by such a transformation of the industry dummies.

Finally, the fact that all coefficient estimates for model (3) in Table VIII are significant at the 10% level or better suggests the possibility that our model overfits the data. As a rough gauge of the reasonableness of our estimates, we perform the following exercise. First, we substitute the mean values of the country-level variables for three countries not contained in the data set, the United States, Canada, and Japan, to obtain fitted values for the country residuals. We use these fitted values—6.71 for the United States and 2.91 for Japan—along with the estimates and data from Table VI to back out the implied average number of relationships for the United States and Japan. We obtain an estimate of 8.22 relationships for the United States and 4.42 for Japan. These results are of the same magnitude as reported by Houston and James (1996), where the average number of banks per firm is 5.22 for the United States, and Horiuchi (1994), where the average is

¹⁸ Three countries in our sample (Ireland, Luxembourg, and Switzerland) are missing from the Cetorelli and Gambera (1999) sample.

between 3.4 and 7.7 for Japanese firms. We obtain a predicted value of 4.70 for Canada, but do not have a source to assess the reasonableness of this estimate.

5. CONCLUSION

To our knowledge, this paper provides the first comprehensive look at the variation in number of bank relationships across firms and countries. Employing the responses from a large cross-sectional survey of corporate treasurers and cash managers in Europe, we find that some countries are characterized by firms with many bank relationships, while in other countries, it is more common to maintain only one bank relationship. We explore the ability of both firm-level and country-level variables to explain these cross-country differences. We find that firms in countries with relatively stable and unconcentrated banking systems maintain more bank relationships, while firms in countries with strong judicial systems and strong creditor protections maintain fewer bank relationships.

Extensions to this paper could take several directions. One interesting area is the influence of foreign bank relationships. Firms with significant operations in foreign countries may rely heavily on bank relationships within the countries they operate. However, banks could also establish operations in foreign countries to service their host-country customers. Another possible avenue for future research could investigate the importance of single versus multiple relationships in other financial arrangements. For example, will firms in multiple-bank countries also choose to maintain relationships with many insurance companies? Does a preference for multiple creditors imply that a firm will choose to forge trade credit arrangements with many product suppliers?

APPENDIX 1

Overview of Number of Bank Relationships, by Industry

Industry	NAICS Code	N	Number			%Firms with n relations		
			Average	Median	Maximum	$n = 1$	$n = 2$	$n = 3$ to 7
Motor vehicle sales	4	13	10.7	9	30	7.7	0.0	30.8
Finance and building societies	5	46	10.0	4	70	14.3	28.6	21.4
Real estate	5	2	9.5	9	17	0.0	50.0	0.0
Motor vehicles	3	28	8.3	5	30	7.4	18.5	37.0
Textiles	3	19	8.2	7	20	0.0	5.6	44.4
Extraction, petroleum, gas	2	48	7.0	4	39	6.4	14.9	55.3
Tobacco	3	11	7.0	5	22	0.0	22.2	55.6
Post and telecommunications	8	24	6.6	2	30	10.0	45.0	25.0
Insurance and pension funding	5	84	6.2	4	50	17.9	17.9	44.9
Construction	2	34	6.1	4	20	9.4	15.6	50.0
Hotels and restaurants	7	4	6.0	3	15	0.0	25.0	50.0

Industry	NAICS Code	N	Number			%Firms with n relations		
			Average	Median	Maximum	$n = 1$	$n = 2$	$n = 3$ to 7
Basic metals	3	35	5.9	3	30	17.1	22.9	37.1
Recreation incl. broadcasting	7	8	5.9	4	21	12.5	12.5	62.5
Mining, metal ores	2	11	5.7	3	12	0.0	30.0	30.0
Computing machinery	3	23	5.7	3	30	26.1	13.0	34.8
Publishing	3	16	5.5	2	24	31.3	18.8	25.0
Electricity and gas	2	32	5.3	3	20	19.4	22.6	32.3
Other	—	30	5.3	3	40	14.3	14.3	53.6
Leather	3	1	5.0	5	5	0.0	0.0	100.0
Paper and paper products	3	15	4.7	3	20	14.3	21.4	50.0
Retailers	4	36	4.7	3	33	19.4	22.6	41.9
Chemical, pharmaceutical	3	94	4.5	3	29	22.0	23.1	40.7
Electrical machinery	3	30	4.5	3	20	16.7	20.0	50.0
Air transport	4	7	4.3	3	9	14.3	28.6	42.3
Engineering	5	26	4.3	3	22	19.2	23.1	42.9
Foods, products, and beverages	3	81	4.1	3	20	19.0	12.7	53.2
Radio, TV, and communication	3	14	4.1	3	11	7.1	14.3	71.4
Rubber and plastics products	3	7	3.9	3	10	14.3	14.3	57.1
Wholesalers	4	11	3.8	3	12	10.0	20.0	60.0
Health and service activities	6	7	3.6	3	8	0.0	28.6	57.1
Building materials	2	14	3.5	3	7	14.3	21.4	64.3
Agriculture	1	8	3.4	3	7	12.5	25.0	62.5
Computer software	5	8	3.1	3	5	12.5	12.5	75.0
Fishing	1	1	3.0	3	3	0.0	0.0	100.0
Medical and precision tools	3	6	3.0	3	5	33.3	16.7	50.0
Water transport	4	10	2.9	2	10	20.0	40.0	30.0
Forestry	1	4	2.8	3	3	0.0	25.0	80.0
Furniture	3	5	2.8	3	4	20.0	0.0	53.3
Water	2	9	2.8	2	7	22.2	33.3	44.4
Land transport	4	15	2.8	3	5	13.3	33.3	75.0
Wood products	3	5	2.6	3	3	0.0	40.0	60.0
Other transport equipment	3	7	2.6	2	4	0.0	57.1	42.9
Wearing apparel	3	4	2.5	2	4	0.0	75.0	25.0
Travel agencies and tourism	7	4	2.5	2	4	25.0	25.0	50.0
Other mining and quarrying	2	2	1.5	1	2	50.0	50.0	0.0
Renting of machinery	5	1	1.0	1	1	100.0	0.0	0.0
Not specified	—	229	6.1	4	60	11.1	11.1	56.0

Note. NAICS code is the North American Industry Classification System. N is the number of observations. “Number” is the number of bank relationships.

APPENDIX 2

Coefficient Estimates on Industry Dummy Variables from Table VI, Model (3)

Industry	Estimate
Agriculture	-0.45939
Forestry	1.282559
Fishing	2.559094
Extraction, petroleum, gas	2.12213*
Mining, metal ores	2.721874
Other mining and quarrying	-3.45968
Foods, products, and beverages	-0.35781
Tobacco	3.39171
Textiles	-0.10245
Wearing apparel	-1.5389
Leather	-5.87962
Wood products	-0.19049
Paper and paper products	0.237622
Publishing	-0.3889
Chemical, pharmaceutical	-1.06823
Rubber and plastics products	-1.33281
Basic metals	0.636698
Computing machinery	-0.23581
Electrical machinery	-1.47423
Radio, TV and communication	-0.91261
Medical and precision tools	-1.154
Motor vehicles	2.372311*
Other transport equipment	-0.44885
Furniture	-0.00983
Electricity and gas	0.245025
Water	-2.99104
Construction	0.838424
Motor vehicle sales	3.458596*
Wholesalers	-0.88798
Retailers	0.329858
Hotels and restaurants	1.09627
Land transport	-0.81067
Water transport	0.154208
Air transport	0.714836
Travel agencies and tourism	-0.4869
Post and telecommunications	2.098874
Finance and building societies	2.427364**
Insurance and pension funding	0.874122
Real estate	3.976417
Renting of machinery	-24.0549
Computer software	0.798172

Industry	Estimate
Health and service activities	-0.22476
Recreation incl. broadcasting	1.508764
Engineering	0.153282
Building materials	-0.52428
Other	0.174176

APPENDIX 3

Firm-Level Tobit Regressions Using Broad Industry Classifications

NAICS		Model	
Code		(1)	(2)
	Constant	3.65***	-0.259
	22 country dummies (Cdum)	no	yes
	Home sales	0.661***	0.441***
	World-wide sales	-0.262***	-0.135
	Relationship scope	0.269***	0.0350
	Relationship importance	-0.433***	-0.000244
	Industry groupings		
1	Agriculture, forestry, fishing, and hunting	-2.52	-0.00534
2	Mining, utilities, and construction	-0.831	0.538
3	Manufacturing	-1.07*	-0.505
4	Trade and transportation	-1.53	0.273
5	Finance and professional services	-0.161	0.813
6	Educational services, health care, and social assistance	-1.10	-0.416
7	Arts, entertainment, accommodation, and food services	-2.60**	-0.0515
	Pseudo- R^2	0.404	0.551
	Likelihood ratio test statistic	8.88	287.6***
	(versus model, degrees of freedom d)	(6-1, 7)	(1, 22)

Note. NAICS code is the North American Industry Classification System. Number of observations (N): 1010. Tobit model estimated using maximum likelihood with correction for left truncation at 1. Dependent variable: the number of domestic cash management relationships. The pseudo- R^2 is defined as $\{L(\theta_i)^{2/n} - L(\alpha)^{2/n}\} / \{L(\theta_i)^{2/n} - L(\alpha)^{2/n}\}$, with $L(\alpha)$ the maximum of the likelihood function when maximized to the constant only. The likelihood ratio test statistic $-2 \log(L(\theta_i)/L(\theta_j))$ is asymptotically distributed $\chi^2(d)$.

***Significant at 1%.
 **Significant at 5%.
 *Significant at 10%.

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