

# What Determines the Number of Bank Relationships?

## Cross-Country Evidence

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### **Abstract**

We investigate the determinants of multiple-bank relationships using a new data set comprised of 1079 firms across twenty 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 strong, but decentralized banking systems and active public bond markets.

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## I. 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.<sup>1</sup> 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. Petersen and Rajan (1994), Ongena and Smith (1998), and Harhoff and Körting (1998b) report statistics consistent with the one-bank (or 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, consist of 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 gathered from 20 European countries, we document that single-bank relationships are relatively uncommon and that many firms maintain relationships with *many* banks. Less than 15% of the firms in our sample maintain single-bank relationships, while 20% report using eight or more banks. Moreover, the

distribution of number of bank relationships varies considerably across countries. For instance, *no* sample firm in Sweden or Norway maintains more than six bank relationships, but the *majority* of firms in Italy, Portugal and Spain maintain at least six bank relationships.

We devote the remainder of the paper to explaining this puzzling incidence of multiple-bank relationships. From firm- and industry-level data, we first investigate whether the composition of firms *within* a country explains the variation *across* countries. Although some firm-level characteristics, such as size, significantly impact the choice of number of bank relationships, we find that they cannot alone explain the incidence of multiple-bank relationships. We therefore turn to investigating the “residual” cross-country variation not explained by firm characteristics.

Motivated by a relatively new set of theories, 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. These variables turn out to explain a large proportion of the variation left unexplained by the firm and industry variables.

We show that firms maintain, on average, more bank relationships in countries with unconcentrated banking systems, inefficient judicial systems and where the enforcement of creditors' rights is weak. Firms in countries with fragile banking systems also tend to use fewer banks, though the relation is nonlinear. Moreover, the average number of bank relationships is positively related to the sophistication of a country's public debt markets. Though these results are interesting, we suspend making strong statements about causality. It is likely that our variables are closely correlated with other country-level variables not included in the analysis and that some latent variable jointly determines the number of bank relationships and some of the explanatory

variables.

Other papers incorporate number of bank relationships into their analysis, though to our knowledge, no paper has examined bank relationships at such a comprehensive level. Petersen and Rajan (1994), Houston and James (1996), Pagano, Panetta and Zingales (1998), Ongena and Smith (1998), and Harhoff and Körting (1998b) use number of bank relationships as an explanatory variable in regressions on other relationship characteristics. However, the focus of these papers is not on the choice of number of relationships. Our study is closer in spirit to Detragiache, Garella and Guiso (1997) and Harhoff and Körting (1998a). Motivated by their observation that Italian firms tend to maintain many bank relationships while U.S. firms do not, Detragiache et al. (1997) develop a theory of choice of number of bank relationships.<sup>2</sup> Although they report summary bank statistics from the U.S. and Italy to help support their arguments, Detragiache et al. (1997) do not attempt to directly test the predictions of their model. We include such tests here. Harhoff and Körting (1998a) study the choice of number of creditors using detailed survey data on German firms with less than 500 employees. Their study emphasizes the impact the number of creditors has on the likelihood a firm later becomes distressed. In contrast, our analysis relies on a data set of relatively large firms from many countries and emphasizes the cross-country variation in 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, and discusses the construction, of the explanatory variables. Section IV presents the bulk of our results. Section V concludes.

## II. Cross-Country Data

### A. *The survey data*

Our primary source of firm-level information is *GlobalCash-Europe96*, a survey of treasury and cash managers conducted in 1996 across twenty European countries under the auspices of *The Bank Relationship Consultancy* and the School of Management at the University of Bath.<sup>3</sup> The aim of the survey is to study the cash management and electronic banking practices of large European corporations. Its main vehicle is a twelve-page questionnaire containing 60 questions and made available in ten different languages. The 1996 questionnaire was mailed to cash managers in 5800 companies and was completed by 1079 respondents, yielding a 19.5 percent 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.

### B. *Number of bank relationships by country and size*

The survey asks participants to list the number of banks they use for cash management purposes within their own country.<sup>4</sup> We take the response to this question as our measure of number of bank relationships. We will justify its use in the next section. First, we summarize in Table 1 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 20% use more

than seven banks. Across all countries, the mean number of relationships is 5.6 and the median is 3.

Somewhat more startling is the variation in the distribution of number of relationships *across* countries. In Table 1, we rank by average number of bank relationships per firm, the 20 countries and two coordination centers. Italy represents one end of the extreme. The median firm in Italy 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 nine banks, and in Belgium and Spain the median is seven. On average, 2.7% of the firms in these four countries use only one bank, while 54.2% use more than seven banks. By way of contrast, single-bank relationships are common in Norway, Sweden, the UK, and Ireland. On average, 24.2% of the firms in these countries use only one bank. The median firm uses two banks and 3.3% of the firms, on average, 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 banks, 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 3 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 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. This makes the median firm in our sample much larger than the U.S. firms in Petersen and Rajan (1994) (with median book value of assets of roughly \$300,000), and roughly the same size as the firms in Houston and James (1996) (with median sales

of roughly \$1.37 billion).

No strong pattern emerges in the average or median value of number of bank relationships across the categories. The median number of bank relationships across all categories is surprisingly stable at three or four. The table does indicate that the number of bank relationships is skewed to the right for larger firms. For instance, only 13.4% of firms with sales less than \$100 million use more than seven banks. For firms with sales greater than \$10 billion, the proportion is 30.4%.

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, for some countries, single-bank relationships are exceptionally rare and multiple-bank relationships consist of *many* banks. For these countries, it is unlikely that monopoly bank relationships are optimal and it does not appear that the motive for holding multiple-bank relationships originates from the desire to mitigate holdup costs. Fourth, the observed distribution of number of bank relationships in other countries is consistent with theories that suggest that one, or a few, banks is optimal.

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

### *C. 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 3 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 liquidity-related activities. Moreover, out the 11 individual activities, “short-term funding (up to one year)” is the second most popular choice, after “liquidity management”.<sup>5</sup>

The predominance of short-term debt in Europe (see, for example, Rajan and Zingales (1995), Table II), strengthens the intersection between credit-based relationships and cash management relationships. In fact, summary statistics on number of *credit* relationships from other papers suggests that the match is very close. Pagano et al. (1998) and Detragiache et al. (1997) draw on data from the Central Credit Registry of Italy. Pagano et al. (1998) report the median number of bank credit relationships to be 11 and the mean to be 13.9. With average sales of \$1.1 billion, the firms in Pagano et al. (1998) are slightly smaller than the Italian firms in our data set. From a sample of larger firms, Detragiache et al. (1997) report the median and mean to be 13 and 16.4, respectively. By comparison, we find Italian firms maintain a median of 12 and mean of 15.2 bank relationships. According to Table 3, average sales of the Italian firms in our data set is \$1.5 billion. Based on average sales of \$5 billion, we find the median number of bank relationships per German firm to be five and mean to be 8.1. Using credit file data on German firms with average turnover of \$150 million, Elsas and Krahnert (1998) also report a median of five bank relationships and a mean of 6.0. Finally, Ongena and Smith (1998) report a median of one and mean of 1.4 for publicly traded Norwegian firms with average sales of \$250 million. Here, the median number of relationships for a Norwegian firm having average sales of \$550 million is two and the mean is 2.3.<sup>6</sup>

Overall, cash management requires classic banking services such as lending, collecting deposits and brokering of other financial activities. These bank-related activities are simply limited to the short term. Therefore, the breadth of bank-related cash management services used by a firm

can also serve as a proxy for the *scope* of a bank relationship beyond a lending relationship. In table 3, we group responses to the cash management activity question according to whether they are liquidity-related, investment-related, lending-related, or foreign exchange-related. More importantly, we report separately the response “bank relationship management”. With an 82.4% response rate, "bank relationship management" ranks a close third to "short-term funding (up to one year)", as the most popular choice. The popularity of the response indicates that an important function of a corporate cash manager is to act as the liaison between the firm and its relationship banks.

### **III. Motivation and Description of Explanatory Variables**

#### *A. Theory*

In early information-based theories, like Diamond (1984), Ramakrishnan and Thakor (1984), and Boot and Thakor (1994), banks arise as coalitions of investors devoted to reducing either redundant monitoring or the costs of renegotiation. These theories imply that a firm in need of bank financing will find it optimal to borrow from only one bank. However, a sole bank also has monopoly access to private information about the firm. Such a bank can exploit this monopoly power in the future, 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 a firm can avoid these holdup costs by establishing a relationship with another firm. Still, Petersen and Rajan (1994) argue that a single bank relationship may be optimal in a repeated-lending setting if competition from other banks impedes the ability for the monopoly bank to construct accommodative pricing arrangements.

In any case, because the above arguments imply that we should only observe single-bank relationships, or multiple-bank relationships with relatively few banks, they cannot adequately

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

### *1. Diversification of bank relationships*

Firms may have incentive to diversify across bank relationships when the risk of losing a given bank relationship is high. For example, Detragiache et al. (1997) 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. Detragiache et al. (1997) 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 number of bank relationships to be positively related to the efficiency of a country's bankruptcy procedure

### *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, *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.<sup>7</sup> 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.

Increasing the cost of strategic default by maintaining multiple creditors will be important in countries where the deadweight costs of bankruptcy are low or where company managers are protected under bankruptcy regulations. For example, bankruptcy procedures in some countries impose an automatic stay, preventing senior creditors from gaining possession of company assets and allowing managers to remain in control. Moreover, bankruptcy codes, such as Chapter 11 in the U.S., explicitly protect incumbent managers during bankruptcy. Therefore, value-maximizing firms may have an incentive to maintain multiple bank relationships in countries where creditor protections are weak, in order to properly discipline management.

### *3. Banks as transactions centers*

We hypothesize that structures influencing the tradeoff between a bank-dominated and capital market economy may also influence the average number of bank relationships. However, the direction of such a relationship is unclear. Boot and Thakor (1996) argue that banks may compete on a transactions-oriented basis in economies with weak capital markets, but compete for relationship lending in an economy with strong capital markets. If multiple-bank lending simply serves as a substitute for capital market financing (which typically involves many lenders), then we should observe economies with stronger capital markets having, on average, fewer bank relationships per firm.

#### *B. Explanatory Variables*

Our cross-sectional analysis of number of bank relationships includes firm-specific variables, industry dummies, and country-level variables. We use the firm-specific characteristics and industry dummies mainly as control variables. We focus our greatest attention on the country-level

variables. Table 4 provides a summary of the variable definitions. Table 3 provides summary statistics, by country, for the firm-level characteristics. Appendix 1 provides summary information by industry. Table 5 list the values of the country variables.

### *1. Firm-specific and industry dummy variables*

The first firm-specific variable is size. We measure size using the categorical variables (described in Section II.A) for home and world-wide sales, measured in U.S. dollars. We conjecture that larger firms will require more bank relationships, because as firms grow, their service requirements and financing needs may exceed the capacity of any one bank in their country. The frequency distributions in Table 2 mildly support this conjecture. We also include a proxy for the breadth of potential bank services required as part of a cash management relationship. We define *Relationship Scope* to be the number of activities, out of a possible 11, considered by the respondent to be a part of cash management. If banks are limited in the type 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 bank relationships, we also include the variable *Relationship Importance*. This variable is an assessment by the surveyed cash manager of the importance of a relationship, among a set of eight possible criteria, when choosing to allocate business across banks. The variable takes on an integer value between zero and five, with zero corresponding to "least important" and five being "most important". If banks serve only as transaction centers for firms with many bank relationships, then number of bank relationships should be negatively related to *Relationship Importance*. Finally, we include industry dummies for 46 specific industries. Different industries have different external financing requirements and some industries may be more reliant on bank financing than others (see Rajan and Zingales (1995)). We use our detailed industry classifications to control for such variation.

## 2. Country-level Variables

Motivated by the diversification arguments in Detragiache et al. (1997), 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 conjecture 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 zero and ten, with lower values corresponding to less default risk. Because Detragiache et al. (1997) argue that the relationship between number of bank relationships and bank fragility is non-monotonic, we also include the squared value of Bank Fragility in our analysis.

We include two variables to study the impact of bankruptcy regulation 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 zero (low efficiency) and 10 (high efficiency). We obtain the scores from Mauro (1995). With the second variable, *Creditor Rights\*Rule of Law*, we proxy the extent to which creditor rights are protected in a country by multiplying an index of creditor rights by an assessment for the rule of law in a country. Both variables are from La Porta, Lopez-de-Silanes, Shleifer and Vishny (1997). They form the creditor rights index by considering a country's laws regarding creditor restrictions on other stakeholders (such as minimum dividends or consent to file for reorganization), plus laws regarding automatic stays, guarantees of priority, and who obtains control during bankruptcy. The index ranges between zero and four, with a four corresponding to the strongest creditor rights laws. We use the rule of law variable as a proxy for the enforcement tradition in country. We use the product of the two variables because enforcement of creditor protection laws may be lax in some countries.<sup>8</sup>

The deadweight cost of bankruptcy procedures should be lower in countries with a high value for *Judicial Efficiency*. If low bankruptcy costs make it easier for firm managers to strategically default, then firm investors may demand multiple creditors in order to "harden" the manager's budget constraint. Therefore, we predict that firms operating within efficient judicial systems will prefer to maintain more bank relationships (Detragiache et al. (1997) make the same prediction using a different argument). On the other hand, creditor protection laws increase the cost of strategic default, serving as a substitute hard budget constraint to multiple creditors. Therefore, we predict that countries with strictly enforced creditor protection laws will have fewer bank relationships.

To measure the influence of capital 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. Its source is *Capital Markets 1997*, published by the International Monetary Fund. If capital markets are a substitute for bank financing, then 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 total banking assets in 1993 accounted for by a country's three largest banks. For Norway, the source is Nordal and Nærland (1995), for all other countries the source is Barth, Nolle and Rice (1997). Following Dewatripont and Maskin (1995), we hypothesize that countries with a high bank concentration will have fewer bank relationships.

## IV. Cross-Country Regressions

### A. Firm-level regressions

We begin our cross-sectional investigation with firm-level regressions of number of bank relationships on firm-specific characteristics, industry dummy variables, and country-level variables. The results are in Table 6. Because number of bank relationships is discrete-valued and truncated, ordinary least squares (OLS) estimates of the slope coefficient and standard errors will be biased. We report estimates from Tobit regressions, but check all our results with both OLS and two specifications of a "count" model.<sup>9</sup> In signs and significance, our results are similar across all specifications, but the Tobit specification is advantageous for two reasons. First, it corrects for the truncation bias induced by the fact that number of bank relationships cannot be negative. Second, like OLS, Tobit produces coefficient estimates that directly represent the marginal impact of a unit change in an explanatory variable on the dependent variable. This makes later analysis simpler to interpret. Though a count model corrects for both truncation bias and the discrete nature of the data, it produces coefficient estimates that are more difficult to interpret.

Variation in *types* of firms across countries could explain the differences observed in Table 1. For example, if Italian firms tend to be relatively large motor vehicle sales companies, then the high average number of bank relationships in Italy could be due to the composition of firms there, not necessarily to separate country effects. Indeed, Models (1) and (2) in Table 6 indicate that firm and industry characteristics describe a substantial amount of firm-level variation in number of bank relationships. Model (1) contains the first set of firm-specific characteristics, *Home Sale*, *World-wide Sales*, *Relationship Scope*, and *Relationship Importance*. These alone explain 39.8% of the variation in number of bank relationships. The coefficient estimates indicate that a firm's choice of number of bank relationships increases in home sales, but decreases in world-wide sales. Firms

with more sales abroad maintain relatively fewer *domestic* bank relationships. Such firms may compensate this reduction by maintaining more bank relationships in foreign countries. In addition, the estimates in model (1) suggest that firms that include more activities as part of cash management use more banks and firms that place a stronger emphasis on the value of a bank relationship maintain fewer bank relationships. Model (2) adds in 46 industry dummy variables. To save space, we relegate the industry dummy coefficient estimates to Appendix 2. Fewer estimates are statistically significant than would be expected by chance. We also try an alternative specification that groups the 46 industries into 7 single digit NAICS categories. Appendix 3 contains these coefficient estimates. Two broad industry classifications are significant, otherwise the results are similar. Moreover, although the pseudo- $R^2$  in model (2) increases to 42.6%, a likelihood ratio test cannot reject the null hypothesis that the industry dummies add no explanatory value to the specification in model (1).

Model (3) adds 21 country dummy variables to the specification. To avoid collinearity with the intercept, we omit Norway from the variable list. The results are striking. Most of the country dummy estimates are large, statistically significant, and maintain the order, by magnitude, of the countries in Table 1. By including the country dummies, the pseudo-linear fit of the model jumps to 56.5%, a level that easily rejects the null that the fit is no better than in model (2). Moreover, once we add the country dummies, the bulk of the firm-specific characteristics are no longer significant. The exception is home sales, which remains positive and statistically significant at the 1% level. Therefore, country identity captures substantial variation left unexplained by the firm-level variables and even dominates characteristics that were previously significant. Of course, that a majority of the country dummy estimates are statistically significant (i.e., different from Norway) provides little information about their cross-sectional variation. For instance, common factors across groups of countries could induce correlation in the estimates. We investigate this possibility

in the next subsection.

First, we turn to whether the *country-level* variables explain variation in number of bank relationships not captured by the country dummies. To do this, we would prefer to simply add the country-level variables to the specification in model (3). Unfortunately, using both country-level variables and the country dummies in the same regression creates collinear columns of data.<sup>10</sup> Therefore, in model (5), we instead replace the country dummies with the country-level variables and compare pseudo-R<sup>2</sup>s across the two specifications. One problem remains with the two models. We lack complete country-level data on four countries (Czech Republic, Hungary, Luxembourg and Poland). Model (4) is identical to model (3), except that it drops observations from the three missing countries, leaving 898 observations. With the removal of the four countries, the pseudo-R<sup>2</sup> increases to nearly 80%, but the magnitude and significance of the estimates remain the same. According to model (5), the cross-country variables also strongly influence the choice of number of bank relationships. The pseudo-R<sup>2</sup> in model (5) is 74.6%, compared with 79.6% in model (4) and the estimates in model (5) easily reject the hypothesis that the country-level variables add nothing to the fit of model (2) (using a version of (2) that drops the missing observations). Model (5) indicates that firms maintain *more* bank relationships in countries with unconcentrated and strong banking systems, weak enforcement of creditor rights, inefficient judicial systems and active bond markets.

The comparison between models (4) and (5) leaves unclear the extent to which the country-level variables account for the variation in number of bank relationships across countries. Below, we introduce a more direct method for measuring this association. At that point, we discuss in more detail the regression results of model (5).

### *B. Using country residuals*

Multiple regression econometrics yields a useful interpretation of the country dummy estimates

reported in models (3) and (4) of Table 6. Each estimate is an average, for a given country, of the residual number of bank relationships left unexplained by firm and industry characteristics. In other words, the estimates provide us with a country-by-country adjustment for the impact of composition- of-firms within a country. In the analysis to follow, we will refer to estimates as country “residuals”.

Common variation across groupings of countries is apparent both in Table 1 and in the country residuals. Italy, Portugal and Spain are southern European countries and all have similarly high-valued country residuals, while the UK, Norway and Sweden are northern European and all have similarly low-valued residuals. To assess the statistical importance of such correlation, we conduct Wald tests for equivalence across different groupings of the residuals from Model (3) of Table 6. Such groupings alone will aid in understanding what influences the cross-country variation in number of bank relationships.

We group countries according to legal origin, as defined by La Porta et al. (1997). That is, we group the 22 countries according to whether their origin of law is English, French, German or Scandinavian. We include an additional category not found in La Porta et al. (1997) for countries that were formerly part of the Eastern bloc of communist countries (Hungary, the Czech Republic and Poland). This classification is adopted for two reasons. First, we wish to avoid explicit data-snooping biases that may arise by grouping the countries according to an arbitrary measure of "common region". The La Porta et al. (1997) categorization provides us with a grouping method based on results external to this paper. 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 7 contains the results. We start by testing whether we can reject the joint hypothesis

that all of the country intercepts are equal. As can be seen in the row labeled “All”, this hypothesis is easily rejected. We then test whether we can reject the hypothesis that the residual estimates are equal within the groupings and across groupings. For tests of equality *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. That is, the country residuals within these groupings are statistically of the same magnitude. The test of Scandinavian countries produces a chi-squared value rejecting equality at the 10% level. However, with chi-squared values of 132 and 15.8, we can easily reject the hypothesis that the country residual estimates are equal inside the French and German law countries. These are the countries found in La Porta et al. (1997) to 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.

We next examine the variation *across* the country groupings by replacing the country dummy variables in Table 6, model (3) with dummy variables corresponding to legal grouping. We set the Scandinavian country grouping equal to zero. In the lower half of Table 7, we report the results of the Wald test that all of the grouping dummies are equal to zero and a tableau of pair-wise Wald tests between each grouping. This portion of the table indicates that equality across all legal origin groups is strongly rejected, and that many pair-wise comparisons are also rejected.

### *C. Country-level regressions: Spanning tests*

In this section, we obtain a feel for how much of the cross-country variation in number of bank relationships can be accounted for by the country-level variables. We center our examination around OLS regressions of the country residuals on the country-level variables. The idea is that such regressions will test whether the seven chosen variables "span" the country residuals in the

sense that they explain the cross-country variation not accounted for by the firm-level regressions.

Table 8 reports the results using the 18 countries for which we have country-level data. Model (1) in that table excludes the bank fragility and legal variables. The model (1) regression indicates that number of bank relationships across countries is negatively related to the value of the equity market and to the level of bank concentration within a country. Not surprisingly, firms in countries dominated by a few banks tend to maintain relatively fewer bank relationships. In addition, the estimates suggest that firms with access to well-developed, liquid equity markets require fewer bank relationships per firm.

However, the development of a country's banking system and its capital markets may be endogenously related to the legal environment of the country. Models (2) and (3) demonstrate the impact of adding the bank fragility, judicial efficiency and creditor rights enforcement variables. In model (2), we exclude bank concentration and the securities market variables. Only the coefficient associated with *Judicial Efficiency* is statistically significant. The sign on the estimate implies that more efficient judicial system tends to reduce the average number of bank relationships in a country. This relation is inconsistent with both our cost-of-coordination argument and the prediction made by Detragiache et al. (1997). However, the significant *Judicial Efficiency* variable explains a substantial portion of the linear variation in the country residuals, 51.6% compared with 34.7% when only the capital market and bank concentration variables are included.

When all of the variables are included in the specification (model (3)), the variables explain fully 71.3% of the linear variation in the country residuals and the signs and significance of the variables match closely the regression in Table 6, model (5). The equity market and concentration estimates remain robust, although the statistical significance of *Equity Market/GNP* falls to the 10% level. In addition, the bond market variable becomes *positively* related to number of bank

relationships, suggesting that strong bond markets and number of bank relationships are complements. Boot and Thakor (1996) conjecture the possibility of such complementarity when bank connections are relationship-oriented. The fact that 80% of surveyed managers choose “bank relationship management” to be a primary cash management activity suggests that the bank relationships in our sample are relationship-oriented.

More striking is the statistical significance and sign of the bank fragility and legal variables. The coefficient on *Bank Fragility* enters with a negative and statistically significant sign, while  $(Bank\ Fragility)^2$  is positive and significant, implying a non-monotonic (quadratic) relationship between average number of bank relationships and bank fragility, though in the wrong direction predicted by Detragiache et al. (1997). To see this more clearly, Figure 1 plots number of bank relationships as a function of bank fragility using the coefficient estimates from *Bank Fragility* and  $(Bank\ Fragility)^2$ . For countries with a mean credit rating of six or above, the number of bank relationships is increasing in the fragility of the banking system. For countries with lower rankings, the number of relationships is decreasing in fragility. The coefficient estimate associated with *Judicial Efficiency* remains negative and statistically significant. In addition, *Creditor Rights\*Rule of Law* also becomes negative and statistically significant, which is consistent with our conjecture that strong creditor rights enforcement serves as a substitute hard budget constraint for multiple creditors. However, the negative sign on both legal variables may suggest a role for the overall efficiency of bankruptcy procedures that we cannot explain.

#### *D. Robustness checks*

When adjusting for size in the regressions of Table 6, we ignore the possibility that relative size of a firm within a given country may be more important than size in absolute dollar terms. To control for this possibility, we add interaction variables to the regression of model (3), 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, but large firms maintain relatively fewer bank relationships in Belgium. Adding the interaction variables do not impact the significance of the size variable alone and do not alter any of the later regressions. We check the sensitivity of these results by replacing size with measures of relative size including size divided by country GDP and size divided by the total bank assets of the country. All results remain robust.

We also re-estimate the model eliminating all firms in the Finance and Building Societies and Insurance and Pension Fund industries. Because these industries are finance-related, they may maintain many bank relationships for reasons other than those discussed here. Dropping firms in these industries has no impact on our results. All results are also unaffected when drop all firms that did not report "short-term funding (up to one year)" as a cash management activity. This exercise focuses exclusively on firms that most likely maintain a credit relationship with their banks.

In Table 8, we estimate up to eight coefficients using only eighteen observations. The fact that all coefficient estimates for model (3) 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 two countries not contained in the data set, the US and Japan, to obtain fitted values for the country residuals. We use these fitted values - 6.71 for the US and 2.91 for Japan - along with the estimates and data from Table 6 to back out the implied average number of relationships for the US and Japan. We obtain an estimate of 8.22 relationships for the U.S. 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 US firm is 5.22, and Horuichi (1994), where the average for

Japanese firms is between 3.4 and 7.7.

## **V. Discussion and 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 document large variation in the average number of bank relationships per country and investigate both firm-specific and country-specific determinants of the number of bank relationships. It is typical for most firms in some countries to maintain many bank relationships, while in other countries, it is more common to maintain one bank relationship. Using a methodology analogous to spanning tests, we explore the ability for country-level variables to explain the portion of the variation in average number of bank relationships not explained by firm and industry-level variables. We find that characteristics of both the banking system and the legal environment are important in capturing the variation in number of bank relationships across countries. However, caution should be taken when drawing inferences from our results. The country-level variables are most likely highly correlated with other characteristics not discussed here.

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**TABLE 1. OVERVIEW OF NUMBER OF BANK RELATIONSHIPS, BY COUNTRY**

Country	N	Number of Relationships			%Firms with <i>n</i> bank relationships			
		Average	Median	Maximum	<i>n</i> =1	<i>n</i> =2	<i>n</i> =3 to 7	<i>n</i> >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 Rep.	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
UK	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
<b>Sample</b>	<b>1079</b>	<b>5.6</b>	<b>3</b>	<b>70</b>	<b>14.5</b>	<b>18.8</b>	<b>47.0</b>	<b>19.7</b>

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

**TABLE 2. OVERVIEW OF NUMBER OF BANK RELATIONSHIPS, BY HOME SALES**

Average Home Sales (in Millions of US\$)	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	115	6.8	4	40	17.4	27.8	39.1	15.7
< 100	232	4.6	4	24	18.1	19.0	49.6	13.4
101-250	140	6.1	4	70	13.6	16.4	52.9	17.1
251-500	151	5.8	4	35	11.9	24.5	45.7	17.9
501-1000	140	5.9	4	40	10.7	16.4	48.6	24.3
1001-2000	110	3.7	3	20	13.6	18.2	46.4	21.8
2001-5000	86	5.3	3	50	19.8	15.1	38.4	26.7
5001-10000	49	5.4	3	40	8.2	14.3	46.9	30.6
> 10000	56	6.9	4	60	10.7	7.1	51.8	30.4

**TABLE 3. OVERVIEW OF FIRM AND RELATIONSHIP CHARACTERISTICS, BY COUNTRY**

Country	Average Sales	% 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 Rep.	< 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
UK	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
<b>Sample Average</b>	<b>750</b>	<b>82.4</b>	<b>96.3</b>	<b>87.0</b>	<b>90.2</b>	<b>78.2</b>	<b>3.3</b>

Notes to Table 3. 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. "Credit-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).

**TABLE 4. DESCRIPTION OF VARIABLES FOR CROSS-SECTIONAL ANALYSIS**

Variable	Description
<u>Dependent Variable</u>	
<i>Number of Bank Relationships</i>	Number of domestic cash management relationships.
<u>Country and Industry Dummies</u>	
<i>Industry Dummies</i>	Forty-six industry dummies (no dummy for non-specified industries). See Appendix 1 for identity of industries
<i>Country Dummies</i>	Twenty-one country dummies (no dummy for Norway).
<u>Firm-specific Characteristics</u>	
<i>Home Sales</i>	Annual home country sales.
<i>World Wide Sales</i>	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 millions of US\$, 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\$.
<i>Relationship Scope</i>	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.
<i>Relationship Importance</i>	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: *Moody's Investors Service 1996:5* and *Credit Ratings International 1995:IV (FT Financial Publishing)*.

## Legal Variables

*Judicial Efficiency* Assessment of the "efficiency and integrity of the legal environment as it affects business, particularly foreign firms", produced by *Business International Corporation*. 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 et al. (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 et al. (1997).

*Rule of Law* Description from La Porta et al. (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 et al. (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 ten largest non-financial, privately-owned domestic firms in a given country. Source: La Porta et al. (1997).

*Bond Market / GNP* Ratio of the market value of domestic private sector debt securities to GNP at the end of 1995. Source: *International Capital Markets 1997:11, Table 12 (International Monetary Fund)*.

## Banking Industry Structure

*Concentration Ratio*

Percentage of total banking system assets accounted for by the largest three banks in 1993. Sources: Nordal and Nærland (1995) (Table 2b) and Barth et al. (1997) (Table 2).

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**TABLE 5. COUNTRY-LEVEL VARIABLES**

	<i>Bank fragility</i>	<i>Judicial Efficiency</i>	<i>Creditor Rights</i>	<i>Rule of Law</i>	<i>Equity Market /GNP</i>	<i>Bond Market /GNP</i>	<i>Concentration Ratio</i>
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 Rep.	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
UK	2.63	10	4	8.57	1	0.35	29.1

Notes: Country-level variables used in regression analysis. Table 4 contains a complete description of each variable.

**TABLE 6. FIRM-LEVEL TOBIT REGRESSIONS.**

<u>Explanatory Variables</u>	Model				
	(1)	(2)	(3)	(4)	(5)
<i>Constant</i>	3.11***	3.83***	-0.662	-0.816	32.5***
<i>Home Sales</i>	0.662***	0.624***	0.347***	0.342***	0.542***
<i>World Wide Sales</i>	-0.293***	-0.217**	-0.137	-0.125	-0.172*
<i>Relationship Scope</i>	0.259***	0.242***	0.0102	-0.00161	0.0495
<i>Relationship Importance</i>	-0.442***	-0.399***	0.00610	0.00173	-0.0759
46 Industry Dummies	no	yes	Yes	yes	yes
<u>Country Dummies</u>					
Austria			3.67**	3.62**	
BCCs			4.03***	4.02***	
Belgium			10.4***	10.5***	
Czech Rep.			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	
UK			1.55	1.62	
<i>Bank fragility</i>					-2.46***
<i>(Bank fragility)<sup>2</sup></i>					0.219***
<i>Judicial Efficiency</i>					-2.17***
<i>Creditor rights*Rule of Law</i>					-0.0927**
<i>Equity Market/GNP</i>					-1.72
<i>Bond Market/GNP</i>					4.97***
<i>Concentration Ratio</i>					-4.93***
Number of observations	1010	1010	1010	898	898
Pseudo-R <sup>2</sup>	0.398	0.426	0.565	0.796	0.746
Likelihood ratio test statistic (versus model, degrees of freedom <i>d</i> )		47.5 (1, 46)	279.8*** (2, 21)	241.8*** (2', 18)	199.2*** (2', 7)

Notes to Table 6. 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- $R^2$  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  $-2\log(L(\theta_i)/L(\theta_j))$  is asymptotically distributed  $\chi^2(d)$ . \*\*\* Significant at 1%, \*\* significant at 5%, \* significant at 10%.

**TABLE 7. WALD TESTS OF RESIDUAL GROUPINGS BY LEGAL ORIGIN**

	Number of Restrictions	Value of $\chi^2$
<i>Hypothesis Tested: Country Dummies are Equal within Grouping</i>		
All	21	320***
<i>Origin of Law</i>		
English	2	0.45
French	8	132***
German	2	15.8***
Scandinavian	3	7.31*
Eastern Europe	2	1.64
<i>Hypothesis Tested: Country Group Dummies are Equal across Groupings</i>		
All	4	231***

Coefficient Estimate		<i>Pair-wise <math>\chi^2</math> Tests Across Groupings</i>			
		French	German	Scandinavian	Eastern Europe
-0.369	<i>Origin of Law</i>				
5.80***	English	99.8***	11.3***	0.28	3.36*
2.24***	French		25.5***	84.9***	31.8***
0	German			7.64**	0.92
1.29	Scandinavian				2.16
	Eastern European				

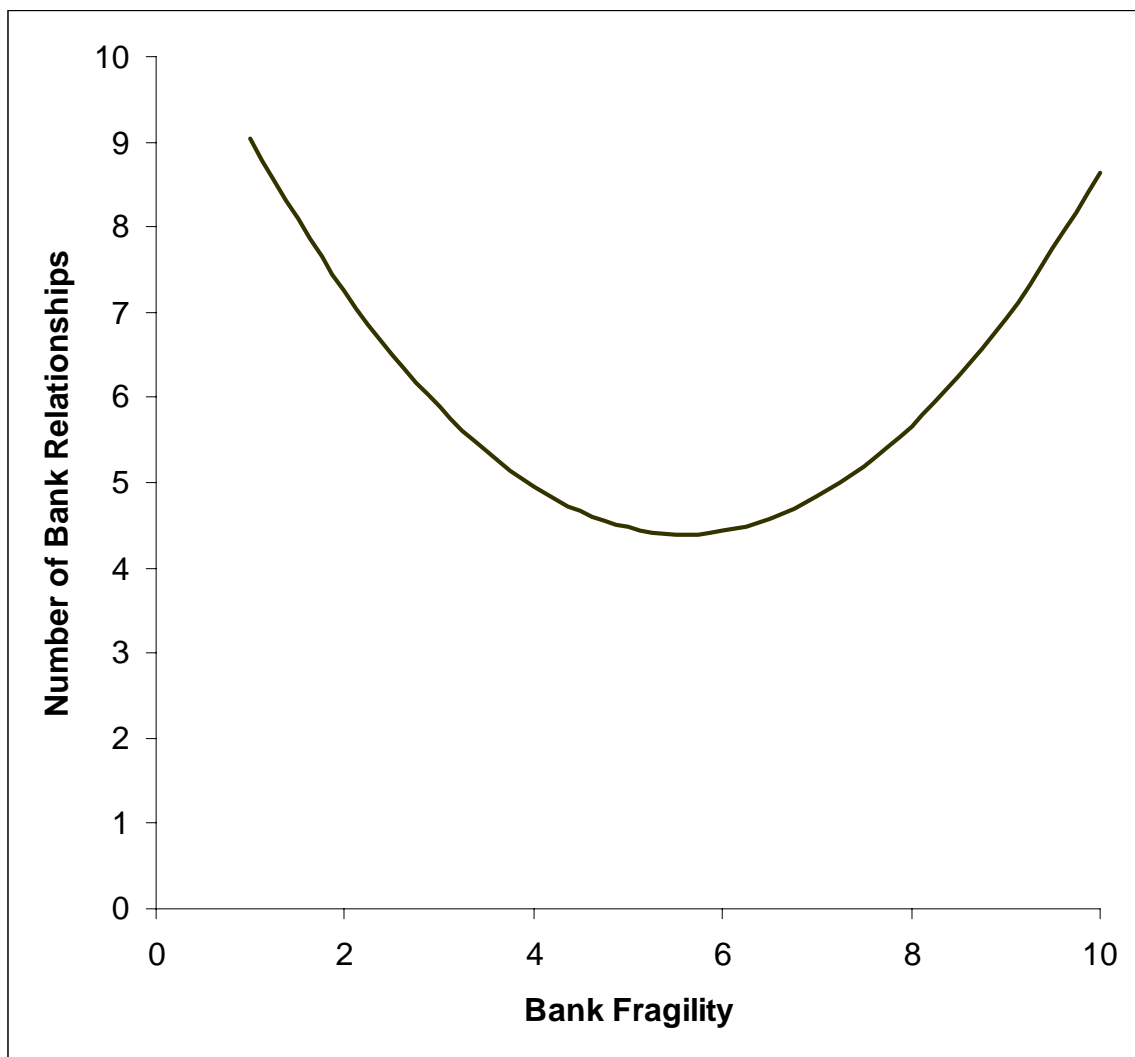
Notes. English law origin countries are: Ireland, UK, and the Irish Financial Service Centers; French law origin: Italy, Portugal, France, Belgium, Spain, Greece, Luxembourg, the Netherlands and Belgian Coordination Centers; German law origin: Germany, Switzerland, and Austria; Scandinavian law origin: Norway, Finland, Denmark, and Sweden; and Eastern European countries are: Hungary, the Czech Republic, and Poland. Number of observations: 1010. The restrictions are imposed on model (3) in Table 6. \*\*\* Significant at 1%, \*\* significant at 5%, \* significant at 10%.

**TABLE 8. COUNTRY-LEVEL REGRESSIONS: SPANNING TESTS**

	(1)	(2)	(3)
Constant	13.6***	26.8***	37.8***
<i>Bank fragility</i>		0.00622	-3.47***
<i>(Bank fragility)<sup>2</sup></i>		0.0256	0.291***
<i>Judicial Efficiency</i>		-2.42***	-1.92***
<i>Creditor rights * Rule of Law</i>		0.0300	-0.147**
<i>Equity Market / GNP</i>	-10.1***		-3.44*
<i>Bond Market / GNP</i>	-1.53		6.26***
<i>Concentration Ratio</i>	-0.897**		-7.93**
Adjusted R-squared	0.347	0.516	0.713
Number of observations	18	18	18

Notes. The Spanning Test is a linear model estimated employing Ordinary Least Squares with White (1980) correction for heteroskedasticity. Dependent variable: coefficients on the Country Dummies from model (4) in Table 6. \*\*\* Significant at 1%, \*\* significant at 5%, \* significant at 10%.

**FIGURE 1. THE NUMBER OF BANK RELATIONSHIPS AND BANK FRAGILITY**



Notes. The figure is constructed using the coefficients from Table 6, model (5) for the average firm in the sample.

**APPENDIX 1. OVERVIEW OF NUMBER OF BANK RELATIONSHIPS, BY INDUSTRY**

Industry	NAICS	N	Number			%Firms with <i>n</i> relations		
			Average	Median	Maximum	<i>n</i> =1	<i>n</i> =2	<i>n</i> =3 to 7
Motor Vehicle Sales	4	8	10.7	9	30	7.7	0.0	30.8
Finance and Building Societies	5	4	10.0	4	70	14.3	28.6	21.4
Real Estate	5	1	9.5	9	17	0.0	50.0	0.0
Motor Vehicles	3	47	8.3	5	30	7.4	18.5	37.0
Textiles	3	10	8.2	7	20	0.0	5.6	44.4
Extraction, Petroleum. Gas	2	2	7.0	4	39	6.4	14.9	55.3
Tobacco	3	79	7.0	5	22	0.0	22.2	55.6
Post and Telecommunications	8	9	6.6	2	30	10.0	45.0	25.0
Insurance and Pension Funding	5	18	6.2	4	50	17.9	17.9	44.9
Construction	2	4	6.1	4	20	9.4	15.6	50.0
Hotels and Restaurants	7	1	6.0	3	15	0.0	25.0	50.0
Basic Metals	3	5	5.9	3	30	17.1	22.9	37.1
Recreation incl. Broadcasting	7	14	5.9	4	21	12.5	12.5	62.5
Mining, Metal Ores	2	16	5.7	3	12	0.0	30.0	30.0
Computing Machinery	3	91	5.7	3	30	26.1	13.0	34.8
Publishing	3	7	5.5	2	24	31.3	18.8	25.0
Electricity and Gas	2	35	5.3	3	20	19.4	22.6	32.3
Other	-	23	5.3	3	40	14.3	14.3	53.6
Leather	3	30	5.0	5	5	0.0	0.0	100.0
Paper and paper products	3	14	4.7	3	20	14.3	21.4	50.0
Retailers	4	6	4.7	3	33	19.4	22.6	41.9
Chemical, Pharmaceutical	3	27	4.5	3	29	22.0	23.1	40.7
Electrical Machinery	3	7	4.5	3	20	16.7	20.0	50.0
Air Transport	4	5	4.3	3	9	14.3	28.6	42.3
Engineering	5	31	4.3	3	22	19.2	23.1	42.9
Foods, Products and Beverages	3	9	4.1	3	20	19.0	12.7	53.2
Radio, TV and Communication	3	32	4.1	3	11	7.1	14.3	71.4
Rubber and Plastics Products	3	13	3.9	3	10	14.3	14.3	57.1
Wholesalers	4	10	3.8	3	12	10.0	20.0	60.0
Health and Service Activities	6	31	3.6	3	8	0.0	28.6	57.1
Building Materials	2	4	3.5	3	7	14.3	21.4	64.3
Agriculture	1	15	3.4	3	7	12.5	25.0	62.5
Computer Software	5	10	3.1	3	5	12.5	12.5	75.0
Fishing	1	7	3.0	3	3	0.0	0.0	100.0
Medical and Precision Tools	3	4	3.0	3	5	33.3	16.7	50.0
Water Transport	4	20	2.9	2	10	20.0	40.0	30.0
Forestry	1	42	2.8	3	3	0.0	25.0	80.0
Furniture	3	78	2.8	3	4	20.0	0.0	53.3
Water	2	2	2.8	2	7	22.2	33.3	44.4
Land transport	4	1	2.8	3	5	13.3	33.3	75.0
Wood Products	3	8	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	8	2.5	2	4	0.0	75.0	25.0
Travel Agencies and Tourism	7	26	2.5	2	4	25.0	25.0	50.0
Other Mining and Quarrying	2	14	1.5	1	2	50.0	50.0	0.0
Renting of Machinery	5	28	1.0	1	1	100.0	0.0	0.0
Not Specified	-	216	6.1	4	60	11.1	11.1	56.0

Notes. NAICS: 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 TABLE 6, MODEL**

(3).

Industry	Estimate
Agriculture	-0.459
Forestry	1.28
Fishing	2.55
Extraction. Petroleum. Gas	2.12*
Mining. Metal Ores	2.72
Other Mining and Quarrying	-3.45
Foods, Products and Beverages	-0.357
Tobacco	3.39
Textiles	-0.102
Wearing Apparel	-1.53
Leather	-5.87
Wood Products	-0.190
Paper and paper products	0.237
Publishing	-0.388
Chemical. Pharmaceutical	-1.06
Rubber and Plastics Products	-1.33
Basic Metals	0.636
Computing Machinery	-0.235
Electrical Machinery	-1.47
Radio. TV and Communication	-0.912
Medical and Precision Tools	-1.15
Motor Vehicles	2.37*
Other Transport Equipment	-0.448
Furniture	-0.00983
Electricity and Gas	0.245
Water	-2.99
Construction	0.838
Motor Vehicle Sales	3.45*
Wholesalers	-0.887
Retailers	0.329
Hotels and Restaurants	1.09
Land transport	-0.810
Water Transport	0.1542
Air Transport	0.714
Travel Agencies and Tourism	-0.486
Post and Telecommunications	2.09
Finance and Building Societies	2.42**
Insurance and Pension Funding	0.874
Real Estate	3.97
Renting of Machinery	-24.0
Computer Software	0.798
Health and Service Activities	-0.224
Recreation incl. Broadcasting	1.50
Engineering	0.153
Building Materials	-0.524
Other	0.174

Notes. \*\*\* Significant at 1%, \*\* significant at 5%, \* significant at 10%.

**APPENDIX 3. FIRM-LEVEL TOBIT REGRESSIONS USING BROAD INDUSTRY CLASSIFICATIONS**

NAICS		(1)	(2)
	Constant	3.65***	-0.259
	22 Country Dummies ( <i>Cdum</i> )	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
	<i>Industry Groupings</i>		
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 <sup>2</sup>	0.404	0.551
	Likelihood ratio test statistic	8.88	287.6***
	(versus model, degrees of freedom <i>d</i> )	(6-1, 7)	(1, 22)

Notes. NAICS: 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<sup>2</sup> 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  $-2\log(L(\theta_i)/L(\alpha))$  is asymptotically distributed  $\chi^2(d)$ . \*\*\* Significant at 1%, \*\* significant at 5%, \* significant at 10%.

## Notes

<sup>1</sup> 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)).

<sup>2</sup> The use of many banks by Italian firms has been a topic of other studies. See Cesarini (1994) and Foglia, Laviola and Marullo Reedtz (1998), and references therein.

<sup>3</sup> 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 UK.

<sup>4</sup> The specific question is, "How many banks does your company use for domestic cash management, in your home country?"

<sup>5</sup> 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.

<sup>6</sup> We match survey firms from Norway to those in Ongena and Smith (1998). We are unable to reject the hypothesis that the average number of bank relationships across these two samples is equal.

<sup>7</sup> Dewatripont and Maskin (1995) make a similar point in a comparison of centralized bank economies (with a few large, wealthy banks) to decentralized banking systems (with many wealth-constrained banks). Decentralized economies prevent commitment to sink financing into long-term projects because dispersed banks with limited capital do not communicate or coordinate bargaining with each other. This leads managers to make efficient accept-reject decisions on long-term projects. Thus, lack of coordination prevents investment in inefficient projects.

<sup>8</sup> We thank Enrica Detragiache for this suggestion.

<sup>9</sup> For a general discussion of "limited-dependent variable" analysis, see [Maddala, 1983 #260]. For specific coverage of count models, see [Cameron, 1986 #354].

<sup>10</sup> 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.