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# BANK RELATIONSHIPS AND FIRM PROFITABILITY

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## Abstract


This paper examines how bank relationships affect firm performance. An empirical implication of recent theoretical models is that firms maintaining multiple bank relationships are less profitable than their single-bank peers. We investigate this empirical implication using a data set containing virtually all Norwegian publicly listed firms for the period 1979-1995. We find that profitability is substantially higher if firms maintain only a single bank relationship. We also find that firms replacing a single bank relationship are on average smaller and younger than firms not replacing a single bank relationship.

# 1    Introduction

Practitioners and business analysts have long recognized the importance of bank relationships for firms (e.g., Stancill (1980)) and a slate of recent theoretical models have rekindled academic interest in the topic. This paper contributes to the growing literature on bank relationships by empirically examining the link between the firm's choice of the number of bank relationships and firm profitability. We find the theoretical backdrop for pursuing this study in the literature that focuses on the choice of the number of credit relationships. In particular, we emphasize papers by Yosha (1995) and von Rheinbaben and Ruckes (1998), as far as we are aware, the only models coupling the firm's choice of the number of creditors to product market behavior. An important implication of both models is that, if firms disclose proprietary information to creditors, firms using bilateral financing achieve higher sales profitability than those using multilateral financing.

In addition to the choice on the number of bank relationships, we also investigate the impact of switching bank relationships on firm profitability and the characteristics of firms replacing a bilateral bank relationship. von Thadden (1998) shows that in equilibrium, firms occasionally switch creditors, as an inside bank may try to holdup a borrower. In his model, switching firms get, on average, better interest rates than firms of the same quality remaining at the inside bank. However, adverse selection occurs such that one implication of his model is that 'bad' firms switch bilateral bank relationships more often than 'good' firms do.

To test these implications of recent theoretical models, we study a data set, which contains bank relationship and firm specific data for most publicly listed Norwegian firms over a sixteen-year period. Controlling for firm characteristics such as age, size, debt structure, asset intangibility, and Tobin's Q, we find a negative correspondence between the number of bank relationships and sales profitability. We also find that firms replacing a single bank relationship are on average smaller and younger than firms maintaining a single bank relationship throughout the sample years.

The remainder of the paper is organized as follows. In Section 2 we highlight relevant theory and recent empirical findings linking the number of bank-firm relationships to firm profitability. In particular, we discuss the papers by Yosha (1995) and von Rheinbaben and Ruckes (1998) in more detail, as we will utilize their intuition throughout ours. Furthermore, we explore the paper by von Thadden (1998), and highlight his predictions concerning the characteristics of firms replacing bilateral bank relationships. Section 3 contains a description of the data and the empirical specifications. Section 4 reports the results, and Section 5 concludes.

## 2    Credit relationships and firm profitability

### 2.1    The price of capital

Bank-firm relationships may affect firm profitability through the price of capital. In von Thadden (1992) multiple bank relationships abate the informational lock-in problem, which may reduce the interest rate charged by the inside banks. Some evidence broadly supports this potential correspondence between the number of bank relationships and the interest rate paid by the firm. For example, studying an extensive survey of small Italian firms, Angelini, Di Salvo and Ferri (1998) report a negative effect of the number of credit relationships on the interest rate charged by the credit granting banks. Weinstein and Yafeh (1998) document that, between 1977 and 1986, Japanese 'main' banks, which typically nurture close and exclusive ties with their corporate clients, extracted higher interest payments than other banks. Machauer and Weber (1999) assert similarly that a lower number of bank relationships and in particular a relationship with a 'house' bank, result in higher interest rates for large German firms.

However, these results have not been replicated for other samples and countries. For example, Harhoff and Körting (1998b) find no effect of the number of bank relationships on interest rates analyzing a survey covering small German firms, while Petersen and Rajan (1994) find that, for small U.S. firms, multiple bank relationships may even increase lending rates. Interestingly, Degryse and Van Cayseele (2000) report that Belgian firms taking loans from a second bank pay higher rates on these loans than the interest rates these firms pay on the loans

granted by their first bank.

## 2.2 *The availability of capital*

Close bank-firm ties may not only increase the firm's borrowing cost, but may also affect the availability of capital. For example, Petersen and Rajan (1995) model the interdependency between a firm's possibilities to borrow and the market power of the inside banks. They show that borrowing from banks with large market power facilitates inter-temporal sharing of rent surplus, while competition may hinder such accommodative policies. Hence an exclusive bank relationship may facilitate access to capital,[1] widen project choice, and boost the profitability of firms. Especially those firms most in need of bank financing, such as small and young firms, may in this way benefit from an exclusive bank relationship. In contrast maintaining multiple, non-exclusive bank relationships may result in credit rationing.

Most studies broadly confirm this theoretical intuition. For example, using data from the 1987 US survey of small business financing, Petersen and Rajan (1994) find that a close relationship with a singular institutional creditor increases the availability of credit. Cole (1998) explores the more recent 1993 small business survey. He finds that lenders are less likely to extend credit if borrowers deal with multiple sources of financial services. Analogously, Harhoff and Körting (1998b) and Angelini et al. (1998) document that credit availability for small, German and Italian firms decreases in the number of relationships. Elsas and Krahnen (1998) indicate that after a moderate deterioration in the firm's credit rating, German 'Hausbanks', in contrast to other banks, continue to lend to the distressed corporate client. Weinstein and Yafeh (1998) also find that Japanese 'main' bank clients enjoyed superior access to capital resources.

While an exclusive bank relationship may positively affect current credit availability, it also exposes the firm to the risk that future credit needed to reinvest in the project may be withheld in case the relationship bank is affected by a negative liquidity shock (Detragiache, Garella and Guiso (1999)). Firms may want to diversify this risk by maintaining multiple bank relationships.

*2.3    Firm behavior*

2.3.1    Performance

Exclusive bank-firm ties not only affect the price and availability of capital, but also may also directly influence management decisions and firm performance.  For example, Bolton and Scharfstein (1996) argue that maintaining multiple creditors creates inefficient renegotiation which may deter strategic default.  While beneficial ex-ante, such a strategy may be costly ex-post if firm distress is caused by exogenous liquidity shocks.  Hence, all else equal, their model predicts that low default risk firms will tend to borrow from more creditors.  On the other hand, and this may be the case especially for large firms, banks may want to diversify firm-specific credit risk, resulting in more creditors for high default risk firms.  The extant empirical evidence, though for smaller and medium sized firms, seems to indicate such diversification may play a role.  For example, Harhoff and Körting (1998a) and Foglia, Laviola and Marullo Reedtz (1998) find that financially distressed firms (in Germany and Italy respectively) have significantly more creditors than other, comparable non-distressed firms.

Weinstein and Yafeh (1998) ascertain that Japanese 'main' banks imposed conservative investment policies on their clients, which inhibited growth and depressed firm profitability.[2] Hence their results may indicate a positive relationship between the number of creditors and firm profitability, if main bank clients in their sample have fewer other credit sources, *ceteris paribus*. Gorton and Schmid (1996) study the impact of 'house' bank relationships on the performance of German firms.  Their evidence for 1974 show that to the extent that banks held firms' equity, firm performance improved.  'House' bank relationships are often more exclusive (Machauer and Weber (1999)), hence this result seems to suggest a negative correspondence between the number of credit relationships and firm performance.  However, this effect had dissipated by 1985 when securities markets were more developed and banks had reduced their block-holdings.[3]

Other papers have touched indirectly upon the connection between the number of

creditors and firm performance.  For example, Horiuchi (1994) reports that statistical tests do not

reveal any significant differences among Japanese firms having one, two, or three main banks as

regards their profit to asset ratio.[4]  However, the firms in his sample use many more banks than

the reported 'main' banks and no statistical tests are reported concerning the total number of

bank relationships and the profit to asset ratio.  Similarly, Houston and James (1996) find that

the profitability of U.S. publicly listed firms with one versus multiple bank relationships do not

differ significantly.[5]

### 2.3.2    Product market behavior

To obtain credit, firms are often compelled to disclose proprietary information to

demonstrate their quality.  Checking account activity may constitute an additional rich source of

'confidential' information about a firm's current condition and future prospects (for example,

Vale (1993) and Nakamura (1993)).  Once acquired and analyzed, a bank could conceivably

transfer such valuable information, directly or through dispensed advice, to product market

competitors of the firm.

However, legal concerns, loss of reputation for the bank, or the negative impact on the

performance of an important client may keep a bank from relaying confidential information

obtained in an exclusive relationship.  For example, in Bhattacharya and Chiesa (1995)

confidentiality is maintained in bilateral borrowing relationships, and this confidentiality

protects proprietary information and facilitates screening and monitoring.  In their model, this

improved confidentiality encourages investment in research and development, when public

disclosure would create a free-rider problem.

On the other hand, banks may still occasionally, deliberately or accidentally, leak

confidential information.  The legal fallout for the bank of an information spill may be limited,[6]

banks may try to optimally 'liquefy reputation', or they may choose to provide useful

information *to* an important client.  Hellwig (1991), for example, notes that "the provision of

information and advice *to* firms has also been an important part of the bank-firm relationship.

Today this aspect may be even more important: if Deutsche bank is involved with the acquisition

program of Daimler-Benz, the relationship probably has more to do with Daimler-Benz's demand for information about other firms and industries than with the moral hazard problems in the relation between Daimler Benz and its financiers...".[7]

### 2.3.3   Yosha (1995)

Recent theoretical models focus more closely on the interaction between the number of creditors and product market competition, with creditors acting as possible conduits of confidential information.  In Yosha (1995), an innovator is entering an imperfectly competitive product market with one established competitor.  There is asymmetric information about the impact of the innovator's entry on the profits of the established firm.  If the entrant draws a high-quality project (notice that entrants do not determine the quality of their innovations), the profits of the established firm will be substantially reduced.  These expected losses will trigger an aggressive reaction by the established firm, reducing the expected profits of the innovator.  As a result, the high-quality innovator would like to conceal its type as long as possible.  On the other hand, if the innovator draws only low-quality projects, the innovator would like to reveal their type as soon as possible to avoid any unnecessary aggressive response from the established firm.

The number of financing sources determines the degree of revelation of the innovator's confidential information concerning project quality.  If the innovator obtains financing from one source (bilateral financing), less information is leaked to the established competitor than if the innovator uses multiple sources.  But a multilateral financing arrangement is more costly.  For example, it is more difficult to communicate with multiple lenders, and there may be a loss of flexibility for the borrowing firm, as its actions have to be coordinated with more than one lender.

The low quality innovator will nevertheless utilize multilateral financing to credibly reveal the low value of its projects to the established firm: the low-quality innovator trades off the additional cost of communicating with multiple lenders with the gain in profits, resulting from a more accommodating stance of the established competitor.  In other words, the low-quality innovator signals his low quality via multiple financing to dampen the aggressive

response of the incumbent.[8]  To conclude, in Yosha's model firms using bilateral financing are more profitable than those using multilateral financing.

2.3.4    von Rheinbaben and Ruckes (1998)

In an extension of Yosha (1995) by von Rheinbaben and Ruckes (1998), the monotonic 'negative' relationship between ex-post profitability and the number of financing sources is no longer present and may be reversed.  Their model incorporates two additional features.  First, multilateral banking does not only entail higher transaction costs, but also more competitive interest rates.  Second, the innovator can control whether or not to disclose confidential information during the loan granting process.  In other words, establishing a bank relationship and disclosing confidential information are independent decisions.

If the innovator discloses information, increasing the number of banks reduces the innovator's expected sales profitability, as the probability that information leaks to the incumbent increases.  If there is no disclosure of confidential information, sales profitability remains unaffected.  As a result, there is no continuous relationship between sales profitability and the number of banks.  Sales profitability decreases in the number of banks within the range of disclosure, and remains high when no disclosure takes place.  Only a highly-rated innovator will find it optimal not to disclose confidential information, while dealing with multiple banks.  Disclosure would not improve the innovator's credit standing, and without disclosure there is no risk of information leakage, while competition between multiple banks lowers the interest rate.

Summarizing, multiple bank relationships go hand-in-hand with lower sales profitability in Yosha (1995) and in von Rheinbaben and Ruckes (1998) in case of information disclosure.  A highly rated innovator will not disclose confidential information such that its high sales profitability is unaffected.  To obtain a competitive interest rate, this innovator will deal with many banks.  Ultimately then determining the impact of the number of credit relationships on firm profitability remains an empirical issue, but as far as we are aware no other paper has tested this connection directly.

*2.4    Switching credit relationships and the cost of capital*

The theoretical intuition and empirical findings discussed so far focus on the static linkage between the number of credit relationships and the cost and availability of capital. von Thadden (1998) models the connection between the switching of credit relationships, firm quality, and the cost of capital. von Thadden revisits Sharpe (1990), who analyzes a model in which a lender obtains inside information about the borrowers' quality over the course of a relationship. The informational asymmetry between the inside bank and the outside banks gives the existing lender an advantage, leading to uneven ex-post competition. In particular, in Sharpe (1990) firms want to borrow for two subsequent periods. In the first period a firm borrows from one bank, which in effect becomes the inside bank. This bank observes after one period the quality of the firm (good or bad), and can therefore set the interest rate in the second period contingent on the quality of the firm. The other 'outside' banks observe only a noisy signal about the firm's quality.

von Thadden (1998) argues the absence of pure strategy equilibria in Sharpe's model due to a 'winner's curse' effect. In other words, the fact that a bid wins contains information about the value of the borrower. In particular, the lower the interest rate offered, the higher is not only the probability that the bank obtains the client-firm, but also the higher is the probability that the firm, if obtained, is estimated by other banks to be of a lower value. von Thadden computes a mixed equilibrium where firms occasionally switch bank, as in Rajan (1992). Both good and bad firms reduce their interest payments, compared to non-switching good and bad firms respectively, by switching banks. But bad firms are expected to switch more frequently. The latter effect outweighs the decrease in interest rates charged in his model such that on average switching firms are observed to pay higher interest rates. Currently no empirical evidence examines this connection between the switching of credit relationships, interest rates, and firm profitability.

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# 3 Data and empirical specification

This paper analyzes data first used by Ongena and Smith (1999). They study the duration of bank relationships. Their data set contains observations of 'primary' bank relationships, gleaned from *Kierulf's Handbook*, for virtually all publicly listed, non-financial Norwegian companies between 1979 and 1995. The Norwegian setting, and this data set in particular, is well suited to explore the connection between firm profitability and the character of the financing arrangement, as modeled by Yosha (1995) and von Rheinbaben and Ruckes (1998). First, around 90% of all commercial debt of Norwegian firms is financed by either a bank or a non-bank financial intermediary (see for example *Statistical Yearbook of Norway, 1996*), and the banking sector remained highly concentrated throughout the sample period.[9] Hence, informational transfers will most likely occur through bank relationships, and stock prices may not be as informative (Perotti and von Thadden (1998)). Bank relationships are reported yearly and only reported bank relationships typically involve both short- and long term credit.[10] In addition, the effect of switching a relationship on interest payments and firm profitability can be gleaned adequately from accounting statements, as bank debt is particularly important.

Second, in any given year between 65 and 75% of the publicly listed Norwegian firms report bilateral, i.e. single, 'primary' bank relationships, in sharp contrast with most other European countries, where bilateral relationships between medium- and large-sized firms and banks are often the exception (Ongena and Smith (2000)). Hence, the distinction between bilateral and multilateral financing will be sharp, and adding or ending a bank relationship will substantially affect the average firm in the sample. Also note that to test implications of the von Thadden (1998) model empirically, we need to observe 'bilateral' switches, i.e. replacements of one single bank relationship for another.

Third, all firms in the data set are publicly listed, but many firms are quite small. For example, more than 50% of the firms have less than 500 employees.[11] Fourth, casual observation seems to suggest that many Norwegian product markets are imperfectly competitive.

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And finally, the long time series of bank relationships allows for various stability tests of the structural relationship, and for more dynamic tests of the basic model.

Each year on average 110 firms, listed on the Oslo Stock Exchange, register up to a maximum of four 'primary' bank relationships. Listing and delisting activity throughout the sample period results in a total of 235 different firms in the sample. The average firm reports at least one bank relationship during 8 consecutive years, amounting to 1897 firm – year observations (Table 1).

The median firm in the sample uses only one 'primary' bank, but around a quarter of the firms maintain multiple bank relationships (17% of the firms employ two banks, 7% three, and 2% of the firms report the maximum of four banks).[12] This presence of firms with multiple bank relationships results in 2436 relationship – year observations, which is around 30% higher than the number of firm - years. Matching each relationship – year with firm specific accounting information from the computer readable data base *FINLIS* (accounting data is missing for a few firms and in the beginning of the sample period) and removing observations with extreme negative levels of sales profitability leaves 1659 usable relationship – year observations.[13] Table 2 lists selected summary statistics for the remaining 1284 companies. Firms quite often alter their set of bank relationships. After matching, the sample contains a total of 87 'events'. In 30 instances a firm replaces its single bank relationship. Firms also change (15 cases) or end (24 cases) one of their multiple bank relationships, or start an extra new relationship (18 cases).

Are firms using bilateral financing more profitable than those using multilateral financing?[14] To investigate this conjecture directly,[15] we start by simply regressing a measure of firm profitability on a dummy (dRELATION) equal to one (zero) when a firm maintains multiple (single) bank relationships. The measure of firm profitability employed as dependent variable on the left hand side is gross ROA, i.e. the percentage ratio of earnings before interest and taxes to the sum of the market value of equity plus the book value of debt (see Table 2). This profitability measure is suited to analyze the empirical implication derived in Yosha (1995) and von Rheinbaben and Ruckes (1998), as the reaction of the established firm determines the

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entrant's earnings derived from sales activities.

The empirical specification further includes measures of firm size, debt structure, age, asset intangibility, and Tobin's Q as independent variables. These variables are not featured in the previously discussed theoretical models, but possible extensions of these models and related theoretical and empirical work seems to suggest these variables may belong in the estimated reduced form. We first motivate why firm size, debt structure, age, and asset intangibility, and Tobin's Q should enter the estimated reduced form. Firm size is included to control for the firm's market power and efficiency. *Ceteris paribus*, more market power as well as greater efficiency may result in higher profitability. Size is measured by the log of the end-of-year sales, deflated by the Norwegian CPI (SALES).

The debt structure of a firm may affect firm profitability in the presence of agency problems (for an overview see Harris and Raviv (1991)). First, debt may mitigate problems of over- and under-investment improving firm profitability (e.g. Jensen (1986) and Stulz (1990)). Second, debt can be used to signal firm profitability (Ross (1977)). Third, debt influences strategic interaction among competitors and the interaction with customers and/or suppliers. In particular, in Brander and Lewis (1986), firms commit to using a more aggressive product market strategy by choosing positive debt levels.[16] Titman (1984) shows that firms producing products that are not unique may be expected to have more debt as a commitment device, such that shareholders will be reluctant to liquidate the firm. In sum, more debt may result in lower agency costs, may signal higher profitability, and may increase product market aggressiveness. The debt structure of the firm is gauged as the ratio of the book value of debt to the sum of the market value of equity plus the book value of debt (DEBT).

Finally, firm age captures the length of the track record of the firm and asset intangibility proxies for firm opaqueness. Higher communication costs will result in lower profitability, all else equal. Firm age is measured by the log of the age of the firm relative to its founding date (AGE). As a measure of asset intangibility, we use the ratio of the total book value of intangibles to the sum of the market value of equity plus the book value of debt

(INTANGIBLES). Finally, Tobin's Q stands in for the firm's investment opportunities, and is defined as the ratio of the end-of-year market value of equity plus book value of debt divided by the book value of assets (Q).

# 4    Results

We first present the results for parsimonious specifications where the analysis focuses on the direct impact of bilateral versus multilateral financing on firm profitability. We next introduce instrumental variables and turn to an 'event specification' approach where we discuss in general the impact upon firm profitability of substituting bank relationship(s). Further, we discuss robustness tests and selection issues. Finally, we investigate the profitability of firms replacing a single bank relationship.

## 4.1    Static specification

We start by estimating the base specification discussed so far, containing ROA as the dependent variable, and a constant, SALES, DEBT, AGE, INTANGIBLES, and Q on the right hand side. The first column in Table 3 (Model 3.1) reports the results from OLS estimation. The coefficient on dRELATION is negative and significant at a 1% level, hence firms with bilateral financing arrangements are more profitable. Maintaining multiple bank relationships decreases ROA by an economically significant 4%, which amounts to more than 40% of its standard deviation. Therefore the banking arrangement seems important in explaining firm profitability. The coefficient on DEBT is negative and significant at a 1% level, possibly indicating pecking order behavior, or more product market aggressiveness. The coefficient on SALES is significantly positive, because market power and efficiency may result in higher sales profitability. The coefficients of AGE and INTANGIBLES are both positive and significant. The coefficient of Q is not significant.

Model 3.1 implicitly assumes that each firm chooses its size, debt structure, age, asset intangibility, Q, financial arrangement and corresponding profitability every year, independent of its own choices in previous years and independent of the contemporaneous choices made by

all other firms. This assumption is in sync with the one-shot and single market character of the game-theoretic models outlined in Yosha (1995) and von Rheinbaben and Ruckes (1998), but this assumption is not satisfied in the data for age, nor probably for any of the other firm-specific variables.[17] Hence it seems fruitful to relax this assumption.

We start by introducing a set of industry dummies in the base model to control for contemporaneous choices made by competitors. A 'SIC / NAISC' type classification scheme is unfortunately not available in Norway. Hence we resort alternatively to a broad classification scheme maintained throughout the sample years by the Oslo Stock Exchange, and to a more precise classification scheme employed in *Finansavisen*, a business daily, for which we draw upon the 1995 edition.[18] In these two new unreported specifications, we can reject the joint hypothesis that all industry dummy coefficients are equal to zero.[19] But the coefficients on all other variables, including dRELATION, are virtually unaffected (though AGE is no longer significant in the second specification).

Rather than retaining industry dummies in the specification, we next allow for firm- and calendar year- random effects, which may capture much more generally industry- and economy-wide influences. A not reported specification contains in addition to the constant and the six independent variables, firm- and calendar year- specific errors.[20] The results are again virtually unaltered vis-a-vis the earlier specifications. The Hausman (1978) test suggests that the null hypothesis of no correlation between the random effects and the regressors can be rejected at a 1% level. In addition, given the comprehensiveness of the sample, i.e. virtually all firms listed on the Oslo Stock Exchange are represented, "the model might be viewed as applying only to the cross-sectional units in the study, not to additional ones outside the sample" (Greene (1997), p. 623). Hence a fixed effect specification, reported as Model 3.2, may be more appropriate.[21] The inclusion of 175 firm- and 14 calendar year- specific dummies increases the adjusted $R^2$ and the absolute magnitudes of all coefficients, except for the coefficients for dRELATION and AGE which decrease somewhat (the latter is no longer significant). But the coefficient on dRELATION remains negative, statistically significant at a 1% level, and economically relevant.

Next we check the structural stability of the base specification for each consecutive year. The rationale for this additional step is that the Norwegian financial landscape altered dramatically during the sample period. Before deregulation in the mid-80s, chronic excess demand for credit cemented close and long-term relationships between borrowers and their banks (Drees and Pazarbasioglu (1995)). Deregulation led to credit expansion, feverish competition for market share, loan losses, a financial crisis, and eventually the effective nationalization of the entire banking sector in 1991.[22]

In the spirit of Fama and MacBeth (1973) and Fama and French (1997), we estimate year-by-year cross-sectional regression models. Then we calculate averages and standard deviations and report the results in Model 3.3 (we report standard deviations divided by the square root of the number of observations for easier comparison with the standard errors reported in the other columns). The average coefficients of these 15 separate regressions and their significance levels (using standard Z-tests) are very similar to the results reported in the previous two specifications. Leverage is correlated negatively with firm profitability, while size, intangibility of assets, and maintaining a single bank relationships is positively correlated with firm profitability.

The 15 coefficients on dRELATION seem relatively stable, i.e. all are negative and many are significant.[23] Nevertheless there is an interesting decrease in the coefficient over time from around –3% to about –6%. Increased concentration in the banking market may be a potential explanation. Such increased concentration could strengthen the impact of the number of credit relationships on profitability. Adding a second bank relationship in a concentrated banking market may increase the possibilities for an information transfer more than in an unconcentrated banking market. The correlation between the 15 coefficients and a Herfindahl-Hirschman Index for the banking market is indeed high, i.e. –0.77. Nevertheless, given the small number of observations we find these results merely suggestive.

Finally, we turn to a specification closer in spirit to the intuition embedded in von Rheinbaben and Ruckes (1998). In their model, firms with an ex-ante high credit rating will not

disclose confidential information, but will maintain many bank relationships. We attempt to capture this possible non-monotonicity in the relationship between profitability and the number of bank connections by replacing dRELATION with three dummies in Model 3.2. These three new dummies are equal to one when a firm maintains respectively either two, three, or four bank relationships, and are equal to zero if a firm maintains a single bank relationship.[24] Interestingly the three new coefficients are all significant at a 1% level and increasing in absolute size, i.e. -2.87, -6.76, and -6.85. Equality of the first and second coefficient can be rejected at a 1% level using an F-test, while equality between the second and third coefficient cannot be rejected. The impact of the number of bank relationships on firm profitability seems monotonically decreasing, and does not correspond to the non-monotonic impact conjectured by von Rheinbaben and Ruckes (1998).

*4.2     Event specification and two stage least squares*

    To this point the empirical work in this paper assumed that firm profitability would be affected immediately by the firm's choice with respect to the number of bank relationships and that the latter choice is independent of the firm's profitability. We will now address both issues by extending our empirical model with event dummies and instrumental variables.

4.2.1     Event dummies

    In Yosha (1995), established firms adjust their product strategy at once after they received the signal from the innovator about the financing arrangement. But the established competitors may face per period quantity adjustment costs. If these costs are convex in quantity, established firms may want to spread their quantity adjustment over time. In this sense, looking at the impact of changes in the number of bank relationships on firm profitability may provide an additional though weaker test of the connection between the number of creditors and firm profitability. We will look at the impact of the adjustments in the financial arrangement up to two years after the event. This time window seems a-priori reasonable and is commonly found in other firm performance type studies (for example, Ber, Yafeh and Yosha (1998)).

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Nevertheless we will also report robustness tests with respect to this particular choice.

We start by defining a dummy variable dSTART (dEND) to take the value of one in the year or up to two years after a firm starts (ends) one of multiple bank relationships. In most cases, starting a new relationship involves moving from a bilateral to a multilateral banking arrangement, while ending a bank relationship results in a move in the opposite direction. A dummy variable dSINGLE takes the value of one in the year or up to two years after a firm replaces a single bank relationship. The dummy variable dREPLACE takes the value of one in the year or up to two years after a firm replaces one of multiple bank relationships.[25]

Replacing a bank could also be a signal about the firm's quality. Changing banks will increase the number of established competitors which can receive information about the innovator's quality, as both the corporate customers from the former and the new bank will have access to the quality information. This is obviously only the case if the quality of innovators is constant over a longer time period, in which case information possessed by the former bank remains accurate. Low quality innovators may be expected to replace banks more often, even if replacing banks is costly. On the other hand, if the quality of innovators changes frequently, and hence information about their quality is quickly outdated, innovators may still wish to replace their bank, as banks have different market shares. A low quality innovator will initially seek a bank with many other corporate customers, including established competitors, even if this bank charges more for its services. Innovators increasing in quality may eventually want to switch to a bank with fewer customers and possibly lower service charges.

But a bilateral replacement may also indicate coordination among incumbant and entrant in order to avoid or propagate leakage of information. For example, a high quality innovator may wish to switch banks if a major incumbent competitor starts a relationship with the innovator's house bank. An additional wrinkle is that the quality of the signal itself may depend on the quality of the bank. High quality banks may be more professional in their management of inside knowledge and less likely to divulge confidential information to the innovator's competitors. If that is indeed the case, low quality innovators will tend to seek out lower quality

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banks.

### 4.2.2   Instrumental variables

The assumption of independence between the error term and the explanatory variables may be violated.  First, even though none of the previously discussed models incorporate this possibility, the firm's choice of the number of bank relationships may also depend upon its sales profitability.  For example, a low-rated firm may have to draw upon multiple banks, whose willingness to lend is inhibited, but who may be willing to risk small stakes.  Second, while public observation of the firm's number of bank relationships may reasonably be expected to precede the reporting and publication in *Kierulfs handbook*, it is possible that this is not the case for all firms.  Notice that reporting to *Kierulfs* occurs before the annual reports are released by the firms and publication of *Kierulfs* occurs after the release.  In addition, profitability figures refer to the whole calendar year, while the observation of (a change in) the number of bank relationships and the incumbent's reaction will occur at some point during the 'recording year' employed by *Kierulfs*.

Hence we also estimate the regression model using two-stage least squares.  We add two instrumental variables.  BANKSIZE is defined as the maximum market share of any of the banks the firm has a relationship with,[26] and dDnBorCBK, takes the value of one if the firm has a relationship with either DnB (Bergens Bank or DnC before their merger) or CBK, and zero otherwise.  We find justification for employing the first variable in the idea that firms having a relationship with a larger bank don't need additional banks to satisfy larger credit needs.  The second variable is complementary.  DnB and CBK are Norway's two largest banks, offering specialized credit and foreign exchange products no other domestic bank offers.  In addition, these banks could be considered less subject to liquidity shocks (Detragiache et al. (1999)) or are even 'too-big-to-fail'.

### 4.2.3   Results

Incorporating the set of new event dummies and two instrumental variables, yields the

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following two-equation system to be estimated:

$$ROA_{it} = a + b_1 SALES_{it} + b_2 DEBT_{it} + b_3 AGE_{it} + b_4 INTANGIBLES_{it}$$
$$+ b_5 Q_{it} + b_6 dRELATION_{it} + b_7 dSINGLE_{it} + b_8 dREPLACE_{it}$$
$$+ b_9 dSTART_{it} + b_{10} dEND_{it} + \text{fixed effects} + e_{it}$$

$$dRELATION_{it} = a' + b_1' SALES_{it} + b_2' DEBT_{it} + b_3' AGE_{it} + b_4' INTANGIBLES_{it}$$
$$+ b_5' Q_{it} + b_6' ROA_{it} + b_7' BANKSIZE_{it} + b_8' dDnBorCBK_{it} + \text{fixed effects} + e_{it}'$$

Model 3.4 reports the estimation results for the first equation of this two-equation

model. The results are interesting. The coefficients -- their sign, magnitudes, and significance --

on all variables featured in previous models are broadly unaltered, with the exception of

INTANGIBLES. The coefficient on dRELATION remains negative, around –4%, and

significant at a 1% level. The coefficient on both dSINGLE and dREPLACE are negative and

significant, indicating that switching a bank relationship is negatively related to the innovator's

profitability, at least in the reported specification. If we limit the time window around the four

different types of events to the event year and the following year, the negative coefficient on

dSINGLE becomes insignificant, while the coefficient on dREPLACE remains significant but

only at a 10% level. Looking only at the event year, leaves neither event dummy coefficient

significant. But the coefficient on dRELATION remains negative, in these unreported

specifications, significant at the 1% level, and around –3.5%, while other results are broadly

unaltered.

*4.3    Robustness*

Next we subject the estimated results in Model 3.4 to a battery of robustness checks.

We start by deriving estimates for specifications using alternative measures of firm profitability.

We employ the ratio of 'pre-tax income' (i.e., earnings, 'before interest and taxes', minus total

interest expenses) to sales, and the ratio of earnings before interest and taxes to sales. Interest

expenses may proxy for the fixed cost involved in establishing a bank relationship, featured for

example in Yosha (1995). And sales profitability is attractive as a measure of firm profitability,

since the theoretical models discussed so far are grounded in product market behaviour. On the

other hand, this measure is somewhat less commonly used and by construction prone to more variability and the occurrence of outliers.  However, the results are mainly unaffected by these changes in profitability measure, hence are not reported in the table.[27]  The coefficient on dRELATION is –4.93 in the first, and –2.76 in the second specification, and significant at a 1 and 10% level respectively.  To control better for dynamics we next add lagged sales profitability as an exogenous variable to the latter specification.  This added variable is positive and significant (though very small), while the coefficient on dRELATION becomes equal to – 3.36 and significant at a 5% level.  The coefficient on dSINGLE remains negative and becomes quite large in absolute value, and the coefficient dSTART becomes significantly positive.  However neither of these coefficients are robust to alterations in the event window.

We also add ownership concentration, i.e. the proportion of firm equity owned by the ten largest shareholders, to specification 3.4, as more concentrated ownership may improve sales profitability (for example, Ber et al. (1998)).  Data on ownership concentration is missing for some firms in the sample, and only 1120 observations remain.  The coefficient on ownership concentration, while positive, is not significant.  Other results are broadly unaffected.  Next we check our empirical model by using alternative definitions of firm size, as we are concerned that non-linearities or the variable definition could partly determine the results reported so far.  Hence in Model 3.4 we replace SALES alternately with deflated sales and deflated sales squared, with dummies capturing below and above median deflated sales, with the number of employees, and with deflated firm assets.  Results are virtually unaffected.

"The central role played in the model by the cost of communicating information renders the model relevant for firms that are not too small to consider multilateral financing arrangements, but are not so large that disclosure costs are a trivial consideration.  The model is therefore most relevant for small- and medium- size firms (say up to 500 workers), ..., which are innovators in the growth sense (striving to expand into geographical areas or to increase market share)" (Yosha (1995), p.4).  In addition, notice that neither Yosha (1995) nor von Rheinbaben and Ruckes (1998) model information transfers from incumbent to innovator or the ensuing

strategic choice by the incumbent of the optimal number of creditors. Our empirical exercises reported so far lump incumbents and innovators together, but firm size is potentially a useful separation criterion between the two groups of firms. Hence, to further test the robustness of the model to firm size and Q, observations for firms larger than 500 employees and firms with a Tobin's Q smaller than one are removed from the sample (Model 3.5). In that way, we hope to capture the entrant innovators. We are left with 680 observations. The coefficient on DEBT is not significant, while the coefficient on AGE is negative and marginally significant. Interestingly, the coefficient on dRELATION is quite large, -6.9% or around 80% of the standard deviation of ROA, and significant at a 1% level. Equality of this coefficient to the coefficient on dRELATION of model 3.4 can be rejected at a 5% level using a $\chi^2$-test. The coefficient on dSINGLE is significantly negative, and more than double the size of the coefficient on dRELATION, while the coefficient on dREPLACE is not significant. The coefficient on dEND is negative and significant. But these event effects are no longer significant when we reduce the event window.

Finally, analyzing relationship – year observations and events affecting these relationships increases the representation in the sample of firms with multiple relationships and/or subject to many events. In addition, events could be correlated through time. For example, once a firm replaced a bank the probability that another replacement will occur soon after may increase. To tackle both problems a not reported exercise considers only one relationship per firm, either the first relationship affected by an event or the relationship ranked first (by the firm) in case none were affected. While the sample drops to 1009 observations, results are largely unaffected.

To conclude, firms with multiple bank relationships are less profitable. The difference with single bank firms in gross return on assets is around 3 to 4%. The profitability of small growth firms seems affected even more. In addition, switching a bank relationship is followed within 2 years by a significant and substantial decrease in sales profitability. But the latter result is not entirely robust to model and sample alterations. Nevertheless, the results seem broadly in

line with an ad-hoc dynamic extension of the Yosha (1995) model.

*4.4    Single bank replacements*

Table 4 takes a closer look at the characteristics of firms replacing a single bank relationship in the event year vis-à-vis the characteristics of all other single bank firms across their listing period.[28] We observe 30 switches of single bank relationships in the sample. As reported in the table, switching firms are on average smaller and younger in the switching year than other single bank firms across their listing period. They also seem less profitable, but the difference is not significant at standard significance levels. Hence 'bad' firms seem to switch more often on average than 'good' ones, broadly confirming one implication of von Thadden (1998). Table 4 also compares firms with bilateral and multiple bank relationships (i.e. we add column 1 and 2, and compare it to column 3). Firms with multiple bank relationships are less profitable, are larger, have a higher debt and intangibility ratio, and a lower Tobin's Q. These results broadly correspond to Houston and James (1996).

**5    Conclusion**

Our empirical work suggests that the profitability of Norwegian publicly listed firms with bilateral bank relationships is higher than the profitability of firms with multilateral relationships. This result is quite robust. It holds controlling for firm age, size, debt, asset intangibility, and Tobin's Q and in a variety of specifications. The result seems conform an implication of Yosha (1995) and von Rheinbaben and Ruckes (1998). If firms disclose proprietary information to creditors, firms using bilateral financing achieve higher sales profitability than those using multilateral financing.

The effects of the replacement, start, or end of one of multiple relationships are less clear. Replacing a bilateral or one of multiple relationships seems to decrease profitability for two years following the event. However, these results are not robust to changes in the length of the event window or to model alterations, possible because the sample does not contain enough events. Switching firms are on average smaller, younger, and seem to be less profitable in the

switching year than other single bank firms across their listing period.  Hence mainly 'bad' firms switch.

A life cycle view of firm financing may synthesize the results.  Small, young firms with promising projects start with a bilateral relationship.  If they grow and continue to have high quality projects, these firms may remain with the same bank.  If firms grow, but their future projects are only mediocre, firms may switch or may add more bank relationships to satisfy their financial needs, while at the same time conveying their lower quality to competitors by maintaining multiple bank relationships.

Table 1

Full sample characteristics.

Firms report a minimum of one and a maximum of four 'primary' bank relationships, which are listed in *Kierulf's Handbook*. The total number of firms reporting bank relationships is the number of different firms listing bank relationships in *Kierulf's Handbook* between 1979 and 1995. The total number of firm – years is the number of firms listing a bank relationship times the number of years the firm is reporting the bank relationship in *Kierulf's Handbook* between 1979 and 1995. The total number of relationship – years is the number of firms listing bank relationships times the number of years the firm is reporting the bank relationship times the number of events (or one if no events take place) for that particular firm. Events include: the replacement of a single bank relationship, the replacement of one of multiple bank relationships, the start of an additional bank relationship, and the end of a bank relationship. The data from *Kierulf's Handbook* is matched with accounting information gleaned from *FINLIS*, an accounting database supported by *Oslo Børs Informasjon*, a subsidiary of the Oslo Stock Exchange.

|  | *Kierulf's Handbook* | After matching with *FINLIS* |
|---|---|---|
| Total number of firms reporting bank relationships | 235 | 176 |
| Total number of firm – years | 1897 | 1284 |
| Total number of relationship – years | 2436 | 1659 |
| Total number of events | 118 | 87 |
| Replacement of a single bank relationship | 44 | 30 |
| Replacement of one of multiple bank relationships | 16 | 15 |
| Start of an additional bank relationship | 24 | 18 |
| End of a bank relationship | 34 | 24 |

Table 2

Descriptive statistics of firm characteristics.

The number of firm – year observations is 1284, except for the ownership concentration ratio where it is 883. Gross ROA is the percentage ratio of earnings before interest and taxes to the sum of the market value of equity plus the book value of debt. Pre-tax income / assets is the percentage ratio of earnings before taxes to the sum of the market value of equity plus the book value of debt. EBIT / sales is the percentage ratio of earnings before interest and taxes to end-of-year sales. Sales is the end-of-year sales (in 000 Norwegian Kroner, 7.5 Kroner buy approximately 1 US $), deflated by the Norwegian CPI (1979=1). Assets is the sum of the market value of equity plus the book value of debt (in 000 Norwegian Kroner), deflated by the Norwegian CPI (1979=1). The debt ratio is the ratio of the book value of debt to the sum of the market value of equity plus the book value of debt. The age of the firm is measured relative to the founding date of the firm. Intangibles is the ratio of the total book value of intangibles to the sum of the market value of equity plus the book value of debt. Tobin's Q is the ratio of the end-of-year market value of equity plus book value of debt divided by the book value of assets. The ownership concentration ratio is the proportion of firm equity owned by the ten largest shareholders. The multiple-bank relationship dummy takes the value of one when a firm maintains a multiple-bank relationship and zero otherwise. A t-test determines the statistical significance of the correlation coefficients (degrees of freedom = 881 for correlation coefficients with the ownership concentration ratio, otherwise = 1282).

| Variable | Mean | Standard Deviation | Minimum | 25% Percentile | Median | 75% Percentile | Maximum |
|---|---|---|---|---|---|---|---|
| Gross ROA (in %) | 3.23 | 9.50 | -57.38 | 1.44 | 5.03 | 7.72 | 23.1 |
| Pre-tax income / assets (in %) | 0.12 | 10.33 | -86.09 | -1.85 | 2.16 | 4.52 | 20.42 |
| EBIT / sales (in %) | 6.38 | 21.24 | -141.73 | 1.69 | 6.00 | 10.99 | 85.7 |
| Sales | 900,616 | 2,736,829 | 4,777 | 645,380 | 178,930 | 6,304,600 | 29,864,000 |
| Number of employees | 1780 | 4138 | 1 | 116 | 486 | 1461 | 43122 |
| Assets | 1,189,793 | 3,513,813 | 4,782 | 112,880 | 262,750 | 835,130 | 46,340,000 |
| Debt ratio | 0.614 | 0.223 | 0 | 0.453 | 0.639 | 0.790 | 0.997 |
| Age | 59 | 41 | 0 | 19 | 63 | 86 | 245 |
| Intangibles | 0.017 | 0.050 | 0 | 0 | 0 | 0.014 | 0.605 |
| Tobin's Q | 1.401 | 1.017 | 0.385 | 1.038 | 1.202 | 1.504 | 30.730 |
| Ownership concentration ratio | 0.660 | 0.206 | 0 | 0.525 | 0.674 | 0.810 | 1 |
| Multiple-bank relationship dummy | 0.290 | 0.454 | 0 | 0 | 0 | 1 | 1 |

Table 2 / continued

| Correlation coefficients | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| (1) Gross ROA | 0.562 *** | 0.957 *** | 0.100 *** | 0.093 *** | 0.088 *** | -0.158 *** | 0.039 | 0.076 *** | 0.071 ** | -0.159 *** | -0.128 *** |
| (2) Pre-tax income / assets | 1 | 0.541 *** | 0.095 *** | 0.091 *** | 0.087 *** | -0.264 *** | 0.000 | 0.066 ** | 0.118 *** | -0.178 *** | -0155 *** |
| (3) EBIT / sales | | 1 | 0.018 | -0.004 | 0.059 ** | -0.166 *** | -0.055 ** | 0.069 ** | 0.175 *** | -0.023 | -0.076 *** |
| (4) Sales | | | 1 | 0.940 *** | 0.953 *** | 0.067 ** | 0.106 *** | 0.027 | -0.035 | -0.140 *** | 0.075 *** |
| (5) Number of employees | | | | 1 | 0.886 *** | 0.116 *** | 0.145 *** | 0.017 | -0.056 * | -0.131 *** | 0.148 *** |
| (6) Assets | | | | | 1 | 0.013 | 0.071 ** | 0.049 * | -0.006 | -0.116 *** | 0.065 ** |
| (7) Debt ratio | | | | | | 1 | 0.140 *** | -0.081 *** | -0.482 *** | 0.036 | 0.248 *** |
| (8) Age | | | | | | | 1 | -0.149 *** | -0.062 * | 0.010 | 0.062 ** |
| (9) Intangibles | | | | | | | | 1 | -0.027 | -0.085 ** | 0.085 *** |
| (10) Tobin's Q | | | | | | | | | 1 | -0.034 | -0.122 *** |
| (11) Ownership concentration ratio | | | | | | | | | | 1 | 0.018 |
| (12) Multiple-bank relationship dummy | | | | | | | | | | | 1 |

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

Table 3
Static and dynamic specifications.

The Static Sample contains 1284 *firm-years*, the Dynamic Sample contains 1659 *relationship-years*. The Restricted Sample contains only relationship-years for small and growth-oriented firms (i.e. firms with fewer than 500 employees and Tobin's Q larger than 1). The dependent variable is the percentage ratio of earnings before interest and taxes to the sum of the market value of equity plus the book value of debt (gross ROA). SALES is the log of the end-of-year sales (in 000 Norwegian Kroner), deflated by 100 times the Norwegian CPI (1979=1). DEBT is the ratio of the book value of debt to the sum of the market value of equity plus the book value of debt. AGE is the log of the age of the firm and is measured relative to the founding date of the firm. INTANGIBLES is the ratio of the total book value of intangibles to the sum of the market value of equity plus the book value of debt. Q is the ratio of the year-end market value of equity plus book value of debt divided by the book value of assets. dRELATION takes the value of one when a firm maintains a multiple-bank relationship and zero otherwise. dSINGLE takes the value of one in the year or up to two years after a firm replaces a single bank relationship and zero otherwise. dREPLACE (dSTART, dEND) takes the value of one in the year or up to two years after a firm replaces (starts, ends) one of multiple bank relationships and zero otherwise. Coefficients are listed on the first row in each cell with heteroskedasticity-consistent standard errors below in parentheses (for model 3 we list the sample standard deviations divided by the square root of the number of observations).

Table 3 / continued

| Model | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| Sample | Static | Static | Fama-French | Dynamic | Restricted |
| Number of Obs. | 1284 | 1284 | 14 | 1659 | 680 |
| Estimation | OLS | OLS | OLS | 2SLS | 2SLS |
| Effects | No | Fixed | No | Fixed | Fixed |
| Constant | -6.19*** | -20.59*** | 0.72 | -11.04** | 14.15 |
| | (1.51) | (5.59) | (3.69) | (5.61) | (14.97) |
| SALES | 1.67*** | 4.14*** | 1.81*** | 3.99*** | 3.98*** |
| | (0.15) | (0.36) | (0.17) | (0.40) | (0.50) |
| DEBT | -7.22*** | -11.20*** | -13.29*** | -7.72*** | -1.08 |
| | (1.27) | (1.59) | (2.11) | (1.67) | (4.21) |
| AGE | 0.50** | -0.02 | -0.05 | -1.82 | -8.28* |
| | (0.22) | (1.38) | (0.21) | (1.54) | (4.27) |
| INTANGIBLES | 14.64*** | 15.19*** | 15.08*** | 24.08*** | 26.67*** |
| | (3.29) | (5.84) | (4.91) | (5.75) | (7.31) |
| Q | 0.12 | -0.97 | -1.13 | -0.05 | -0.19 |
| | (0.14) | (0.24) | (0.94) | (0.18) | (0.21) |
| dRELATION | -4.03*** | -3.77*** | -4.68*** | -4.06*** | -6.89*** |
| | (0.72) | (0.87) | (0.61) | (0.72) | (1.37) |
| dSINGLE | | | | -9.72* | -17.15* |
| | | | | (5.80) | (9.65) |
| dREPLACE | | | | -4.46*** | 0.77 |
| | | | | (1.30) | (3.60) |
| dSTART | | | | 4.03 | -1.12 |
| | | | | (2.64) | (3.23) |
| dEND | | | | -1.41 | -5.65** |
| | | | | (1.63) | (2.72) |
| Adjusted $R^2$ | 0.119 | 0.544 | 0.151 | 0.500 | 0.289 |

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

Table 4

Replacement of single bank relationships.

The first column lists the characteristics of firms replacing a single bank relationship in the event year. The second column reports characteristics of all other firms, which across their listing period, have only one bank relationship and do not replace that relationship. The last column lists characteristics of firms which report multiple bank relationships. Gross ROA is the percentage ratio of earnings before interest and taxes to the sum of the market value of equity plus the book value of debt. Pre-tax income / assets is the percentage ratio of earnings before taxes to the sum of the market value of equity plus the book value of debt. EBIT / sales is the percentage ratio of earnings before interest and taxes to end-of-year sales. Sales is the end-of-year sales (in 000 Norwegian Kroner), deflated by the Norwegian CPI (1979=1). Assets is the sum of the market value of equity plus the book value of debt (in 000 Norwegian Kroner), deflated by the Norwegian CPI (1979=1). The debt ratio is the ratio of the book value of debt to the sum of the market value of equity plus the book value of debt. The age of the firm is measured relative to the founding date of the firm. Intangibles is the ratio of the total book value of intangibles to the sum of the market value of equity plus the book value of debt. Tobin's Q is the ratio of the year-end market value of equity plus book value of debt divided by the book value of assets. Means are listed on the first row in each cell, standard errors are reported below in parentheses, and medians are listed on the third row. The means are compared using a two-sided T-test (variances are not assumed equal). To compare medians we use a two-sided Mann-Whitney test.

Table 4 / continued

| Variable | Bilateral Replacing | Bilateral Not Replacing | Multiple |
|---|---|---|---|
| Number of observations | 30 | 538 | 574 |
| Gross ROA (in %) | 1.91 | 4.23 | 1.92*** |
| | (8.59) | (7.75) | (11.77) |
| | 4.32 | 5.39 | 4.80*** |
| Pre-tax income / assets (in %) | -0.46 | 0.91 | -1.95*** |
| | (9.28) | (8.14) | (13.47) |
| | 2.12 | 2.41 | 0.93*** |
| EBIT / sales (in %) | -1.32 | 9.10 | 5.00*** |
| | (34.41) | (18.54) | (17.69) |
| | 6.33 | 6.87 | 5.75*** |
| Sales | 186,516*** | 1,058,400 | 1,208,700 |
| | (191,602) | (4,031,300) | (1,539,000) |
| | 121,420 | 130,740 | 580,220*** |
| Number of employees | 387*** | 1772 | 2697*** |
| | (439) | (5423) | (3612) |
| | 207*** | 372 | 1214*** |
| Assets | 329,994*** | 1,473,228 | 1,627,487 |
| | (474,062) | (5,117,825) | (1,998,165) |
| | 177,820 | 173,520 | 632,090*** |
| Debt ratio | 0.506 | 0.575 | 0.707*** |
| | (0.238) | (0.225) | (0.184) |
| | 0.572 | 0.594 | 0.724*** |
| Age | 46** | 59 | 59 |
| | (33) | (42) | (41) |
| | 33 | 61 | 67 |
| Intangibles | 0.016 | 0.015 | 0.021** |
| | (0.035) | (0.048) | (0.056) |
| | 0 | 0 | 0.17*** |
| Tobin's Q | 1.466 | 1.454 | 1.203*** |
| | (0.659) | (0.663) | (0.356) |
| | 1.252 | 1.237 | 1.121*** |
| Interest payments / Debt | 0.070 | 0.056 | 0.054 |
| | (0.119) | (0.039) | (0.048) |
| | 0.035 | 0.059 | 0.055 |

***, **, * Significantly different from 'Not Replacing' at 1%, 5%, and 10% respectively.

***, **, ∗ Significantly different from 'Bilateral' (Column 1 and 2) at 1%, 5%, and 10% respectively.

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# Notes

[1] Access to non-bank funding may be improved by a close bank relationship (Diamond (1991)), in effect reducing the need for bank funds (Miarka (1999)).

[2] Kang, Shivdasani and Yamada (1999) on the other hand find that close ties with healthy Japanese banks facilitated investment policies enhancing shareholder wealth, especially for firms with poor investment opportunities.

[3] However, the focus of these and related studies (e.g., Cable (1985) and Edwards and Fisher (1994)) is mainly on the universal character of the German banking system, and not on the number of different banks a firm engages. See for example Emmons and Schmid (1998) for a review of this literature.

[4] Most firms in his data set have *more than one* 'main' bank, in contrast to firms in Weinstein and Yafeh (1998) which predominantly have single 'main' bank relationships.

[5] Houston and James (1996) focus on the reliance on bank debt, which they find negatively related to the importance of growth opportunities for firms with a single bank relationship, and positively related for firms borrowing from multiple banks.

[6] Seeking legal redress for such an information spill by a bank may be difficult. It is hard to document that the information transfer actually took place. Moreover, it is not clear that courts will be sympathetic to the plaintiff's case. For example, in ADT Operations, Inc. versus Chase Manhattan Bank (Chase financed a hostile takeover by another client against ADT) the court dismissed the charges of abuse of confidential information. The court noted that "no fiduciary relationship has been created by the mere communication of confidential information from the customer to the bank". This case is discussed at length in von Rheinbaben and Ruckes (1998).

[7] German banks are often suspected of shepherding domestic firms through their holdings of voting rights and board membership and through their resulting informational leverage. For example, on March 18th, 1997 Krupp launched a hostile takeover bid for Thyssen, and Deutsche Bank and Dresdner Bank were important holders of voting rights at Thyssen. To back the hostile takeover bid both "Deutsche Morgan Grenfell and Dresdner Kleinwort Bentwort, provided, through their parent commercial banks, a credit line believed to be worth DM18 billion" (The Economist, March 22, 1997). Deutsche was criticised because one of its board members was also a member of the Thyssen supervisory board. "He sat alongside the Thyssen management at the company's annual meeting last Friday without giving a hint of the bid plans or the bank's role" (Financial Times, March 21, 1997)). "The deal faltered *mainly because Deutsche Bank and Dresdner Bank ... got cold feet*" (The Economist, March 29, 1997).

[8] In fact, this dampening strategic effect causes higher firm quality to improve profitability by relatively more when firms are bilaterally financed. The reason is that in case firms are multilaterally financed, information leakage neutralizes part of the impact of the quality differential.

[9] For example a Herfindahl-Hirschman Index, calculated as the sum of the squared percentage shares of the total number of relationships with publicly listed firms held by each bank, stood at 3258 in 1989, and 2984 in 1994.

[10] In a recent survey of 16 randomly chosen firms, all reported 'primary' bank relationships involve short and long term credit, cash management, foreign exchange and hedging services. Eleven firms also employ other banks for a variety of services but typically at a much lower intensity. Only 6 firms obtain credit from their 'non-primary' banks.

[11] Yosha (1995) suggests this cut-off rate for applicability of his theoretical model.

[12] This also shows that the maximum of 'four' primary bank relationships is not an important restriction.

[13] We remove 14 observations for which the percentage ratio of earnings before interest and taxes to end-of-year sales is less than -150%, and 2 observations with negative sales values. Firms with extreme negative levels of profitability are likely to be atypical and the removal of extreme observations may facilitate the interpretation of the results.

[14] In Yosha (1995) higher firm quality improves profitability relatively more if firms are

bilaterally financed than if firms are multilaterally financed. In the latter case information leakage neutralizes part of the impact of the quality differential. Interactive variables would be needed to estimate this additional effect.

[15] Explaining firm profitability has been and remains a topic of great controversy in Industrial Organization (IO). Firm profitability could reflect both market power and greater efficiency (Demsetz (1974)). New Empirical IO suggests to study the profitability of industries and firms separately, that is taking into account strategic interaction among firms (see e.g. Bresnahan (1997) for a good overview). Theoretical models, such as Yosha (1995), von Rheinbaben and Ruckes (1998), and von Thadden (1998), are based upon imperfect information and the requirement that behavior should occur as an equilibrium phenomenon. This is fully in line with the tenets of the New Empirical IO approach. However, we are deviating from the New Empirical IO ground rules when we consider all Norwegian firms simultaneously (the theoretical models apply to all industries), and when we use accounting data as a proxy for firm profitability. But in our empirical specification we will also analyze specifications containing fixed firm effects. Moreover, our focus is not on the measurement of market power or greater efficiency but on the effect of bilateral/multilateral financing mechanisms and bank switching upon firm profitability.

[16] On the other hand, in Hubert (1998) equity enhances the firm's competitiveness in the product market.

[17] Recall also the discussion concerning the application of the New Empirical IO.

[18] The OSE scheme categorizes publicly listed firms in four groups: industry, shipping, insurance, and banking (the latter two categories are irrelevant for our purposes). There are also a few unclassified firms. The industry classification scheme employed by *Finansavisen* assigns firms to eight different business categories: manufacturing, media, off-shore (i.e. mainly oil- and gas-related activities), shipping, other transportation, IT, real estate, and distribution. Our assignment of firms to categories on the basis of their 1995 classification is problematic for firms not listed in 1995, for firms which shifted industry during the sample years, and for firms operating in more than one industry.

[19] We use a Wald $\chi^2$ test. For the first specification the test statistic is equal to 8.01, for the second it is equal to 14.16. Hence the hypotheses can be rejected at a 5% and 10% level of significance respectively.

[20] See Greene (1997) for a discussion on why it is reasonable to start with a random effects model (p. 632).

[21] Likelihood ratio tests reject the null hypotheses that the coefficients of the independent variables, firm, and year dummies are all (i.e., within each group) equal to zero at a significance level of 1% and for a variety of sub-specifications. (1) Constant term only, (2) Constant term and firm effects, (3) Constant term and X - variables, (4) Constant term, X and firm effects, (5) Constant term, X, firm, and year effects. Likelihood ratio tests are then conducted on the following pairings: (2) vs (1), (3) vs (1), (4) vs (1), (4) vs (2), (4) vs (3), (5) vs (4), and (5) vs (3). F-tests confirm these results. In addition most individual coefficients on the fixed year effects are significant. Both set of tests seem to suggest that even after controlling for firm characteristics, such as age, size, debt structure, asset intangibility, and the type of banking arrangement, both firm- and year- specific effects are present in the data.

[22] For an overview of the events in the run-up to and during the Norwegian banking crisis, see for example Kaen and Michalsen (1997).

[23] Four coefficients are significant at 5% and three at a 10% level. The signficance level on six other coefficients is below 20%.

[24] 236 firms report two, 101 firms report three, and 38 firms report four bank relationships.

[25] We consider a change in relationship due to a bank merger not to be an event.

[26] Market share is based on the total number of bank relationships a bank has with OSE listed firms.

[27] Using net income to equity (Return On Equity) changes the results. All coefficients on the variables become insignificant, except for DEBT. But ROE is often noisy and driven by

accounting and tax practises.

[28] We actually discard the first year in each listing period, as it is impossible to know whether or not switching occurred.