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Does bank relationship matter for a firm's investment and financial constraints? The case of Taiwan

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Abstract

This paper investigates the effects of a bank relationship on reducing a firm's financial asymmetric information in an investment function. A bank relationship is proxied by the number of banks that a firm engages for its borrowing activities. A bank relationship is further divided into two regimes, i.e., a strong and a weak bank relationship regime, where the former is defined as one with smaller number of loan related-bank, and the latter is one with a greater number. It is expected that a strong bank relationship reduces the asymmetric information, i.e., investment cash-flow sensitivity here. Based on the examination of unique Taiwanese bank transaction data, our results show that investment is less sensitive to cash flow when a firm has a strong bank relationship. This implies that the firm holds less cash flow in hand for future investment expenditures. By contrast, when a firm has a weak bank relationship, the investment is sensitive to cash-flow. Our results are robust regardless if the bank relationship is proxied by either the loan amount or loan duration.

JEL classification: D82; E22; G21; G31
Keywords: Bank relationships; Investment; Financial constraints; Cash-flow sensitivity

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1. Introduction

Academics have long recognized the central role of banks as the optimal mechanism for channeling funds from investors to firms when costly information asymmetries exist between them. In fact, potential investors may find it more efficient to delegate a bank to provide them funding rather than have multiple lenders collect information about their firm's prospects prior to granting it credit and simultaneously monitoring their actions once an investment has been made. Boot and Thakor (2000) argued that the raison d'être of banks may well be their role in mitigating informational asymmetries, which can simultaneously be accompanied by maintaining a close, or strong, bank relationship. It follows then that if firms have a close banking relationship, they may obtain funds from banks relatively easily, which permits them to keep lower liquidity on hand. In other words, they are not financially constrained.

The aim of this paper is to investigate whether a suitable "bank relationship" can mitigate a firm's "financial constraints" using Taiwan data, where the term "financial constraints" here means that a lack of internal funds may negatively affect a firm's investments when the capital market is imperfect. The firm's investment is thus affected by the cash flow it retains, which is often referred to as "investment cash-flow sensitivity". Our hypothesis is that a strong bank relationship improves asymmetric information between firms and banks by alleviating the problem of financial constraints since banks are able to provide liquidity when needed. This research departs from past research in that notion of the bank relationship effect has been ignored in the previous studies which attempted to get a firmer grasp on investment cash-flow sensitivity.[1] One possible reason they have ignored the bank relationship effect is because of the paucity of bank relationship data. This paper employs unique Taiwan bank transaction data, which helps us identify the number of banks that a firm is related to. This variable is used as the proxy for a bank relationship. We expected that a firm with a strong bank relationship holds less cash flow for future investment expenditures, a notion which stems from the argument that with a strong bank relationship, asymmetric information is mitigated to a minimum. On the other hand, a firm with a weak bank relationship should hold greater cash-flow. This all means that the relation between a firm's bank relationship and its cash flow sensitivity is significant for firms with a strong bank relationship, but insignificant for firms with a weak one. Furthermore, our results are robust when the bank relationship is proxied by the loan amounts and duration of loans.

There are seven sections in this paper. The next section presents a review of the literature with a focus on the discussion of a "bank relationship". Section 3 outlines the

[1] Empirical studies have tried to identify those factors that can affect cash flow sensitivity, and these include the average dividend payout ratio (Fazzari et al., 1988; Fazzari and Petersen, 1993; Bond and Meghir, 1994), the degree of bank affiliation or membership in an industrial group (Hoshi et al., 1991; Chirinko and Schaller, 1995), firm size and age (Devereux and Schiantarelli, 1990; Oliner and Rudebusch, 1992; Jaramillo et al., 1996; Gertler and Gilchrist, 1994; Harris et al., 1994; Kadapakkam et al., 1998; Shen and Wang, 2000), a composite index of the above indicators (Hu and Schiantarelli, 1998), concentration of ownership (Chirinko and Schaller, 1995), and the issuance of commercial paper (Gilchrist and Himmelberg, 1995). Research studies that have used international market data to explore the impact of international capital markets on estimated cash flow sensitivity include Love (2001).

testing of the hypothesis and the econometric specifications. Section 4 describes the sources of data, the definitions of the variables, and provides their basic statistics. Section 5 discusses the empirical results, while Section 6 reports on the robust testing. The final section contains the concluding remarks.

2. Literature review

2.1. Investment and financial constraints

Classical investment theories, which presume a perfect capital market system, have argued that different sources of financing are irrelevant to corporate investment decision-making provided that the projects show a positive net present value. This irrelevance theorem, which is mainly based on Modigliani and Miller's (1958) pioneer work, implies that there is no asymmetric information between lenders and borrowers, and hence, internal funds and external funds can be perfectly substituted for each other. In the real world, however, an imperfect capital market is the norm, and as a result, outside investors typically demand a financial premium on a debt or stocks issued by a firm, a policy which in itself suggests that internal funds are cheaper than external financing ones. Thus, for the most part, firms are more apt to prefer internal financing to external financing, a practice which has been dubbed the "financial hierarchy" (Fazzari et al., 1988). The existence of financial hierarchy implies that internal and external financing are no longer perfect substitutes for each other. As for external financing, Diamond (1984) and Fama (1985) argued that banks have an informational advantage over other intermediaries because they are appointed to serve as delegated monitors and, as such, have a greater incentive to collect information. Table 1 presents the internal and external funding sources of Taiwan

Table 1
Percentage of sources of total private external finance in Taiwan

Year	Internal finance (%)	External finance						
		Loans by financial institutions	Borrowing from non-financial institutions	Borrowing from abroad	CP and BA	CB	Foreign portfolio investment	Sum (%)
1992	41.59	41.03	17.30	0.37	2.35	0.29	–	58.41
1993	41.29	39.27	19.25	0.35	3.85	0.35	–	58.71
1994	39.04	40.18	17.73	0.31	3.42	0.39	0.57	60.96
1995	38.25	38.67	18.28	0.32	3.89	0.44	0.62	61.75
1996	38.44	35.52	13.91	0.18	5.59	1.41	0.65	61.56
1997	38.86	38.56	12.39	0.13	5.99	1.42	1.06	61.14
1998	38.68	39.22	12.55	0.13	7.03	1.46	0.82	61.32
1999	40.83	39.62	11.52	0.17	6.25	2.04	0.71	59.17
2000	39.75	41.12	11.75	0.20	7.26	3.00	0.72	64.05

Source: Economic Research Department of the Central Bank of China (ROC), Survey of the Financial Conditions of Public and Private Enterprises in Taiwan, Dec 2000.
Notes: (1) External Finance = Debt; Internal Finance = Net Worth. (2) $(units): Trillions of New Taiwan Dollars. (3) CP and BA = the commercial papers and bank acceptances. (4) CB = corporate bonds.

corporations, where the latter accounts for 60% of the total funds. Among the external funds, the largest shares are loans from financial institutions. Thus, bank relationships are crucial for Taiwan's firms.

Generally speaking, one approach to test asymmetric information is to examine the correlation between a firm's cash flow and its investment expenditure. This approach assumes that capital market imperfections create a preference for internal over external financing and that the magnitude of these imperfections is measured by the extent to which a firm's investments are correlated to its cash flow. Fazzari et al. (1988) asserted that if asymmetric information exists, then firms cannot easily obtain external funds and, hence, need to maintain a considerable amount of internal funds for their investments. Thus, asymmetric information is assessed by whether or not the investment becomes sensitive to the cash flow. A different phrase is that firms are financially constrained if asymmetric information exists but non-financially constrained otherwise (Fazzari et al., 1988). The former is also referred to as cash flow sensitivity, and the latter as insensitivity.

Studies of investment cash-flow sensitivity using different criteria that divide firms into two categories, where one category has less and the other category has more asymmetric information, are abundant.[2] The general conclusion is that cash flow sensitivity is, in fact, reduced when information is more transparent. Studies as to how a bank relationship affects investment cash-flow sensitivity, nonetheless, are relatively few in number, probably on account of the difficulty in accessing information on detailed bank borrowing firms. An indirect approach to study the relationship of sensitivity is often applied by judging whether or not a firm belongs to a financial conglomerate. To cite a few examples, in Japan, a firm in a *kereitsu* group automatically classifies it as one with strong ties with the group's banks. In Germany, universal banks are allowed to hold shares in firms, which imply that firms there supposedly have strong ties with banks. In this paper, we employ unique Taiwan bank transaction data, and use a direct approach to identify the degree of a banking relationship by first counting the number of related banks, and then by calculating the amounts and durations of loans.

2.2. Bank relationship

Literature investigating the benefits of firms having close bank relationships employs the number of banks that a firm engages to help it in its borrowing activity as the bank relationship (hereafter the number of banks). This proxy naturally gives rise to the debatable issue of the optimal number of banks. Supporters of a single-bank relationship argue that a close relationship with a single bank is beneficial since confidentiality may be valuable for firms engaging in research and development, particularly for high-technology innovators. In other words, a single-bank lending relationship could limit the leakage of proprietary information (Degryse and Ongena, 2001). Also, a single bank relationship may strengthen the moral responsibility of the bank to rescue the firm when it is in distress, which Tilly (1989) referred to as "liquidity insurance".

Further rationale in support of a single-bank relationship is that reliance on a greater number of banking relationships can be more costly. If the information one

[2] See footnote 1.

bank gathers on a firm cannot be conveyed credibly by the firm to other parties, then the firm will have to pay a "lemon's premium" when it approaches other banks. The premium arises because other banks will question the firm's decision not to seek funding from its original lender. From this perspective, if the lemon's premium the firm pays when it approaches other banks increases, it is more likely that the firm incurs the costs of initiating other relationships. Besides this, firms typically limit their search to relatively few banks since relationships with more banks also increase firms' searching costs. Also, supportive of the single-bank relationship concept, von Rheinbaben and Ruckes (1997) noted that a multilateral banking relationship entails not only higher transaction costs, but also more competitive interest rates.

As opponents to a single-bank relationship, Sharpe (1990) and Rajan (1992) argued that the proprietary information about borrowers that a single bank obtains as part of the relationship may give that single bank an information monopoly. They showed that competition from an additional informed bank can eliminate such "hold-up" effect. Since bank financing forces a bank to become well-informed about a firm, it might tend to hold the firm hostage to the bank and, hence, enable the bank to extract rents. One reason that firms seek financing from multiple banks, Thakor (1996) argued, is to reduce the risk of being denied credit.

Empirical studies that use the number of lending related-banks as a proxy of the bank relationship are also found in the literature. Ongena and Smith's (2000) study, for one, implicitly showed that bank fragility rises after it reaches the threshold of a bank relationship, suggesting that while a single relationship is not optimal, unlimited multilateral relationships are also less than desirable. Farinha and Santos (2002) reported a non-monotonic effect, claiming that multiple banking relationships are more likely to be found among firms those with more growth opportunities than among those with poor performance. They demonstrated that firms with higher levels of investment prior to the initiation of multiple relationships increase their investments even further once they start to borrow from multiple banks and that firms with a poor prior performance continue to perform poorly afterwards. Consistent with the above findings, Houston and James (1996) found that multiple-bank firms tend to be larger than single-bank firms. Hence, the optimal number of bank relationships is not constant but possibly increases with the size of a firm. In light of this, we are highly motivated to adopt a non-linear specification in our paper to explore the relationship between a banking relationship and cash-flow sensitivity. According to existing theoretical literature, neither too many nor too few bank relationships are desirable when it comes to reducing asymmetric information. With this in mind, we conduct this study with a view to determining whether or not there is an optimal threshold. Above the threshold, firms have multiple bank relationships, but have only a weak relationship with each bank. Such firms, therefore, tend to retain more cash flow for their future investments. Below the threshold, firms have fewer bank relationships, but stronger ties with each bank, thereby making them less concerned about funding sources. This conjectured financing behavior, which either exceeds or is below the bank relationship threshold, enables us to identify the optimal, most desirable, number of bank relationships.

Our paper uses the "number of lending related-banks" to proxy the banking relationship. To check the robustness, "loan amount" and "loan duration" are also attempted,[3] where the former is similar to the concentration of borrowing (Houston and James, 2001) and the latter is similar to the strength of a relationship based on its length (Ongena and Smith, 2001).[4] As concerns the proxy of a bank relationship, we prefer to use number of banks as opposed to loan amount and loan duration, to the latter two as the proxy of bank relationship because the bank number seems to be in line with the definition of a bank relationship for the traditional banking theory and this measurement is based on data accuracy. The individual transaction loan data used in our paper are available in supplementary notes of firms' balance sheets. The format of these notes is not regulated, making firms report them in an ad hoc way. To be sure, it is found that many firms are willing to disclose the names of related banks but not the actual loan amounts. The calculation of loan duration is an even more challenging task as it is not un-common for firms to terminate a borrowing relationship by pre-paying the debt or by other means.[5]

3. Econometric specifications

Despite numerous heated discussions about the optimal number of banks, empirical results, for example those from Ongena and Smith (2000) presented in Table A1 (in Appendix A), seem to suggest that the optimal number of banks changes across countries. The number of bank relationships across 22 countries range from 2.3 (Norway) to 15.2 (Italy), with an overall average of 5.6. Furthermore, single-bank relationships are relatively uncommon in the world, perhaps because most firms maintain multiple-bank relationships with the aim of reducing the chance of being denied credit. From a different perspective, the percentage of firms with a single-bank relationship is only 14.5%, whereas that of firms with three or more bank relationships is more than 50%. Except for the work of Ongena and Smith (2000), relatively few papers have focused on the number of banks that firms borrow from, particularly in an emerging market, like Taiwan, where firms tend to have fewer single-bank relationships. Our empirical study contributes to the field by attempting to fill this gap.

We hypothesize that there is an optimal bank relationship which affects the relationship between the sensitivity of investments and the internal funds. Below the optimal bank relationship, the number of banks that lend to a firm is smaller, lending to closer ties between that firm and each of the banks. As stated above, we refer to firms that borrow from fewer banks as having a strong bank relationship regime, where asymmetric information is substantially reduced. When the optimal bank relationship is exceeded, the number of banks that lends to a firm is greater. A bank that does not have proprietary information about a given firm is referred to as having a weak bank

[3] We appreciate that referees have pointed out this critical remark.

[4] Ongena and Smith (2001) found that small, young, highly leveraged firms maintain the shortest relationship with banks. Houston and James (1996) used loan/(total-debt) as the proxy of a bank relationship and reported that a strong bank relationship increases credit availability.

[5] We often find that the borrowing relationship suddenly ends without explanation. In this study, we adjust this error to the best of our ability.

relationship regime. Asymmetric information remains in this regime. Accordingly, our hypothesis is that investment is insensitive to liquidity in a strong bank regime but sensitive in a weak one.

We adopt two specifications to examine this hypothesis. First, the threshold of the bank relationship is an exogenous variable by averaging the bank number of all firms. Thus,

$$(I/K)_{i,t}=\beta_0^{(1)}+\beta_1^{(1)}Q_{i,t+1}+\beta_2^{(1)}(\mathrm{Liq}/K)_{i,t-1}+\beta_3^{(1)}(P/K)_{i,t-1}+\beta_4^{(1)}\mathrm{INDU}_{it}+\beta_5^{(1)}\mathrm{YEAR}_{it} + \varepsilon_i^{(1)} \quad \text{if bank} < \gamma \ \text{(the strong bank relationship regime)}, \tag{1}$$

$$(I/K)_{i,t}=\beta_0^{(2)}+\beta_1^{(2)}Q_{i,t+1}+\beta_2^{(2)}(\mathrm{Liq}/K)_{i,t-1}+\beta_3^{(2)}(P/K)_{i,t-1}+\beta_4^{(2)}\mathrm{INDU}_{it}+\beta_5^{(2)}\mathrm{YEAR}_{it} + \varepsilon_i^{(2)} \quad \text{if bank} \geq \gamma \ \text{(the weak bank relationship regime)}, \tag{2}$$

where $i=1,2,\ldots,N, t=1,2,\ldots,T$, subscript i denotes the ith firm and t denotes the tth period; I is the amount of gross investment; Q is Tobin's Q; Liq is the index to proxy liquidity; P is the firm's production, and stands for the proxy of the income effect for investment; K denotes the capital which is equal to long-term debt plus equity and which serves as a scale variable; Bank proxies three meanings: the "number", "amounts" and "durations" of the bank loans that firms obtain. γ is the threshold value, and subscripts T and N denote T periods and N firms, respectively.

The detailed explanations of the variables are given for below. The definition of I is the flow amounts of gross investment, which is measured as the change in expenditures on factory property and equipment. While the liquidity variable is typically proxied by a firm's operating cash flow (OCF) (for example, see Hoshi et al., 1991; Gibson, 1995), Houston and James (2001) suggested using corporate cash and its equivalents (CASH) as an alternative measure. This cash and its equivalents, equaling cash holdings plus short-term securities, are readily convertible into cash.[6] Thus, two liquidity proxies, OCF and CASH, are employed in this paper.

In a perfect capital market, the level of investment should only be related to the profitability of a firm's investment opportunities and should be unrelated to the internal funds generated by a firm.[7] This theory predicts that Q should be the only determinant of investment if external financing does not matter. Our Q is the average Q, which is measured by the ratio of the market value of outstanding stocks divided by the book value of total assets taken by the replacement costs in the next period (Q_{t+1}). The term Q_{t+1} controls future investment opportunities.[8] Other control variables include lagged production, where production is defined as sales plus the change in the inventories of final goods.

[6] High liquidity signals that a firm has done well and is likely to continue doing well. Thus, more liquid firms have better investment opportunities, and therefore, we include Q to control for the expected profitability of investments when determining the investment effects of liquidity.

[7] This is typically referred to as the Modigliani and Miller Proposition I (M&M I), which states that how a firm chooses to arrange its finances is completely irrelevant.

[8] Some argue that a marginal Q should be used instead of the average Q; see Hayashi (1982) for a discussion. In reviewing such studies, we are struck by the variety and complexity of the procedures used to estimate Q. Perfect and Kenneth (1994) provide a good summary of different methods and their deficiencies. In this paper, we use the commonly used method of Lang and Litzenberger (1989).

In accordance with existing literature, we deflate all variables by the firm's capital (K) to adjust for the problem of heteroscedasticity. In addition, we consider two additional dummy variables, INDU (industry dummy) and YEAR (year dummy), where INDU is unity if a firm belongs to a "new" economy (e.g., the electronics industry) and zero if it belongs to a "conventional" economy (e.g., the construction, paper and pulp, food, and steel industries). Term YEAR is the yearly dummy and is zero before the Asian financial crisis period (1991–1996) and unity afterwards (1997–2000). Finally, we estimate the investment equation using within-group fixed effects. Within-group fixed effects are equivalent to including an industry variable for each firm in the sample and, as a consequence, controls for any omitted firm-specific characteristics that may affect investment expenditures.

The testing strategy proceeds as follows. First, we set the optimal number of bank relationships at 8, which is the average number of banks (see Table 1 for a detailed calculation), and this suggests that the threshold value γ is equal to 8. We then use this threshold to divide the sample into two sub-samples. When Bank<8, firms are in a strong bank relationship regime and can obtain funds from a bank relatively more easily and, hence, keep lower liquidity on hand; this suggests that $\beta_2^{(1)}$ is insignificant. Conversely, when Bank≥8, firms are in a weak bank relationship regime and need to maintain liquidity when investing, which is indicative of a positive $\beta_2^{(2)}$. We also apply the same logic to the loan amount and the loan duration when they are applied. Our non-linear effect of a bank relationship on asymmetric information is thus

$$H_0 : \beta_2^{(1)} > 0, \beta_2^{(2)} = 0.$$

This specification endogenizes the bank relationship by letting the model decide the optimal number of bank relationships. This endogenous specification assumes cash-flow sensitivity is a function of the bank number; that is,

$$(I/K)_{i,t} = \beta_0 + \beta_1 Q_{i,t+1} + \beta_2(\mathrm{Liq}/K)_{i,t-1} + \beta_3(P/K)_{i,t-1} + \beta_4\mathrm{INDU}_{it} + \beta_5\mathrm{YEAR}_{it} + \varepsilon_i, \tag{3}$$

$$\beta_{2,i,t-1} = \theta_0 + \theta_1(\mathrm{Bank})_{i,t-1}. \tag{4}$$

The estimation procedure of this model involves substituting (4) into (3), which yields the additional interaction variable Bank×(Liq/K). It is expected that θ_0=0 and θ_1>0, which means that cash flow is less sensitive (asymmetric information is reduced) in a strong bank relationship regime. When investment is not affected by cash flow, i.e., β_2=0, this makes Bank=$-\theta_0/\theta_1$, which determines the optimal bank relationship.

4. Data sources and basic statistics

The concept of a 'bank relationship' is quite elusive in the banking theory. In modern banking theory, for instance, a close relationship of a firm with banks may arise from the fee services, including the fact that the bank may help a firm in terms of cash management, portfolio investment hedging, financial consulting, etc. (Ongena and Smith, 2000). While these bank services enhance the relationship between banks and firms, it is not easy to quantify them. For this reason, it is hard to use fee services as the basis for studies on bank relationships. In contrast, conventional banking theory, which stresses bank relationship based on lending, is used here.

Private corporate borrowing over the past decade in Taiwan has been roughly 60% from external finance, and about 40% from internal finance based on estimates from Taiwan's Central Bank, as shown in Table 1. Among the external finance, about 40% corporate loans from financial institutions, particularly from general commercial banks. As mentioned in the literature review, the major part of the external funds of private corporate funds in Taiwan are from financial institutions, suggesting that the financial structure in Taiwan is much like a bank-based financial system. Hence, it is reasonable to state that bank lending does influence the investment funding of private firms.

Our bank relationship data set is collected from the Taiwan Security Exchange Council (TSEC hereafter). In Taiwan, as in many countries, listed companies are required to send the stock exchange commission their financial statements, which mainly include their balance sheets and income statements. However, when sending these two publicly available financial statements, companies in Taiwan are further required to attach a "long format" financial statement, which describes in detail how each item in the two publicly available financial statements is compiled.[9] This long format financial statement, albeit not directly available to the public, can nevertheless be obtained by application and xeroxing. A complete long format financial statement records data on each loan transaction, including loan rate, bank name, loan amount, and duration of a loan. Thus, we are able to count the number of banks a public firm borrows from during our sample periods. Shen (2002), in fact, uses this data set to study whether or not corporations are credit rationed during normal periods and whether they were during the Asian crisis period.[10]

The summary statistics of single- and multiple-bank relationships across industries are reported in Table 2. Firms are categorized into 18 industries based on the security code of TSEC. The average number of multiple banking relationships for all firms is 8.33, which is the threshold value we used in Eqs. (1) and (2). It is observed that the steel industry has the highest number of banking relationships (borrowing from 16.14 banks on average), whereas the automobile industry has the lowest number (borrowing from 3.42 banks on average). In each industry, some firms have only a single-bank relationship, but the percentage of this type of single bank relationship varies in each industry. The rubber industry has the highest percentage of single-bank relationships (57.42%), whereas the paper and pulp industry has zero.

Three interesting points are worth noting in Table 2. First, compared with the average number of 5.6 banks in European countries (Ongena and Smith, 2000), the

[9] The long format of a financial statement in Chinese means a "detailed" financial statement; see Shen (2002) for a detailed description of these data.

[10] As we have discussed in Section 2.2, the individual transaction loan data set used in our paper is available in a supplementary report. The items of this report are not uniform. Also, firms may choose not to provide the information in as much detail as they could. We find that even though firms are willing to disclose the names of related banks, they are often unwilling to disclose the loan amount and/or the loan duration.

Table 2
Summary statistics of the cross-industry samples for the number of banks

Code	Industry	Sample number[a]	Firms reporting bank relationships			
			Mean	Standard deviation	Max	Single-bank relationship (%)[b]
11	Cement	8	8.31	6.95	19	8.52
12	Food	24	14.42	5.42	21	5.45
13	Plastics	21	11.75	9.25	32	1.76
14	Textiles	58	15.78	8.44	33	5.24
15	Electrical Machinery	27	6.94	5.07	17	0.12
16	Wire and Cable	16	8.06	6.67	28	7.24
17	Chemical	23	9.15	7.64	17	10.12
18	Ceramics and Glass Products	7	7.43	5.32	12	8.15
19	Pulp and Paper	7	7.43	5.18	17	0.00
20	Steel	26	16.14	9.64	35	5.41
21	Rubber	8	9.74	5.18	14	21.93
22	Automobile	4	3.42	2.02	8	0.12
23,24	Electronics	77	6.94	5.51	32	10.13
25	Construction	37	12.32	4.69	30	16.73
26	Transportation	16	6.16	4.63	18	12.64
27	Tourism	6	5.18	1.96	6	57.42
29	Department Stores	12	7.46	3.26	15	0.24
99	Other	33	7.94	5.92	19	12.46
	Overall Sample	349	8.335	4.73	35	10.22

[a] Firms and banks in this table are all public traded companies on the TSEC.
[b] The single bank relationship (%) = (The number of a single bank relationship that a firms report) / (The total number of firms in this industry).

average in Taiwan is higher at 8.335. According to the results of Ongena and Smith (2000), as a general rule, firms maintain more banking relationships in countries with poorer corporate governance. If this argument holds, then in Taiwan, there must be room for improvements in corporate governance. Next, it is apparent that Taiwan's publicly traded firms are more inclined to have a larger number of bank relationships. Firms with a single-bank relationship in most industries make up less than 10%. Third, when we further divide our sample into 'new' and 'traditional' economies, the latter seems to have a higher average number of bank relationships. The average number for the traditional industries of construction, food, textile, and steel industries is respectively 12.32, 14.42, 15.78, and 16.14, values which are all above the country average of 8.335. By contrast, the number of bank relationships for the electronics industry is only 6.94.

Sample statistics of listed firms and bank numbers across years are presented in Table 3. The bank number increases from 7 in 1991, reaching a peak of 18 in 1998; it then gradually decreases gradually. Also shown is the Taiwan stock index, which rises from 3377 in 1991 to 8187 in 1996, after which time it decreases. In the late 1980s, the period of the asset bubble in Taiwan, the stock index reaches its historic high. Interesting to note is that during this period, firms are evidently more eager to obtain additional external financing from banks. This result, at least to some extent,

Table 3
Summary statistics of annual samples

Year	All listed firms (number)	Domestic banks (number)	TSEC stock index	Average number of banks a firm deals with	Added new relationships	Termination of relationship
1991	221	24	3377.06	7	–	–
1992	256	28	6070.56	10	5	2
1993	285	33	7124.66	10	4	4
1994	313	37	5173.73	11	4	3
1995	347	45	6933.94	15	5	1
1996	382	47	8187.27	18	6	3
1997	404	48	6418.43	16	2	4
1998	437	52	7448.84	15	4	5
1999	462	53	4739.09	11	0	4
2000	531	53	4509.44	12	2	3

Notes: We identify a firm as ending a relationship when it drops a bank from the list or replaces one bank with another. The same logic is applied to the definition of "new relationships".

may seem to contradict conventional wisdom according to which equity financing and debt financing are most probably substitutes. Yet their patterns appear complementary in our simple case (see Demirgüç-Kunt and Maksimovic, 1996, for a discussion of

Table 4
Distributions of observed bank relationships and other variables (proxy: the number of banks) (unit=million)

The number of banks a firm deals with	Marginal (%)	Cumulative (%)	I	Q	OCF	D/E (debt to equity, %)	Sales	ROA (%)
<5	5	–	458	15.52	84	110	8979	13.21
6	10	15	434	13.31	88	130	7647	11.45
7	8	23	374	14.96	71	156	6854	12.45
8	10	33	326	11.27	81	159	4156	8.54
9	13	46	265	9.05	60	144	7567	9.21
10	12	58	293	10.62	64	186	5564	8.67
11	8	66	287	10.54	53	127	6012	6.56
12	7	73	254	10.74	57	167	5124	7.94
13	5	78	295	12.93	49	154	4469	6.64
14	11	89	511	14.05	64	223	5234	8.69
15	4	93	463	11.56	58	195	7364	5.65
>15	7	100	581	9.48	62	214	8402	6.44
Average	8.33	–	378.41	11.91	65.91	154.75	6447.67	8.78

Notes: Variable Definitions: (1) I (Investment, Capital Expenditures): The increased amounts of gross investment, which is measured as the change of expenditures on plant property and equipment. (2) Q: Market Value/Book Value, which is measured as the ratio of the market value of outstanding stock divided by the book value of the firm's total assets. (3) OCF (Operating Cash Flow): This is measured as net income before extraordinary items and depreciation, and this cash is from the normal activities of business. (4) D/E: This ratio represents the financial leverage, which is defined as Debt/Equity. (5) ROE: This measures the return on equity, which is measured as Net Income/Equity. (6) I, Q, OCF, D/E, Sales and ROE: These variables reported in this table are the sample means for 1991–2000.

Table 5
Descriptive statistics of the variables

Variables	Mean	Standard deviation	Max	Min	Skew.	Kurt.
$(I/K)_{i,t}$	1.857	1.347	9.731	0.157	2.004	2.725
$Q_{i,t+1}$	11.916	17.469	51.297	0.875	9.019	3.713
OCF: (Liq/K)	4.657	9.541	14.197	−2.457	−1.259	0.592
CASH: (Liq/K)	10.573	6.984	19.144	5.761	−2.007	0.614
$(P/K)_{i,t-1}$	8.541	10.547	15.204	0.153	1.843	0.507
BANK	8.335	4.73	37.00	1.00	9.546	6.749

Notes: Variable definitions: I: Investment in capital expenditures. Q: Market value/book value. OCF: Operating cash flow. CASH: Cash plus cash equivalents and short-term securities. Sales: Revenue in sales. K: Capital, which is measured as long-term debt plus equity.

this issue). That is, the added bank number increases when Taiwan's weighted stock index rises. One factor contributing to this may be a missing third variable, such as the economic cycle, which drives both financing sources. This is indicative of a division in the sample based on the state of the macro-economy.

The changing pattern of the explanatory and dependent variables using bank numbers instead of year as the pivot is presented in Table 4. To explain this, we explore changes in the average of each variable when the bank number functions as an axis. As the bank number increases, the amount of investments falls first, reaching a minimum when the bank number is 13; thereafter it increases. Tobin's Q and cash flow exhibit the same patterns as that of investment, but the minima are 9 and 11, respectively. The data of the D/E (the ratio of debt to equity) and sales ratio display reverse pattern once the bank number is 13. As the bank number increases continuously, changes in each of the variables exhibit either a concave or a convex pattern. Turning to the returns on assets (ROA), as shown in the last column, they also decrease first and then increase. Though it is premature to draw any conclusions based on these basic statistics, the finding are consistent with our hypothesis of the existence of an optimal bank relationship.

The descriptive statistics of the five explanatory variables are reported in Table 5. The average number of $(I/K)_{i,t}$, $Q_{i,t+1}$, $(\mathrm{Liq}/K)_{i,t-1}$ (liquidity has two proxies: OCF and CASH; see Section 2.2 for more details), $(P/K)_{i,t-1}$, and Bank are 1.857, 11.916, 4.657 (OCF), 10.573 (CASH), 8.541, and 8.335, respectively. The standard deviations and the maximum and minimum values of these variables are also given. In sharp contrast to the other remaining variables, $(I/K)_{i,t}$, $Q_{i,t+1}$ and $(P/K)_{i,t-1}$ display obvious higher volatility, and their standard deviations are much larger than the means.

5. Empirical results

Our estimation method includes the Ordinary Least Square (hereafter OLS) and the fixed effect of the panel model. Each method contains two proxies for liquidity. We initially expected that the coefficient of liquidity would be insignificant in a strong relationship regime (the first regime), but significant in a weak one (the second regime).

5.1. Exogenous threshold

The results from different estimation methods when the threshold is equal to 8 are listed in Table 6. The first two columns show the results of the estimation method when the liquidity proxy is Operation Cash Flow (hereafter OCF). Recall that our hypothesis requires insignificant and positive values in the first and second regimes, respectively. The coefficients on OCF in the two regimes are both insignificantly positive, which implies that our supposition is only half supported. When liquidity is proxied by CASH in Model B, as reported in the third and fourth columns, the coefficients in the two regimes become −0.102 and 0.241, respectively, with both being significantly different from zero. Of particular interest is the negative coefficient on a strong bank relationship regime is interesting for it implies that a firm with fewer related banks maintains less cash and its equivalents even in the presence of potential investment opportunities. This could be referred to as a state of ‘super insensitivity’ since a firm with a strong bank relationship is expected to be fully confident as far as funding sources go, thus giving it to keep less cash flow even when it expects to make future investments.

The argument with respect to super-insensitivity is certainly not a complete new in the literature. To cite one example, recently, Ferris et al. (2003) suggested that over-investments might occur in Korean chaebol’s firms even if those firms are among the industries in decline. That is, while chaebol’s firms lack cash, they still invest more than might normally be expected because they are sure to obtain financing from their conglomerate. Such over-investment is consistent with our concerning super-insensitivity argument as firms with a strong bank relationship have a similar status to that of chaebol’s firms in a conglomerate.

The estimated results using the fixed effect of the panel model are shown on the right hand side of Table 6. Bear in mind that the estimation of OLS may be biased since it ignores the idiosyncratic risk. When OCF is employed as the measurement of liquidity, the focused coefficients in the two regimes, i.e., name them again, are −1.254 and 0.357, respectively, with the former being insignificant and the latter significant, which fully supports our hypothesis. When the liquidity measure is proxied by CASH, the results change little from those obtained using the OLS. More specifically, in the same two regimes, the two coefficients are respectively −1.107 and 0.242, and both are significant.

Using the conventional liquidity measure of cash flow provides support for our notion of the non-linear effect of a bank relationship on asymmetric information. It is only half supported when a broad measure of *liquidity* is used with the exogenous threshold of 8, and it is estimated by the fixed effect estimation technique. The investment behavior is, indeed, different when the bank relationship across the threshold is 8.

The implications of our results are that firms with a weak bank relationship may have to cut their future potentially profitable investments in response to cash flow

Table 6
Bank relationships and liquidity sensitivity: Exogenous threshold

Model	OLS estimation				Fixed effect for panel data			
	Proxy for liquidity				Proxy for liquidity			
	Model A (OCF): Operation cash flow		Model B (CASH): Cash and equivalents		Model A (OCF): Operation cash flow		Model B (CASH): Cash and equivalents	
Information asymmetry	Low (BANK$\prec\gamma$)	High (BANK$\geq\gamma$)	Low (BANK$\prec\gamma$)	High (BANK $\geq\gamma$)	Low (BANK$\prec\gamma$)	High (BANK$\geq\gamma$)	Low (BANK$\prec\gamma$)	High (BANK $\geq\gamma$)
Intercept	2.219 (9.247)***	0.174 (1.706)*	0.124 (1.009)	−3.305 (−0.250)	–	–	–	–
$Q_{i,t+1}$	0.109 (8.731)***	0.065 (1.615)*	0.018 (0.274)	−0.221 (−0.399)	0.145 (1.801)**	0.057 (1.643)*	0.039 (1.743)*	0.002 (1.543)
$(\mathrm{Liq}/K)_{i,t-1}$	1.742 (1.515)	3.682 (1.005)	−0.102 (−1.996)**	0.241 (1.674)*	−1.254 (1.637)	0.357 (1.741)*	−1.107 (−1.966)**	0.242 (1.800)*
$(P/K)_{i,t-1}$	1.354 (3.736)***	1.409 (0.919)	2.477 (0.599)	−0.294 (−0.568)	0.997 (1.476)	−1.201 (−1.416)	−0.657 (−1.357)	0.114 (1.125)
Adj-R^2	0.39	0.25	0.21	0.17	0.27	0.16	0.17	0.16
Sample number	175	174	175	174	175	174	175	174

See Eqs. (1) and (2).

The sensitivity measure is different in the two regimes, and the regimes depend on the threshold variable BANK and the threshold value γ. Here the cut-off point γ is the eight banks that firms deal with as reported in Table 1. When BANK < 8, firms are in a strong banking relationship regime, and they can obtain funds from bank loans relatively more easily; hence, they tend to keep lower liquidity on hand, suggestive of an insignificant $\beta_2^{(1)}$. Otherwise, BANK ≥ 8 means that firms are in a weak banking relationship regime. Where there are investment opportunities, they need to maintain more liquidity, because they may face information asymmetry more seriously, indicative of a positive $\beta_2^{(2)}$. The liquidity proxy for Model A is operation cash flow (OCF), and the liquidity proxy for Model B is cash and equivalents (CASH). The number in the parenthesis is the t value. *** is significant at 1%, ** is significant at 5%, and * is significant at 10%.

shortfalls. This being the case, the number of banks could serve as a signal of the degree of information asymmetry. We postulate, therefore, that establishing a close loan relationship with a few banks, which could reduce the cost of private loans, should be encouraged.

Our results also confirm that a single-bank relationship is relatively uncommon in the world (Ongena and Smith, 2000). Although the single-bank relationship can keep a bank well informed about firms and increase not only the availability of capital to borrowing firms but also investments, Weinstein and Yafeh (1998) found that such close bank–firm ties do not lead to a higher growth in profitability since it holds the firms hostage to the bank, hence enabling the bank to extract monopoly rents. The net effect shows that the optimal number of banks depends on their ability to negotiate with each other.

5.2. Endogenous threshold

The estimated results when the threshold is endogenous, i.e., the sensitivity measure is a function of the number of banks are reported in Table 7. Recall that by assuming this endogenous specification, an interaction term between liquidity and the bank number is introduced. The optimal bank relationship Bank$=-\theta_0/\theta_1$ is also obtained by setting $\beta_2=0$.

The results, nevertheless, do not change significantly. First, the estimated optimal number of bank relationships is 8.79, 9.01, 12.31, and 7.46 for four different specifications, and all are close to the exogenous specification of 8. This may very well mean that the results of the exogenous threshold in Table 6 are, indeed, acceptable. The estimated results of the interactive terms, however, are overwhelmingly but still

Table 7
Bank relationships and liquidity sensitivity: endogenous threshold

	OLS estimation		Fixed effect for panel data	
	Proxy for liquidity		Proxy for liquidity	
	Model A (OCF): operation cash flow	Model B (CASH): cash and equivalents	Model A (OCF): operation cash flow	Model B (CASH): cash and equivalents
Intercept	1.436 (0.574)	−0.137 (−1.443)	–	–
$Q_{i,t+1}$	0.561 (1.753)*	−0.442 (−0.075)	0.436 (1.098)	0.169 (0.185)
$(\text{Liq}/K)_{i,t-1}$	1.354 (1.741)*	1.847 (1.461)	−1.009 (0.005)	0.835 (1.283)
$(\text{Liq}/K\times\text{Bank})_{i,t-1}$	−0.154 (−0.556)	−0.205 (−1.196)	0.082 (0.582)	−0.112 (−0.962)
(Bank) Number	8.792	9.009	12.305	7.455
Adj-R^2	0.11	0.16	0.13	0.15
Sample number	157	158	157	158

$$(I/K)_{i,t} = \beta_0 + \beta_1 Q_{i,t+1} + \theta_0(\text{Liq}/K)_{i,t-1} + \theta_1(\text{Liq}/K \times \text{Bank})_{i,t-1} + \beta_3(P/K)_{i,t-1} + \beta_4\text{INDU}_{it} + \beta_5\text{YEAR}_{it} + \varepsilon_{i,t}$$

$$\beta_{2,i,t-1} = \theta_0 + \theta_1(\text{Bank})_{i,t-1}$$

The above equation allows for the adapted threshold number of banks to be unknown, and liquidity is the function of the number of banks. If the coefficient of liquidity is zero, then Bank$=-\theta_0/\theta_1$, and the threshold number of banks can be re-checked to compare with the known number, 8 of Table 1. For the fixed effect of panel data, we erase two variables, INDU and YEAR, because of the econometric specifications of the fixed effect (Greene, 1997).

Table 8
Bank relationships and liquidity sensitivity (proxy: loan amount as the degree of a bank relationship)

Model	OLS estimation				Fixed effect for panel data			
	Proxy for liquidity				Proxy for liquidity			
	Model a (OCF): operation cash flow		Model b (CASH): cash and equivalents		Model A (OCF):operation cash flow		Model B (CASH): cash and equivalents	
Information asymmetry	Low	High	Low	High	Low	High	Low	High
Intercept	−1.134 (−1.465)	−1.554 (−1.041)	0.074 (1.256)	−0.415 (−1.751)*	–	–	–	–
$Q_{i,t+1}$	1.124 (1.815)**	1.425 (1.440)	−0.973 (−1.597)	0.487 (1.749)*	1.465 (1.706)*	−0.151 (−1.334)	0.817 (1.751)*	−0.751 (−0.005)
$(\text{Liq}/K)_{i,t-1}$	−0.365 (−0.754)	1.004 (1.654)*	−0.715 (−1.681)**	0.954 (1.893)**	0.379 (1.124)	1.129 (1.799)**	−0.978 (−1.751)**	0.325 (1.972)**
$(P/K)_{i,t-1}$	0.458 (1.625)	0.687 (1.602)	−0.584 (−1.416)	0.336 (1.561)	−0.054 (−0.657)	−1.205 (−1.137)	−1.152 (−1.069)	0.453 (1.468)
Adj-R^2	0.21	0.19	0.23	0.16	0.19	0.15	0.16	0.14
Sample number	175	174	175	174	175	174	175	174

When the loan/amounts > 19% (the standard deviation = 27%), firms have a close (strong) bank relationship and the information asymmetry is low; otherwise, the relationship is weak, and the information asymmetry is high. The number in the parenthesis is the t value. ***Significant at 1%, ** is significant at 5%, and * significant at 10%. See Eqs. (1) and (2).

Table 9
Bank relationships and liquidity sensitivity (proxy: loan duration as the degree of a bank relationship)

Model	OLS estimation				Fixed effect for panel data			
	Proxy for liquidity				Proxy for liquidity			
	Model A (OCF): operation cash flow		Model B (CASH): cash and equivalents		Model A (OCF): operation cash flow		Model b (CASH): cash and equivalents	
Information asymmetry	Low	High	Low	High	Low	High	Low	High
Intercept	0.775 (1.235)	1.148 (1.536)	−0.872 (−1.152)	1.038 (1.367)	–	–	–	–
$Q_{i,t+1}$	−1.362 (−1.387)	1.053 (1.556)	1.164 (1.668)*	0.943 (1.795)**	0.874 (1.900)**	1.071 (1.681)*	−1.002 (−1.429)	0.105 (1.659)*
$(\mathrm{Liq}/K)_{i,t-1}$	0.783 (1.526)	1.094 (2.095)**	0.258 (1.575)	1.649 (2.157)**	1.105 (1.498)	1.254 (1.806)**	1.253 (1.248)	1.456 (1.758)**
$(P/K)_{i,t-1}$	0.452 (0.687)	0.526 (1.806)**	1.274 (1.541)	1.624 (1.274)	−0.775 (−1.589)	1.684 (1.534)	0.446 (1.579)	−0.451 (−1.387)
Adj-R^2	0.25	0.13	0.17	0.14	0.19	0.13	0.15	0.14
Sample number	175	174	175	174	175	174	175	174

When the duration of a loan is more than 3 years (the standard deviation = 1.7 years), firms have a close (strong) banking relationship, and the information asymmetry is low; otherwise, the relationship is weak, and the information asymmetry is high. The number in the parenthesis is the t value. ***Significant at 1%, ** is significant at 5%, and * significant at 10%. See Eqs. (1) and (2).

insignificantly different from zero. The coefficients of the liquidity proxies are also insignificant except for the coefficient of OCF in the first regime, which is even positive when the OLS method is employed.

6. Testing for robustness

In this section, we use the loan amount and loan duration to proxy the degree of bank relationships.[11] First of all, the estimated results using loan amount to proxy the bank relationship are shown in Table 8. The first two columns report the results of the OLS estimation method when the liquidity proxy is OCF. Our earlier expectation that the coefficients of liquidity are respectively, insignificant and positive in the first and second regimes, gains further support. When liquidity is proxied by CASH in Model B, as reported in the third and fourth columns, the coefficients in the two regimes become significantly negative and positive, respectively, where the former is super-insensitive and the latter is sensitive. The conclusion hence remains unchanged as those drawn from using the number of banks. In other words, what is implied is that the larger the amount of the loan, the less asymmetry information is, and vice versa.

On the second way to proxy the degree of banking relationship, the estimated results using loan duration as a proxy for a banking relationship are presented in Table 9. The first two columns report the results of the OLS estimation method when the liquidity proxy is OCF. The use of OCF again supports our hypothesis, as the coefficients on the OCF in the two regimes are insignificantly and significantly positive, respectively. When liquidity is proxied by CASH in Model B, the results are not altered. Hence, a longer loan duration suggests less information asymmetry and vice versa. Thus, once again, our hypothesis is supported even when the proxy of loan amount and loan duration are used.

7. Conclusions

As investment is central in economic growth, the study of firms' financial channel is important. This paper claims that asymmetric information. Few empirical studies, however, have been conducted to investigate the influence of a bank relationship on the financing of investment though scholars have had numerous theoretical debates on the issue. is mitigated to a minimum when a firm has a close bank relationship, while asymmetric information may be substantial when a firm has a weak bank relationship. This hypothesis is tested by determining whether the liquidity coefficient is insignificant in a strong bank relationship regime, but significant in a weak bank relationship regime in an investment function. To this end, two approaches with respect to dividing the regimes and the implementation of two different proxies of liquidity, i.e., OCF and CASH, are attempted. The exogenous threshold that is calculated from the average number of bank relationships is 8, and the endogenous

[11] We thank the referee for suggesting that we use loan amount and loan duration to investigate the sensitivity.

approach implements an interaction term to identify the threshold. The OLS and the fixed effect of panel data are both employed.

From the examination of unique Taiwanese bank transaction data, the bank relationship is evaluated by three proxies, the number of banks that a firm engages to conduct its borrowing activities, loan amount, and loan duration. This bank relationship is further divided into two regimes, i.e., a strong and a weak bank relationship regime, where the former is defined as one with a lower number of loan related-bank, higher loan amounts, and longer durations of the loan contract, while the latter is one with a greater number of loan related-banks, smaller loan amounts, and shorter duration. A stronger bank relationship is expected to reduce the asymmetric information, i.e., the investment of cash-flow sensitivity here. Our results using the exogenous threshold model show that the asymmetric information is mitigated to a minimum when a firm has a strong bank relationship, implying that they hold less cash flow in hand for future investment expenditures. By contrast, the asymmetric information is substantial when a firm has a weak bank relationship.

When the endogenous threshold is used, the coefficients on the liquidity proxy are significant in the first regime, but not in the second, contradicting our hypothesis. We then re-examine the issue by deleting investments with extreme values. The new results support our original conjecture.

The econometric evidence here indicates that monitored by fewer banks can avoid the problem of ‘free rider’, and a closer bank relationship enables firms to depend less on their internal measures of liquidity to finance the investment expenditures. The overall results correspond strikingly with the results of Fazzari et al. (1988), Hoshi et al. (1990), and Ramirez (1995). The contribution of the study makes, however, is that it adds more evidence to the growing literature on capital structure and corporate finance and strongly suggests that the capital market imperfections play a critical role in the financial structure of corporations. On the capability side, our methodology yields results which imply that an optimal bank relationship improves the financing mechanism of firms, providing them with a option to choose a lower cost of capital to finance their investment expenditures.

Extensions of this paper could take several directions. One interesting area would be to investigate the differences between a greater number and a smaller number of banking relationships on a firm’s financial arrangements. Another possible avenue for further research could be to discuss the impact of the choice of the number of bank relationships on bank performance.

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Appendix A

Table A1
Overview of the number of bank relationships, by country

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

Source: Ongena and Smith (2000, Table I, p. 30).

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