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Post-Crisis Changes
in Banking and Corporate
Landscapes: The Case of
Thailand

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-- THE CASE OF THAILAND**

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**by
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Post-Crisis Changes in Banking and Corporate Landscapes -- The Case of Thailand

This study investigates the relative importance of factors shaping banking and corporate landscapes in Thailand after 1997 through an empirical analysis of micro-data of Thai banks and firms. The results of the analysis of the bank data show that the deceleration of bank credit growth is mainly attributable to the fallout from the Asian crisis and post-crisis regulatory changes. While high non-performing loans (NPLs) and foreclosed assets on balance sheets hinder the resumption of lending, those banks that were well capitalised, larger or domestic could resume lending faster. The analysis also showed that big, domestic, well-capitalised banks with higher NPLs are more prone to diversify into securities investments. The analysis of the firm sample indicates that Thai firms have diversified their sources of financing over the period of 1997-2000, which is reflected in the rise of the share of debt securities and trade financing. As a conclusion from the above analyses, the diversification of banks' asset portfolios and firms' financing sources *per se* can be considered a good direction. Nevertheless if banks respond to decreasing profits and capital adequacy requirements merely by venturing into new activities and gaining new customer segments, and do not adequately address their NPLs, it will offset the positive risk-sharing effect of portfolio diversification. Therefore, a rigorous plan to resolve the NPL problem and financial reforms to ensure the availability of alternative ways of financing for businesses should be implemented simultaneously.

JEL Classification: G21, G31, G34, E44, O53, C23

Keywords: banking behaviour, corporate financing policy, restructuring, financial markets, Asia, panel data

* * * * *

Les Changements après la Crise dans le Paysage des Banques et des Entreprises en Asie Dynamique– le Cas de la Thaïlande

Cette étude analyse l'importance relative des facteurs modelant le paysage des banques et des entreprises en Thaïlande après 1997 par le biais d'une analyse empirique de micro données des banques et entreprises thaïlandaises. Le résultat de l'analyse des données bancaires montre que la décélération de la croissance du crédit bancaire est principalement attribuable aux retombées de la crise asiatique et aux changements de réglementation après la crise. Tandis que les prêts non productifs élevés et les avoirs saisis sur les bilans retardent la reprise des prêts, les banques qui étaient bien capitalisées, plus grandes ou nationales ont pu reprendre les prêts plus vite. L'analyse montre également que les grandes banques, nationales, bien capitalisées avec des prêts non productifs élevés sont plus enclines à se diversifier en des investissements en titres. L'analyse de l'échantillon des entreprises indique que les firmes thaïlandaises ont diversifié leur source de financement sur la période 1997-2000, ce qui est reflété dans la hausse de la part des titres de dettes et dans l'échange de financement. Comme conclusion des analyses ci-dessus, la diversification du portefeuille de capitaux des banques et des sources de financement des entreprises *per se* peut être considérée comme allant dans la bonne direction. Néanmoins si les banques répondent à leur baisse de profit et à leur besoin d'un capital adéquat simplement en s'avançant dans de nouvelles activités et à gagner de nouvelles parts de marchés, et n'aborde pas de la bonne manière leur prêts non productifs, cela va contrebalancer l'effet positif du partage du risque par la diversification du portefeuille. Par conséquent, un plan rigoureux pour résoudre le problème des prêts non productifs et les réformes financières pour assurer la disponibilité de voies de financements alternatives des affaires doivent être entrepris simultanément.

Classification JEL: G21, G31, G34, E44, O53, C23

Mots clé: comportement banquier, politique de financement des entreprises, restructuration, marchés financiers, Asie, données de panel

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**POST-CRISIS CHANGES IN BANKING AND CORPORATE LANDSCAPES
-- THE CASE OF THAILAND**

SUMMARY

1. This study investigates the changing relations between banks and their business customers in Thailand after 1997. These changes are manifest in declining bank lending growth and can be attributed to three major driving forces: cyclical factors, the fallout from the 1997 Asian crisis and structural factors affecting both the supply of and demand for bank credit. Cyclical factors such as the Asian crisis and the economic downturn in 2001 have reduced corporate loan demand. The fallout from the 1997 crisis (and more recent downturns) in the form of non-performing loans (NPLs) and foreclosed properties have made banks more cautious in their lending decisions. These factors along with other factors of a more structural nature such as increasing competition from multinationals and capital markets have squeezed bank profits. In response to declining lending growth and declining profits, banks have been changing their strategies. They have been diversifying their customer base and scope of activities. Individuals and small and medium-size enterprises are among the fastest growing customer segments of the banks. Banks are also expanding the scope of their activities and the firewall between banking and securities business is disappearing. Another strategy to restore profitability and stay afloat in the global competition arena is consolidation. Mergers and acquisitions have resulted in further concentration of the banking sector in Thailand. The corporate sector has been hard hit by the Asian crisis and the resulting debt load and over-capacity in many sectors. These problems are inducing shifts in corporate strategies that are affecting their demand for loans and other products from banks. Faced with more stringent bank lending conditions, and seeking to reduce their debt loads, larger firms have been turning to capital markets as part of an effort to diversify their sources of funding. The development of the corporate bond market, facilitated by the establishment of pricing benchmarks, has been spectacular. Large privatisation moves of utilities and other state-owned enterprises are expected to contribute to the revival of equity markets.

2. The relative importance of these factors is investigated through an empirical analysis of micro-data of Thai banks and firms. The results of the analysis of the bank data show that the deceleration of bank credit growth is mainly attributable to the fallout from the Asian crisis and post-crisis regulatory changes. While high NPLs and foreclosed assets on balance sheets hinder the resumption of lending, those banks that were well capitalised, larger or domestic could resume lending faster. The analysis also investigated the underlying factors of diversification of asset portfolios into securities investments. It is shown that big, domestic, well-capitalised banks with higher NPLs are more prone to diversify into securities investments. The analysis of the firm sample indicates that Thai firms have diversified their sources of financing over the period of 1997-2000, which is reflected in the rise of the share of debt securities and trade financing. The share of loans, short-term or long-term, on the other hand, has declined. The increase of the share of debt securities financing is especially pronounced in the case of manufacturing firms. Debt securities issuance is no longer limited to firms in the infrastructure or energy sectors, but has become available for firms in the textiles, electronics or other manufacturing sectors.

3. As a conclusion from the above analyses, the diversification of banks' asset portfolios and firms' financing sources *per se* can be considered a good direction. Nevertheless if banks respond to decreasing profits and capital adequacy requirements merely by venturing into new activities and gaining new

customer segments, and do not adequately address their non-performing loans, it will offset the positive risk-sharing effect of portfolio diversification. On the corporate side, if firms have limited access to bank credit, they have the alternative to diversify into non-bank financing, especially bond financing given that financial reforms to foster bond markets have been put in place. Therefore, a rigorous plan to resolve the NPL problem and financial reforms to ensure the availability of alternative ways of financing for businesses should be implemented simultaneously.

1. INTRODUCTION

4. This study conducts empirical tests on some of the findings of the paper entitled “Post-Crisis Changes in Banking and Corporate Landscapes in Dynamic Asia” applying micro data of banks and business enterprises in Thailand. It investigates the changing relations between banks and their business customers in Thailand after 1997. External and domestic, demand and supply-side factors have been reshaping banking and corporate landscapes in Thailand after 1997. The deceleration of bank credit growth is mainly attributable to supply side factors closely related to the fallout from the crisis and post-crisis regulatory changes. While bank credit has decreased sharply, deposits have appeared to be nearly unaffected by the crisis, which implies huge losses in banks' balance sheets as they could not turn down depositors. Big banks were hit to a larger extent as depositors favoured them to smaller ones. The Bank of Thailand helped to ease this burden by reallocating liquidity among banks. High interest rates immediately after the crisis further aggravated the situation as banks had to pay more for deposits and many corporate customers were forced to default on their loans. Banks in Thailand have appeared to be innovative to cope with rising deposits relative to loans. They have been diversifying the asset side of their balance sheets, have been gaining new customer segments and have been venturing into new activities.

5. In parallel with banking sector developments, enterprises have embarked on a diversification of their capital structure. The post-crisis credit crunch has pressed many corporations to diversify away from bank financing. Firms with good reputation could acquire fresh funds by issuing debt securities, and some have even used bond issues to pay back their bank loans. The corporate bond market, taking advantage of recent low interest rates, is experiencing an unprecedented growth, due largely to government's efforts to foster the bond market. The equity market, has been less attractive due to depressed share prices and high issuance costs, but is expected to play a larger role in the coming years.

6. Some of the above changes are empirically tested in this study using micro-data on Thai banks and firms. The results suggest that the deceleration in bank lending is largely attributable to more stringent regulations concerning capital adequacy together with the fallout from the 1997 crisis, in the form of NPLs and foreclosed assets in banks' balance sheets. Further, banks incorporated in Thailand have more been affected by these factors than branches of foreign banks. On the other hand, diversification of banks' scope of business seems to depend on the size of the bank rather than the place of incorporation. Decreasing loan demand and new regulatory requirements have been pressing banks to get engaged in new activities. The major change on the corporate side is the diversification of sources of financing. The share of bank borrowing has decreased while firms have been increasingly turning to the debt market for fresh funds. The debt securities market has become accessible also to firms outside the infrastructure and energy sectors. Manufacturing firms, besides increasing bond issues, have been more relying on trade loans compared to before 1997. Their debt-equity ratios and the interest burden of previous borrowings have risen.

7. The following two sections provide micro-level analysis of a large sample of Thai banks and firms. Using micro-data in both analyses helps to avoid the pitfalls of aggregation and the large size of the samples (in case of banks above 95 per cent of the market in terms of loans or assets, in case of firms above 25 per cent in terms of number or above 40 per cent in terms of market capitalisation of non-financial firms) makes it more likely that the results will be more representative.

2. BANKING SECTOR: WHAT EXPLAINS FALL IN BANK CREDITS?

8. In the post-1997 literature, many attribute the deceleration of bank lending in Thailand to a credit crunch. *Agénor, et al. (2000)* show -- by estimating a demand function for excess reserves by commercial banks¹ -- that the reduction of credit growth is consistent with a supply-side phenomenon. *Chiuri et al. (2001)* modify the Peek-Rosengren approach² and investigate the effect of stricter enforcement of minimum capital discipline on bank intermediation in 15 emerging economies using panel data of 572 banks. They also include other variables like improved accounting standards, more rigorous provisioning practices and more binding bankruptcy laws to support the hypothesis of credit crunch especially in economies with bank-based financial systems.

9. Building on the observation of credit crunch in previous studies, the first analysis of this study investigates the reasons for decelerating lending on the supply side.³ As a result of the crisis and an attempt by the authorities to enhance stability of the financial system, capital adequacy requirements became more stringent and enforcement more effective. Many banks needed capital injections or other kinds of assistance to build up their capital and sometimes the price was a deceleration of bank lending growth (or even recalls of loans). In other cases fresh capital was provided by foreign investors, who were more cautious about lending in a new environment, than incumbent management. Notwithstanding the immediate capital-shrinking effects of post-crisis CAR enforcement, even after capital adequacy requirements had already been met, banks have been struggling with keeping their CARs at required levels. This suggests that more stringent capital adequacy requirements (introduced and enforced in 1997) may have contributed to a persistent credit crunch in Thailand as new entry and re-entry NPLs make it difficult for banks to observe the capital adequacy requirement. Different from 1997, in the sample period Thailand has been experiencing credit crunch without shrinking bank capital. This is because banks have been reluctant to write off bad loans or have not transferred all of NPLs to AMCAs and they have practically not started yet the disposal of foreclosed assets. The other reason for shrinking lending without shrinking assets as a total is that Thai banks have successfully diversified their asset portfolios.

10. Further, as balance sheets of banks in Thailand, especially of banks incorporated in Thailand,⁴ had been still saddled with large amounts of NPLs during the sample period (2000:III to 2001:IV), the

1. The authors first develop a demand function for excess reserves by commercial banks capturing the impact of reserve requirements, funding costs, and precautionary motives related to liquidity risk and output volatility. Then, after confirming the stability of the model using a dynamic version, they carry out dynamic projections. If the forecast errors from the predictions of the model of excess liquid assets are small enough to be consistent with the predicted path of reserves then the reasons for slowdown are to be traced on the supply side, on the contrary, if large enough, on the demand side.

2. *Peek and Rosengren (1995)* explicitly include enforcement (captured by a dummy variable for formal actions) as a determinant of shrinkage of credit supply and show that US banks with formal actions shrink at a faster rate than those without.

3. It should be noted that here the focus is on recent developments in bank credit and not the immediate effect of the post-crisis CAR enforcement. Therefore enforcement itself is not treated explicitly (given that the year of CAR enforcement is 1997), but instead it is assumed that all banks had met capital adequacy requirements by the beginning of the estimation period (Q3 2000). Nevertheless, capital ratios are considered to be an important factor in the recovery of bank lending as banks with lower capital ratios are assumed to be more cautious when extending new loans.

4. It has been observed, that domestic banks were more reluctant to write off NPLs vis-à-vis foreign bank branches (except for Japanese banks, which also advocate the stance of "no haircut").

heavy burden of NPLs may have also contributed to the sharp deceleration of bank lending growth. Another factor that may be relevant for the analysis is foreclosed assets on banks' balance sheets. In the pre-1997 period banks' lending decisions had been collateral based and not cash flow based. When corporations were unable to serve their loan obligations, the ownership of real estate that served as collateral to the loan was transferred to the bank. This way banks became owners of large amounts of often-unfinished real estate, which bring little cash returns (unless they can be rented out) and can not be profitably disposed when asset prices are low.

11. To examine whether capital-asset ratios, NPLs and holding of foreclosed property have contributed to a credit crunch, a pooled time series and cross-section panel of banks' balance sheet and income statement data is applied. The sample includes all domestic commercial banks (13) that existed over the 2000:III to 2001:IV period and foreign bank branches (13) for which data are available for the given period.⁵ The panel begins in the third quarter of 2000 because the number of banks for which data are available for earlier periods is very limited and would not be sufficient for a similar analysis.⁶ The last available quarter was the fourth quarter of 2001, providing six quarters for the analysis. Before executing the analysis, it was checked whether the behaviour of domestic and foreign banks in Thailand can be considered similar (*i.e.* whether the slopes for domestic and foreign banks are the same).⁷ After verifying that the data can be pooled, the following equation is estimated by panel data analysis:

$$\frac{\Delta A_{j,i,t}}{A_{i,t-1}} = \alpha_1 + \alpha_2 \frac{K_{i,t-1}}{A_{i,t-1}} + \alpha_3 NPL_{i,t} + \alpha_4 FORC_{i,t} + \alpha_5 \log A_{i,t} + DTHAI_i + \gamma_i + \varepsilon_{i,t}$$

where

A: assets

K: capital

NPL: NPL ratio (NPLs outstanding to total loans outstanding)

FORC: foreclosed asset ratio (foreclosed assets to total assets)

DTHAI: dummy for Thai banks

γ_i : fixed effect for individual bank i

12. The dependent variable is the change in asset category j of bank i scaled by total assets of bank i . Asset categories chosen for the analysis are loans and securities. The independent variables are the capital-asset ratio, the NPL ratio (NPLs outstanding to total loans outstanding), the foreclosed asset ratio (FORC), which is foreclosed assets scaled by total assets, the logarithm of bank assets and a dummy for banks incorporated in Thailand. Figure 10 shows the trends in the two alternative dependent variables, loans outstanding and securities investments scaled by total assets, and the loans-to-deposits ratio. While the ratio of loans to total assets and the loans-to-deposits ratio have been gradually declining, the share of securities investments in total assets have been rising. Notwithstanding that lending has the highest share of assets in the asset portfolio of commercial banks in Thailand, this illustrates a diversification trend. The

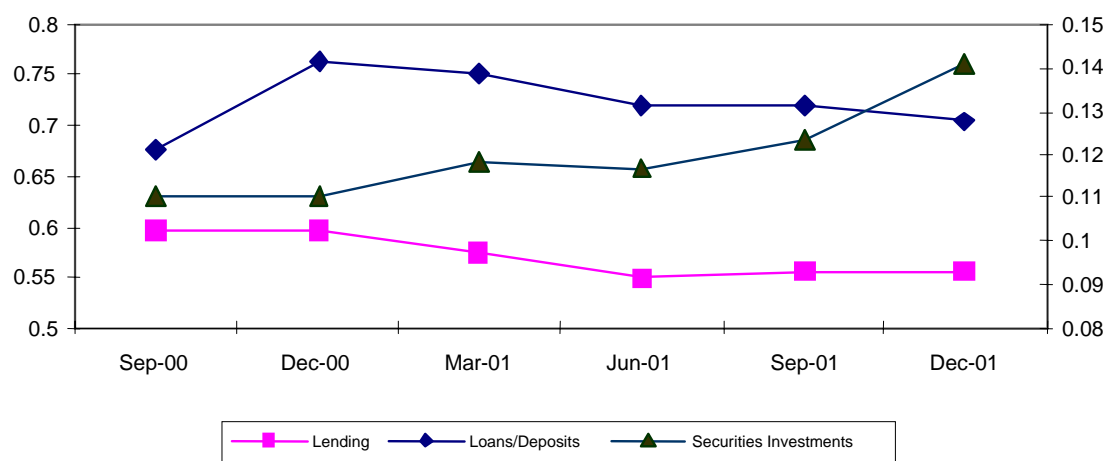
5. For this reason the International Finance Corporation Thailand (IFCT), which was given a bank status in 2001 is not included. For consistency of data over time, financial statements of foreign bank branches whose head offices merged during the sample period were merged for periods preceding the merger so that the data series would consistently reflect the activities of the consolidated bank. These cases are the merger of Sanwa with Tokai Bank and the merger of the Industrial Bank of Japan, Daiichi Kangyo and Fuji Bank.

6. Also, there has been a big amalgamation of financial institutions in 1999, which could make it difficult to use pre-2000 data for such comparison. An example is the acquisition of Krungthai Thanakit Finance and Securities Public Company Ltd and 12 finance companies by Krung Thai Bank.

7. For this the diagonality test was applied and the hypothesis that the variance-covariance matrix of the stacked model of domestic and foreign banks is diagonal, could not be rejected (the resulting test statistic is 5.54085 and the critical value is 5.540853).

expected signs are + for the capital-assets ratio, - for the NPL ratio, + for the foreclosed assets ratio and + for the logarithm of assets.

Figure 1. Trends in Share of Bank Lending, Loan/Deposit Ratio and Ratio of Securities Investments in Thailand



Note: The left-hand side scale belongs to lending and loans/deposits and the right-hand side one to securities investments

13. As the Hausman test rejected the random-effects specification relative to the fixed-effect specification in most of the cases, a model with a dummy variable for each institution is estimated. The results in the first column of Table 1 show that all the independent variables do have a significant impact on loan growth. The sign of the coefficient on the capital-asset ratio is positive, as expected, and statistically significant at the 5 per cent level. This indicates that those banks that are relatively well capitalised were able to resume lending more easily than others. The coefficient on the NPL ratio is negative and significant at the 1 per cent level. This is what was expected, given that NPLs constitute a heavy burden on banks' balance sheets they constrain bank lending.

14. The sign of the estimated coefficient on the foreclosure ratio is negative and this coefficient is the largest (significant at the 1 per cent level). This result is somewhat puzzling, as holding of seized assets means that the resolution of NPLs is progressing, so that lending should increase. A possible explanation for the negative sign is that foreclosed assets used to serve as collateral for loans classified as NPL and these loans can be viewed as assets of the worst quality. Given that NPLs were not 100 per cent backed by collateral, when a bank seizes the collateral, unavoidable losses occur. The presence of foreclosed asset may reflect these losses. On the other hand, the collateral itself has lost value as a result of the bursting of the asset price bubble (given that the most common collateral was real estate), which again implies losses

for a bank that holds foreclosed assets in its balance sheet.⁸ These possible explanations suggest that the presence of foreclosed assets *per se* reflects these losses.⁹

15. The logarithm of total assets is included in the regression to assess the size effect, the coefficient on this variable is positive and significant at the 5 per cent level, indicating that larger banks were able to resume lending faster. The coefficient on the dummy for domestic commercial banks is also positive and significant at the 1 per cent level, which suggests that domestic banks were faster to resume lending. This is not surprising given their informational advantage *vis-à-vis* foreign banks and probably the more cautious behaviour of foreign banks when extending loans to companies in Thailand.

16. The second column in Table 1 investigates why securities investments of commercial banks increased. The Hausman test rejects the random effects model, therefore the fixed effects estimation method is applied. The coefficients on the capital-asset ratio, and NPL ratio are positive and significant at the 5 per cent level, though both are very small. It is not surprising that relatively well-capitalised banks are more engaged in securities investments, than those that have less capital. The reason, however, why banks with higher NPLs are more investing in securities might be that securities investments are more profitable *vis-à-vis* lending when interest rates are low. Also, in banks where there are already large amounts of NPL, there is more risk aversion to new NPLs and thus a likely greater preference for safer securities. The coefficients on the logarithm of assets and the dummy for domestic banks are positive and significant at the 1 per cent level, suggesting that bigger and domestic banks are more engaged in securities investments than smaller of foreign banks. This is in line with the observations that non-interest income of large banks (such as Bangkok Bank, Thai Farmers Bank, Krung Thai Bank etc) has increased sharply in the recent years.

17. From column 3 to column 6 the same hypotheses were checked for domestic commercial banks and foreign full branches, respectively. Among domestic commercial banks, those that are better capitalised, have lower NPLs and less foreclosed assets on their balance sheets, have expanded their lending activities faster. Surprisingly, the size effect is not significant. With regards to securities investments, on the other hand, only the size effect has explanatory power.¹⁰ For foreign branches only the size effect is significant. This may reflect the lower NPLs and lower foreclosed assets of foreign banks.

8. A third factor providing an additional explanation for the negative sign is the asset valuation method approved by the Bank of Thailand, which deducts the reserve for decline in value from the acquisition cost of the asset. In parallel with falling real estate prices, reserves for decline in value are higher, thus the value of the asset is lower. This is an additional source of "loss", at least in an accounting sense, which is related to foreclosed assets in banks' balance sheets.

9. Foreclosed assets received between January 1997 and December 31 2002 must be sold within 10 years from the date of acquisition.

10. In this estimation the evidence against the random effect model is not compelling, therefore this model was also estimated. None of the coefficients, are, however significant and the explanatory power of the regression is very small. It should be noted that the explanatory power of the regressions in Table 1 in general is relatively low because there should be other, economy-wide factors affecting the deceleration of bank lending. Given the specification of the model, however, only variables that vary over individual (bank) and time are included.

Table 1. The effects of recapitalization, NPLs and foreclosed assets on asset categories of commercial banks in Thailand

Independent variable	Estimation method: Fixed Effects			
	All banks		Foreign full branches	
	dLoans/Assets	dSecurities/Assets	dLoans/Assets	dSecurities/Assets
Capital/Asset ratio	0.188* (0.099)	0.099* (0.057)	-0.018 (0.118)	0.041 (0.109)
NPL ratio	-0.250** (0.072)	0.079* (0.041)	0.035 (0.035)	-0.121 (0.127)
Foreclosure ratio	-5.615** (0.737)	-0.002 (0.422)	-0.034 (0.263)	-3.348 (8.419)
Log assets	0.385* (0.162)	0.778** (0.093)	0.501* (0.174)	0.576** (0.177)
Thai bank dummy	0.221** (0.064)	0.224** (0.037)	0.070 (0.480)	0.177 (0.133)
R-squared	0.495	0.513	0.072	0.275
SSR	0.541	0.177	0.036	0.260
SER	0.074	0.043	0.025	0.074
Hausman test H0:RE	CHISQ(4) = 52.191	CHISQ(4) = 82.876	CHISQ(4) = 7.994	CHISQ(4) = 15.534
P-value	0	0	0.092	0.004
Random Effects				
Capital/Asset ratio			-0.109 (0.089)	0.035 (0.042)
NPL ratio			-0.013 (0.019)	-0.098 (0.102)
Foreclosure ratio			0.093 (0.104)	2.697 (5.652)
Log assets			0.015 (0.010)	0.023 (0.033)
R-squared			0.011	0.039
SSR			0.040	0.359
SER			0.026	0.078
				CHISQ(4) = 43.374
				0

*, **, *** Significant at the 5%, 1% confidence level, respectively
Standard errors in parentheses.

3. ENTERPRISE SECTOR: CHANGING CHARACTERISTICS OF ENTERPRISE FINANCING 1997 AND 2000

18. While banks have been showing decreasing lending and increasing securities investments and non-core activities, recent enterprise surveys confirm the existence of a credit crunch. Firms that weathered the crisis relatively well and have started to undertake fixed assets investments have increasingly been relying on the debt securities market and to some extent on the equity market for fresh funds. This analysis investigates changes in firms' financing methods and their diversification into direct financing. It uses balance sheet data of 100 firms randomly selected from listed firms on the Stock Exchange of Thailand. A comparison of cross-sections in 1997 with 2000 can be considered as a good basis for identifying the types of firms that underwent diversification of financing methods after the crisis.

19. Debt financing has decreased 26 per cent over 1997-2000. Table 2 shows that on average financing by short-term loans, trade credit and long-term loans has decreased over 1997-2000, but debt securities financing has increased. The largest decline has been registered in long-term bank loans, whose share has dropped from over 50 per cent to 43 per cent, while the share of short-term loans has dropped from 27 to 24 per cent. On the other hand, the share of debt securities financing has increased from 11 per cent to 18 per cent and that of trade credit from 12 per cent to 15 per cent (though trade credit has decreased in absolute terms, the extent was smaller than the decrease of total debt financing therefore its share has increased). As a result of the 1997 crisis, Thai enterprises have been struggling with debt restructuring and have become even more highly leveraged. The average debt-equity ratio has increased from 1.55 in 1997 to 7.75 in 2000. The depreciation of currency and the post-crisis downturn further increased the debt-servicing burden of enterprises. The share of the current portion of long-term liabilities in total liabilities has soared to 11 per cent in 2000 from just 4 per cent in 1997.

Table 2. Debt Financing Sources in Thailand (in million baht and shares)

	Short-term loans	Share	Trade credit	Share	Long-term loans	Share	Debt securities	Share	Debt/Equity Ratio	Share of Current Portion of Long-term Liabilities
1997										
Number and Share of Companies	94	0.94	100	1	82	0.82	27	0.27		
Mean	1658	0.27	773	0.12	3248	0.50	710	0.11	1.55	0.04
Standard Deviation	2418		1219		9969		2105		1.13	0.05
Minimum	0	0	4.68	6E-05	0	0	0	0	-5.14	0
Maximum	14106	0.95	6620	1	71687	0.90	15818	0.84	5.84	0.19
2000										
Number and Share of Companies	95	0.91	103	0.99	80	0.77	28	0.27		
Mean	1135	0.24	704	0.15	2020	0.43	854	0.18	7.75	0.11
Standard Deviation	1905		1139		4206		2722		59	0.15
Minimum	0	0	0	0	0	0	0	0	-19	0
Maximum	12860	0.88	7368	0.84	20597	0.95	21077	0.67	604	0.80

Note: The total number of companies is 100 and 104 in 1997 and 2000, respectively.

20. When examining the changes of sources of debt financing of manufacturing firms (Table 3), a somewhat different pattern can be traced. In absolute terms, debt securities financing has nearly doubled over the period of 1997-2000 and trade credit has also increased. The share of long-term bank loans has changed little (from 42 per cent to 40 per cent) while the share of short-term bank loans has decreased from 41 per cent to 33 per cent and that of trade credit has increased from 15 per cent to 21 per cent. The share of debt securities financing has more than doubled to 5 per cent from just 2 per cent in 1997. The trends in financing patterns illustrated by Table 2 and Table 3 show that bank loans in general have decreased, both in terms of absolute value and in shares. This fact is in line with the findings of the previous analysis of the banking sector. As a result of the credit crunch, firms have started to diversify their capital structure into non-bank financing. The most spectacular growth has been registered by debt securities financing, especially in the case of manufacturing firms.

Table 3. **Debt Financing Sources of Manufacturing Firms in Thailand (in billion bahts and share)**

1997				
Variable	Mean	Std. Dev.	Min	Max
<i>Short-term loans</i>	1435	1815	0	9993
Share	0.41		0	0.86
<i>Trade credit</i>	522	525	30	2082
Share	0.14		0	0.86
<i>Long-term loans</i>	1463	2712	0	10014
Share	0.42		0	0.90
<i>Debt securities</i>	72	236	0	1102
Share	0.02		0	0.44
<i>Debt/equity ratio</i>	1.76	1.05	0.66	5.84
<i>Share of current portion of long-term liabilities in total liabilities</i>	0.03	0.04	0	0.15
2000				
Variable	Mean	Std. Dev.	Min	Max
<i>Short-term loans</i>	876	1226	0	6135
Share	0.33		0	0.87
<i>Trade credit</i>	572	768	0	4147
Share	0.21		0	0.75
<i>Long-term loans</i>	1070	2663	0	12700
Share	0.40		0	0.76
<i>Debt securities</i>	137	409	0	1939
Share	0.05		0	0.46
<i>Debt/equity ratio</i>	2.00	3.96	-11	15
<i>Share of current portion of long-term liabilities in total liabilities</i>	0.09	0.13	0	0.66

Note: The number of manufacturing firms is 42 and 48, making up 42 and 46 per cent of the sample in 1997 and 2000, respectively.

21. The results of principal components and cluster analyses also illustrate this trend. They show that debt securities issuance is no longer limited to large firms in the energy and infrastructure sectors as it used to be in 1997, but even smaller firms, especially in the food and beverages, electronics, textiles, agribusiness sectors now are financing or refinancing through issuing debt securities. Firms in the property and chemicals sectors continue to rely on long-term bank borrowing and commercial enterprises on trade credit. A substantial change, however, is that many firms, especially in commerce and light industries have been relying on short-term bank loans as their main method of financing. This may be related to the credit crunch, which tends to be more serious in industries with lower capacity utilisation ratios such as food and beverages (38.6 per cent in 2000) and electronics (69.8 per cent in 2000).

Details of Factor and Cluster Analyses of the Sample of Firms

22. To assess the major types of financing by non-financial firms belonging to different sectors, factor (principal components) and cluster (hierarchical cluster) analyses were conducted. The results confirm the findings of the descriptive analyses of data in the main text of the study. The major finding is that financing patterns have changed in 2000 compared to 1997. While in 1997 only very few firms -- mainly in the energy and infrastructure sectors -- issued debt securities, by 2000 debt securities financing has become available to a large number of firms even in manufacturing industries.

Capital Structure in 1997

23. First the sample of Thai firms (description of data in Appendix) is subjected to principal components analysis. In principal components analysis the aim is to extract the main relations in data and describe the data by the first components -- which account for most of the variation in the data -- without loss of essential information. One purpose is to see if the first few principal components account for most of the variation in the data. If they do then the idea is to use these few components to describe the data. That is the main characteristics are summarised into these components while trying to minimise loss of information. The principal components of the data are found by calculating the eigenvectors of the data correlation matrix.¹¹ These vectors give the directions in which the data are stretched most. The principal components are actually the projections of the data on the eigenvectors. The corresponding eigenvalues give an indication of the amount of information the respective principal components represent. For instance, principal components corresponding to large eigenvalues represent the most information in the data set and thus tell us much about the relations between the data points.

24. To analyse the main financing patterns by different types of firms, four variables are selected representing major financing methods in Thailand: DRAFT (short-term bank loans), TRADE (trade credit), DEBT (debt securities) and LONGGL (long-term bank loans).¹² To get the scores for principal components, the regression method is used. Since the first two components only explained 80 per cent of variation in the data, three components with eigenvalues over 0.8 were extracted. The Scree Plot¹³ also suggested the extraction of three components.

25. At the first step three outliers were detected: marked by THAI, SCC and UCOM. All these three firms are substantially larger in assets, sales and other measures of size than the rest of the sample and their financing also involved larger funds. SCC (Siam Cement) is the largest borrower in the sample both short

11. It is possible to compute principal components from either the covariance matrix or correlation matrix of the p variables. If the variables are scaled in a similar manner then many researchers prefer to use the covariance matrix. When the variables are scaled very different from one another than using the correlation matrix is preferred. Here the scales of different variables are different hence the correlation matrix is used.

12. In the balance sheet of Thai firms retained earnings are often not indicated separately but included in equity capital, thus it was not possible to take this form of financing into account.

13. The Scree Plot is part of the output of factor analysis, it helps to determine the number of components to be extracted.

and long-term. THAI (Thai Airways) has no debt securities but is the second largest long-term borrower in the sample, and its short-term borrowing is also sizeable. UCOM (United Communication Industry) is one of the largest issuers of debt securities, but has sizeable long-term loans, too. After deleting these three outliers from the sample the analysis was repeated and the following results are obtained. As Table 4 shows, the first two components explain only 67.8 per cent of variance, and therefore the first three components were extracted, again supported by the Scree Plot. These three components explain 89.4 per cent of the variance, so the characteristics of the data set can be captured without much loss of information. The first component, for instance, has the highest eigenvalue of 1.6 and explains 40.9 per cent of variance in the data.¹⁴

Table 4. Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.635	40.881	40.881	1.635	40.881	40.881
2	1.078	26.952	67.833	1.078	26.952	67.833
3	.863	21.587	89.420	.863	21.587	89.420
4	.423	10.580	100.000			

Extraction Method: Principal Component Analysis.

Note: Squared loadings indicate what percentage of the variance in an original variable is explained by a component.

26. The above three extracted components scored the values in Table 5 for the four selected variables. Interpreting these principal components is a common though very subjective activity. Here luckily none of the variables scores high on more than one component, and all score high on at least one. Attempting to interpret what the values might represent, Component 1 represents high long-term-loan dependence and also very strong trade-credit dependence, Component 2 stands for intensive issuing of debt securities and Component 3 for heavy short-term bank loans.

Table 5. Component Matrix

	Component		
	1	2	3
DRAFT	.454	-.461	.761
TRADE	.795	-.200	-.405
DEBT	.236	.890	.327
LONGL	.861	.184	-.117

Extraction Method: Principal Component Analysis.

3 components extracted.

14. The first principal component can be expressed as follows,

$$Y_1 = a_{11}X_1 + a_{21}X_2 + \dots + a_{p1}X_p$$

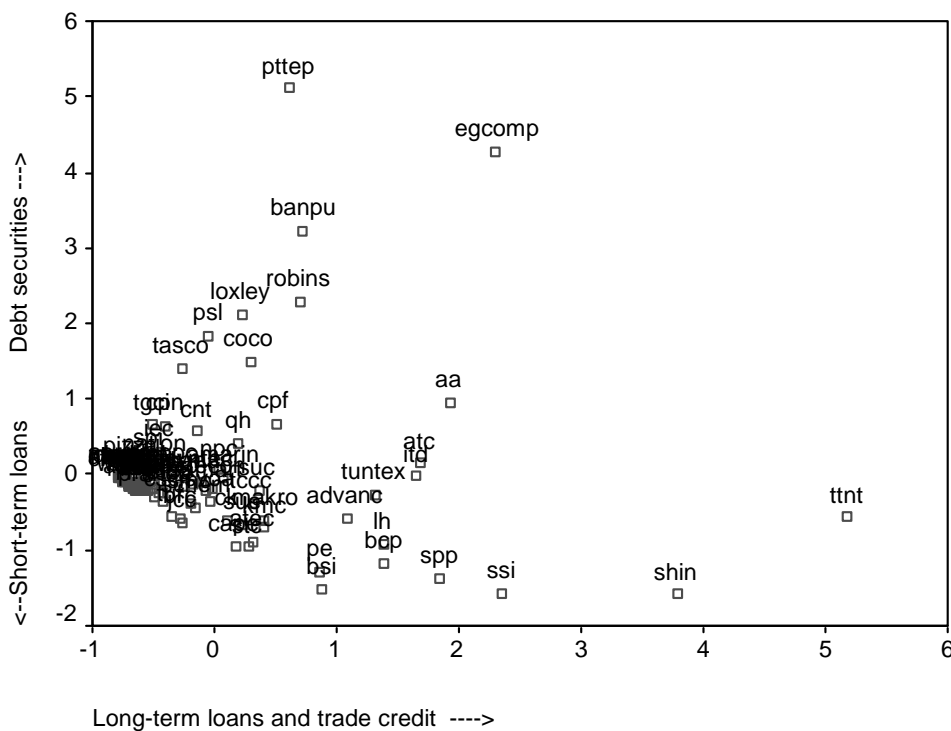
or in matrix form

$$Y_1 = \mathbf{a}'\mathbf{x}$$

The a_{j1} are scaled such that $\mathbf{a}_1'\mathbf{a}_1 = 1$. Y_1 accounts for the maximum variability of the p variables of any linear combination. The variance of Y_1 is λ_1 . Next, principal component Y_2 is formed such that its variance, λ_2 is the maximum amount of the remaining variance and that it is orthogonal to the first principal component. That is, $\mathbf{a}_1'\mathbf{a}_2 = 0$. One continues to extract components until some stopping criteria is encountered or until p components are formed.

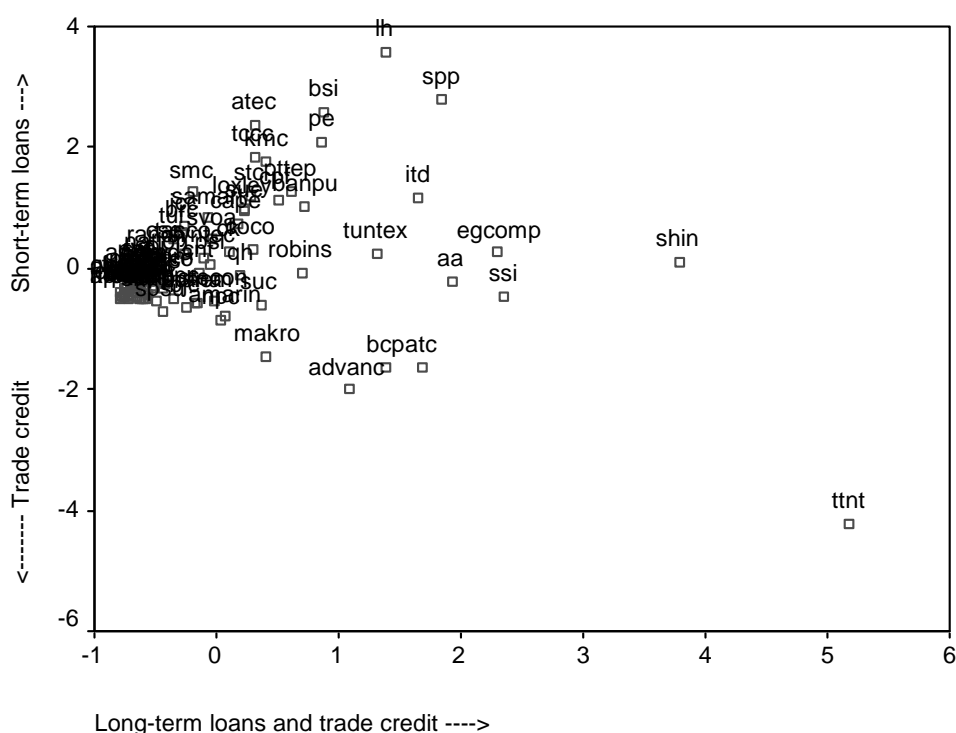
27. Since the above analyses resulted in three principal components, the result could be plotted in a three-dimension figure, but to make it easier to interpret, the three-dimension figure is decomposed into three two-dimension figures (Figures 2-4).

Figure 2. Plot of 97 Thai Firms - Components 1 and 2



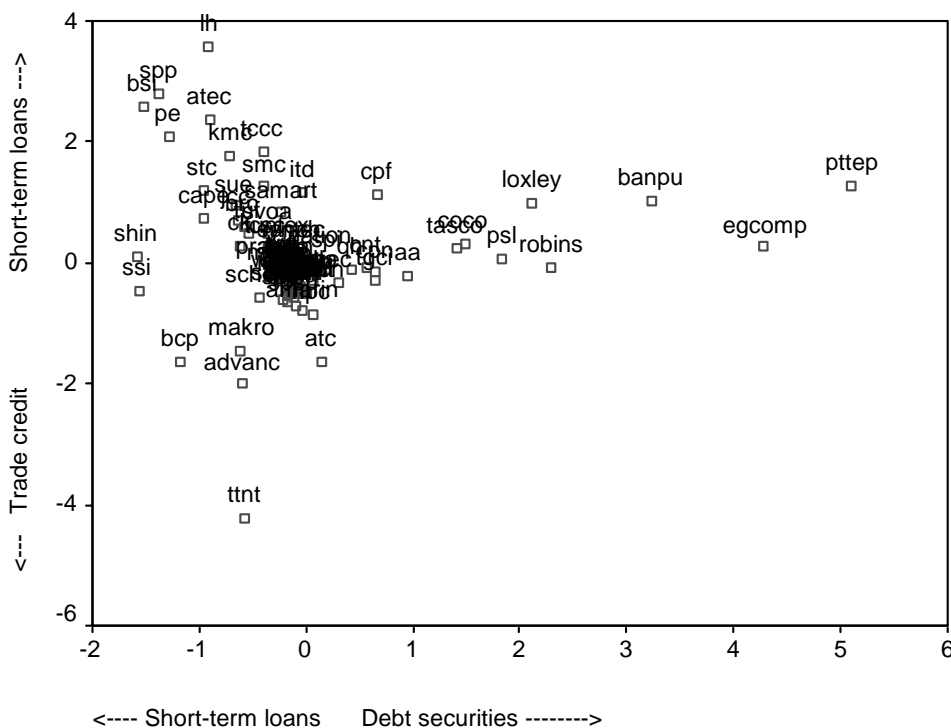
28. Following the above interpretation of components, firms with heavy use of debt securities finance are in the upper half and firms heavily relying on short-term loans are in the lower half of Figure 2. Large debt securities issuers include EGCOMP (Electricity Generating PCL, energy), PTTEP (PTT Exploration and Production PCL, energy) the largest issuer of debt securities in the sample, BANPU (Ban Pu Coal PCL, energy), ROBINS (Robinson Department Store PCL, commerce), PSL (Precious Shipping PCL) and LOXLEY (Loxley PCL, commerce). Most of these firms belong to the energy sector or some are well known commercial enterprises. Firms in the bottom such as BSI (Bangkok Steel Industry PCL, building and furnishing materials) have large short-term loans. The more firms are located to the right the more likely they are to depend on long-term loans and trade credit. These include TTNT (Thai Telephone and Telecommunication PCL, communications), SHIN (Shinawatra Computer and Communications PCL, communications) and SSI (Sahaviriya Steel Industry PCL, building and furnishing materials).

Figure 3. Plot of 97 Thai Firms - Components 1 and 3



29. In Figure 3 large short-term borrowers are situated at the top, such as LH (Land and House PCL, real estate), ATEC (Alphatec Electronics PCL, electronic components) and BSI (Bangkok Steel Industry PCL, building & furnishing materials) and firms heavily relying on trade credit are at the bottom such as TTNT (Thai Telephone and Telecommunication PCL, communications) and ADVANC (Advanced Info Service PCL, communications). Those firms that also have large long- and short-term loans but no trade credit are in the upper right such as SPP (Siam Pulp & Paper, pulp & paper) and those that rely heavily on trade credit and long-term loans but no short-term loans are in the lower right of the Figure such as ATC (Aromatics Thailand PCL, chemicals & plastics). In this plot TTNT (Thai Telephone and Telecommunication PCL, communications) is even more distinct from the rest of the sample due to its huge long-term loans and trade credit but negligible short-term loans.

Figure 4. Plot of 97 Thai Firms - Components 2 and 3



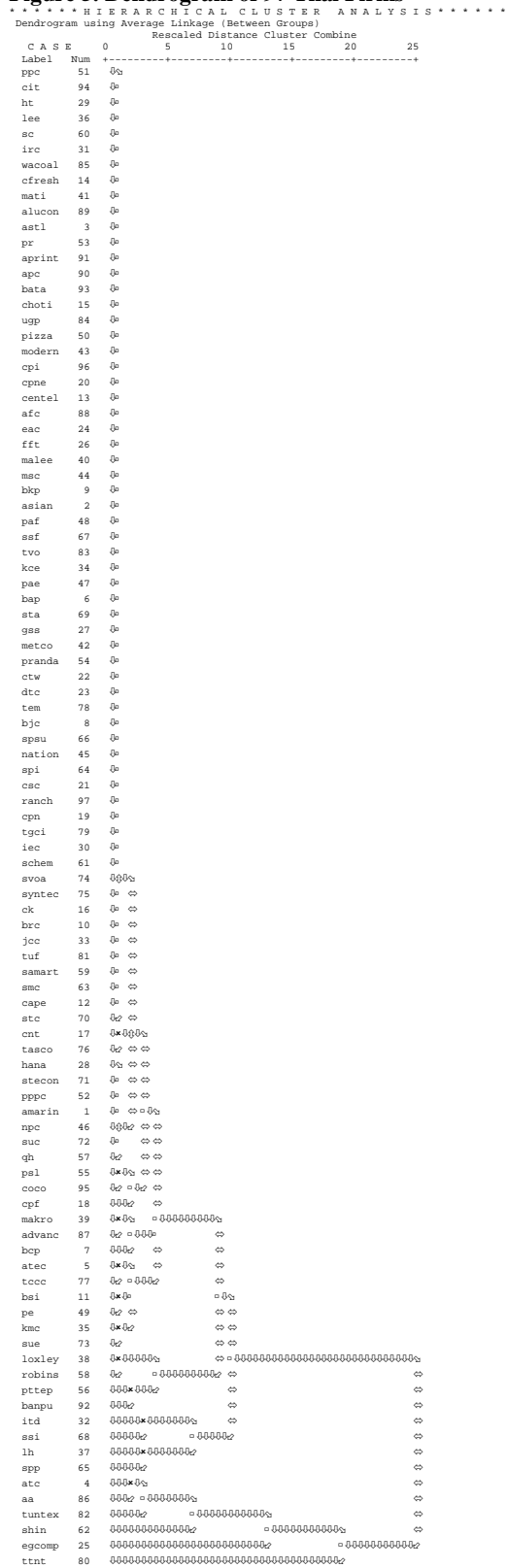
30. In Figure 4 large debt securities issuers are in the right such as EGCOMP (Electricity Generating PCL, energy), short-term borrowers in the upper left such as SPP (Siam Pulp & Paper, pulp & paper) and firms relying on trade credit are in the lower half of the Figure such as ADVANC (Advanced Info Service PCL, communications). The figure also shows that there are not so many companies that relied heavily on both debt securities and short-term loans such as PTTEP (PTT Exploration and Production PCL, energy).

31. In the next step hierarchical cluster analysis is conducted on the sample of 97 Thai firms. Cluster analysis assists classification of objects into groups of similar objects: individuals (in this case firms) are linked into groups, these groups are linked into larger groups. The result is shown in a “family tree” of objects. Cluster analysis consists of two components: a “distance metric” or similarity coefficient that measures the similarity between objects and groups of objects and a clustering algorithm, which determines how similar object groups are linked into larger groups. For cluster analysis the hierarchical cluster, for clustering algorithm the between-groups linkage method is used here and interval is measured by squared Euclidean distance. The result of cluster analysis is plot in the dendrogram¹⁵ in Figure 5. Starting from the left-hand side, at the first step firms with similar characteristics join, and as one moves to the right of the plot, the clusters of firms become more heterogeneous.

32. There is no purely objective method to determine the optimal or “correct” cluster solution, although there is a commonly applied guide to define the clusters. A more informative approach relies on the qualitative decision that the clusters are meaningful in the sense that their common characteristics can be easily identified and interpreted.

15. The plot is a visual representation of the steps in a hierarchical clustering solution that shows the clusters being combined and the values of the distance coefficients at each step are represented in the figure. The figure re-scales the actual distances between 0 and 25, preserving the ratio of the distances between steps, and connected vertical lines designate joined cases.

Figure 5. Dendrogram of 97 Thai Firms



Note: At the left of the dendrogram the stock symbols of firms are listed, in the next column their number in the alphabetical order. The distance between firms is re-scaled on a 0 to 25 scale.

33. Keeping the above rules as a principle, in the resulting dendrogram (Figure 5) six clusters can be identified (if making the cut at 7 in the rescaled distance bar), which are described in Table 6. *Cluster 1* includes a single company, TTNT (Thai Telephone and Telecommunication PCL, communications) that has extremely high loans both short- and long-term. Due to the size effects, as well, this is the last firm to join the rest of the sample in the hierarchical cluster analysis. The next *Cluster 2* also contains a single firm EGCOMP (Electricity Generating PCL), from the energy sector. It stands out with its huge debt securities issues. These firms in the energy sector are mammoths in size, with usually a lack of considerable competitors. *Cluster 3* has four companies SHIN (Shinawatra Computer and Communications PCL, communications), TUNTEX (Tuntex Thailand PCL, textiles and footwear), ATC (Aromatics Thailand PCL, chemicals & plastics) and AA (Advance Agro PCL, pulp & paper). These firms show a variation in sectoral affiliation belonging to communications, textiles, chemicals and pulp & paper, respectively. These firms are also large in size and their main common characteristics are reliance on debt securities issues and short-term loans. *Cluster 4* contains four companies of SPP (Siam Pulp and Paper PCL, pulp & paper), LH (Land and Housing PCL, real estate), SSI (Sahaviraya Steel Industry PCL, building & furnishing materials) and ITD (Italian-Thai Development PCL, real estate). All these companies have large bank loans. *Cluster 5* has again four firms, PTTEP (PTT Exploration and Production PCL), BANPU (Ban Pu Coal PCL), ROBINS (Robinson Department Stores PCL) and LOXLEY (Loxley PCL). The first two are in the energy sector, the latter two in commerce, and all the four are large issuers of debt securities. *Cluster 6* contains the rest of the sample and is relatively homogenous compared to the other five clusters. The above principal components and hierarchical cluster analyses showed, that debt securities financing was affordable for infrastructure, or energy-related firms and some other well-established firms, while companies in the real estate, building & furnishing materials and chemicals & plastics sectors relied on bank loans and trade companies on trade credit.

Table 6. **Cluster Membership**

Cluster No.	Firms	Main Characteristics
Cluster 1	TTNT	Large short- and long-term loans Sector: communications
Cluster 2	EGCOMP	Large debt securities issues Sector: energy
Cluster 3	SHIN TUNTEX ATC AA	Large debt securities issues and short-term loans Sector: communications, textiles, chemicals, pulp & paper
Cluster 4	SPP LH SSI ITD	Large bank loans Sector: construction & real estate
Cluster 5	PTTEP BANPU ROBINS LOXLEY	Heavy reliance on debt securities Sector: energy, commerce
Cluster 6	rest of the sample	Mainly trade credit and short-term loans, not too large Sector: manufacturing & light industries

Capital Structure in 2000

34. As in the case of the 1997 sample of firms the 2000 sample is subjected to principal components analysis using the same four variables of financing (DRAFT standing for short-term loans, TRADE – trade credit, LONGL – long-term loans and DEBT – debt securities). In this case again three components were extracted. At the first step seventeen outliers were deleted (PTTEP, EGCOMP, COCO, RATCH, SSI, LH, BCP, TUNTEX, ATC, CPF, BSI, ADVANC, MAKRO, UCOM, ITD, SCCC and BANPU). All these

firms are substantially larger in assets, sales etc size than the rest of the sample and their financing also involved larger amounts of funds. Most of these firms belong to the energy sector, though the largest companies of some other sectors are also represented (Charoen Pokphand, CPF is the largest agribusiness firm, Aromatics Thailand, ATC is a large chemical enterprise and Land and House, LH is a large property-development firm). The main common characteristics of their capital structure are large debt securities issues and sizeable long-term bank loans. After deleting these seventeen outliers from the sample the analysis was repeated and the following results are obtained. As Table 7 shows, the first two components explain only 60.2 per cent of the variance, therefore the first three components are extracted, again supported by the Scree Plot. These three components explain 82.5 per cent of the variance, so the characteristics of the data set can be captured without much loss of information.

Table 7. Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	1.340	33.505	33.505	1.340	33.505	33.505
2	1.069	26.737	60.242	1.069	26.737	60.242
3	.890	22.250	82.493	.890	22.250	82.493
4	.700	17.507	100.000			

Extraction Method: Principal Component Analysis.

35. The above three extracted components scored the values in Table 8 for the four selected variables. Interpreting these principal components is again a very subjective activity. Here the interpretation of the component is even more arbitrary compared to the 1997 sample as two of the variables score high on more than one component: long-term loans (LONGL) on Component 2 and 3 and debt securities (DEBT) on component 3 and 2. All variables, however, score high on at least one component. Attempting to interpret what the values might represent, Component 1 represents extremely high short-term bank loans and trade-credit dependence, Component 2 stands for large long-term loans and sizeable issuing of debt securities and Component 3 for large debt-securities dependence and sizeable long-term bank loans. The difference of Component 2 and 3 is the direction of the eigenvector for debt securities (which is indicated by the negative sign of the score of Component 3 on debt securities). The different signs make it possible to divide the sample into long-term borrowers and debt-securities issuers.

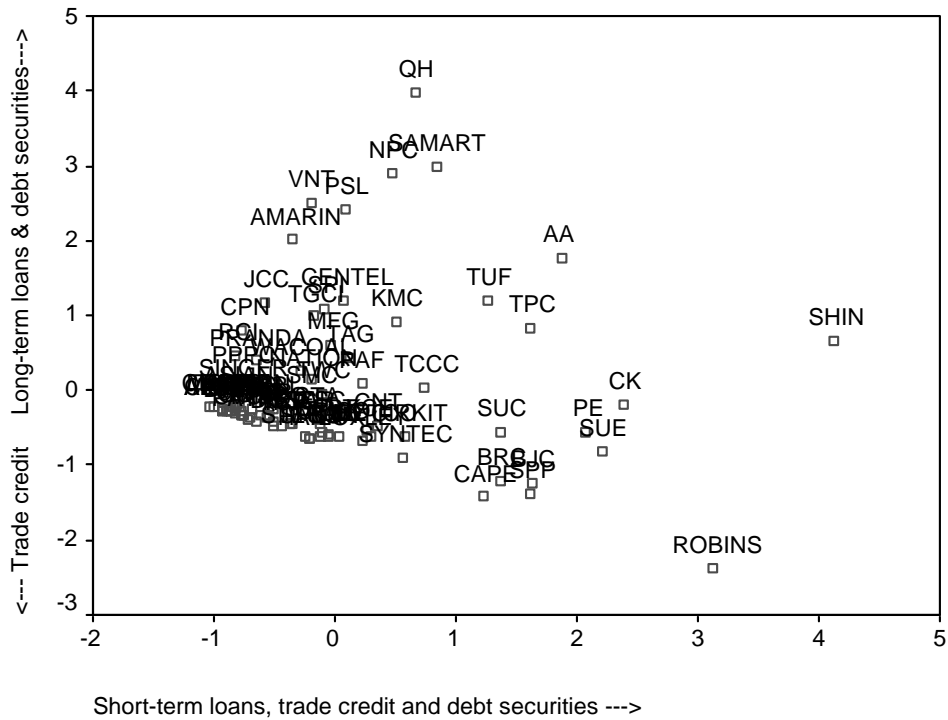
Table 8. Component Matrix

	Component		
	1	2	3
DRAFT	.752	-.229	.237
TRADE	.744	-.319	-2.640E-02
LONGL	.225	.766	.584
DEBT	.413	.573	-.702

*Extraction Method: Principal Component Analysis.
3 components extracted.*

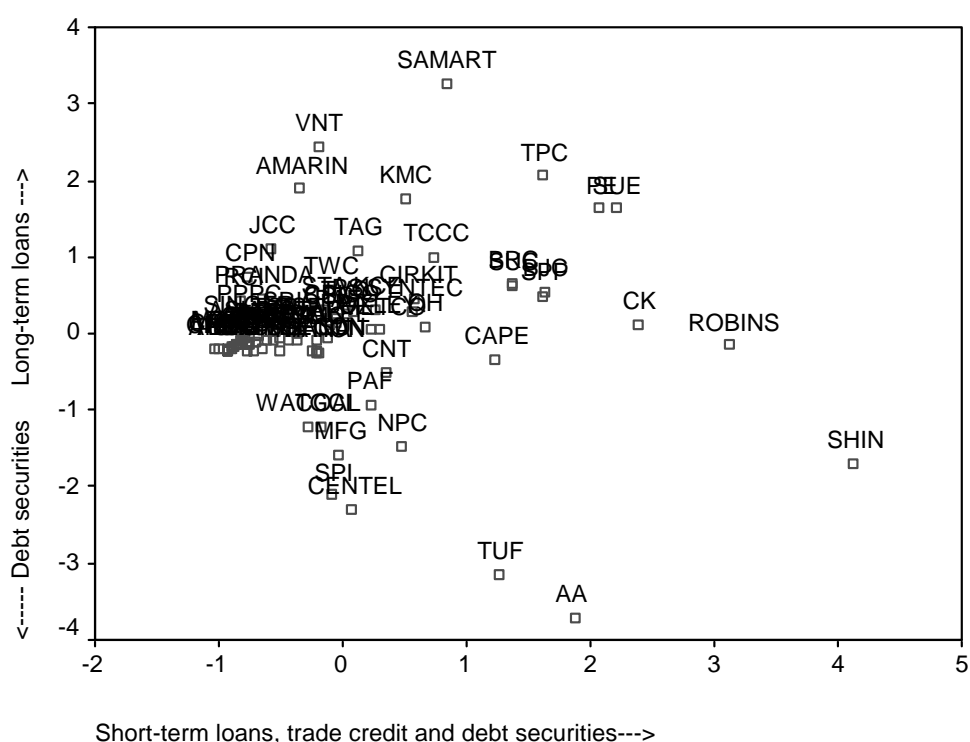
36. Given that three components were extracted, the results of principal components are plotted in three two-dimension figures in Figures 6-8.

Figure 6. Plot of 87 Thai Firms - Components 1 and 2



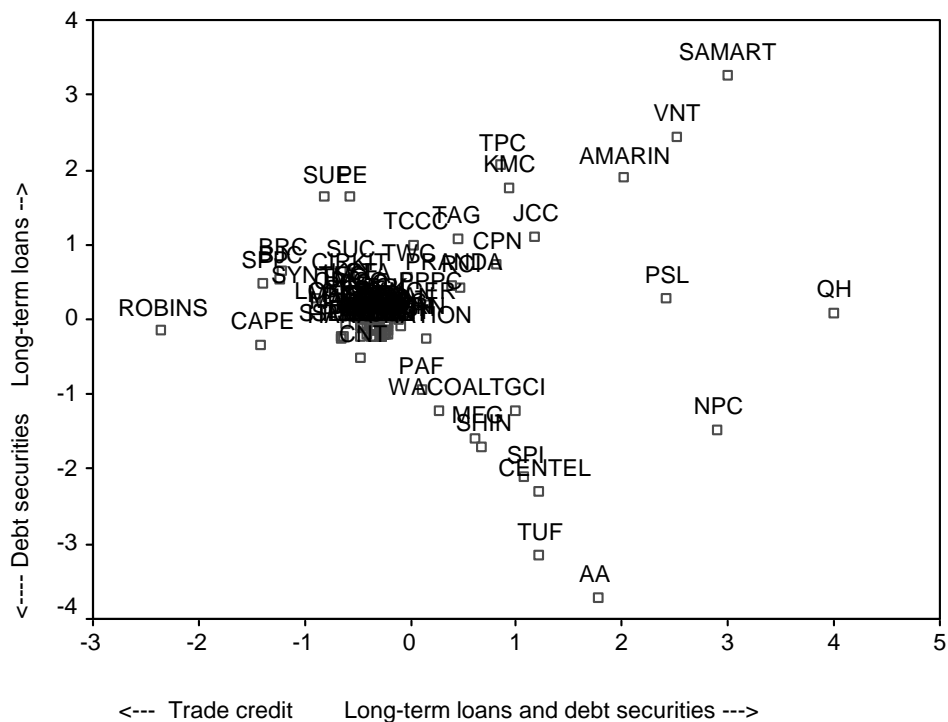
37. In Figure 6 firms with large long-term bank loans and debt securities are in the upper half of the figure, while large short-term borrowers and firms relying on trade credit are in the right. In the upper right are firms such as AA (Advance Agro PCL, pulp and paper industry), which issued large amounts of debt securities and borrowed heavily short-term or TUF (Thai Union Frozen Products PCL, foods and beverages industry), which also issued large amounts of debt securities and relies heavily on trade credit. QH (Quality Housing PCL, property development sector) in the top of the figure mainly relies on debt securities and long-term loans, but its trade credit and short-term loans are negligible. ROBINS (Robinson Department Store PCL), on the other hand has large trade credit and short-term loans but no long-term loans or debt securities, so it is located in the bottom right of the figure.

Figure 7. Plot of 87 Thai Firms - Components 1 and 3



38. In Figure 7 firms with heavy reliance on short-term loans, trade credit and debt securities are in the right, while firms with large long-term bank loans in the upper half and large debt securities issues in the lower half. SHIN (Shinawatra Computer and Communications PCL, communications industry) is in the far right because it has huge short-term loans and trade credit. The company also issued large amounts of debt securities and borrowed heavily long-term, but given that its debt issues are larger than its long-term loans, it is in the lower half of the figure. SAMART (Samart Corporation, communications industry), on the other hand has large long-term loans but no debt securities, therefore it is located in the top of the figure. In the lower half of the figure there are firms such as NPC (National Petrochemical PCL, chemicals and plastics industry), TUF (Thai Union Frozen Products PCL, food and beverages industry), WACOAL (Thai Wacoal PCL, textiles and footwear industry), SPI (Saha Pathana Inter-Holding PCL, commerce) or AA (Advanced Agro PCL, pulp & paper industry), which mainly rely on debt securities issuance for financing, yet they belong to different sectors. This is a considerable change compared to 1997, when debt securities issuance was mainly confined to energy and infrastructure-related firms.

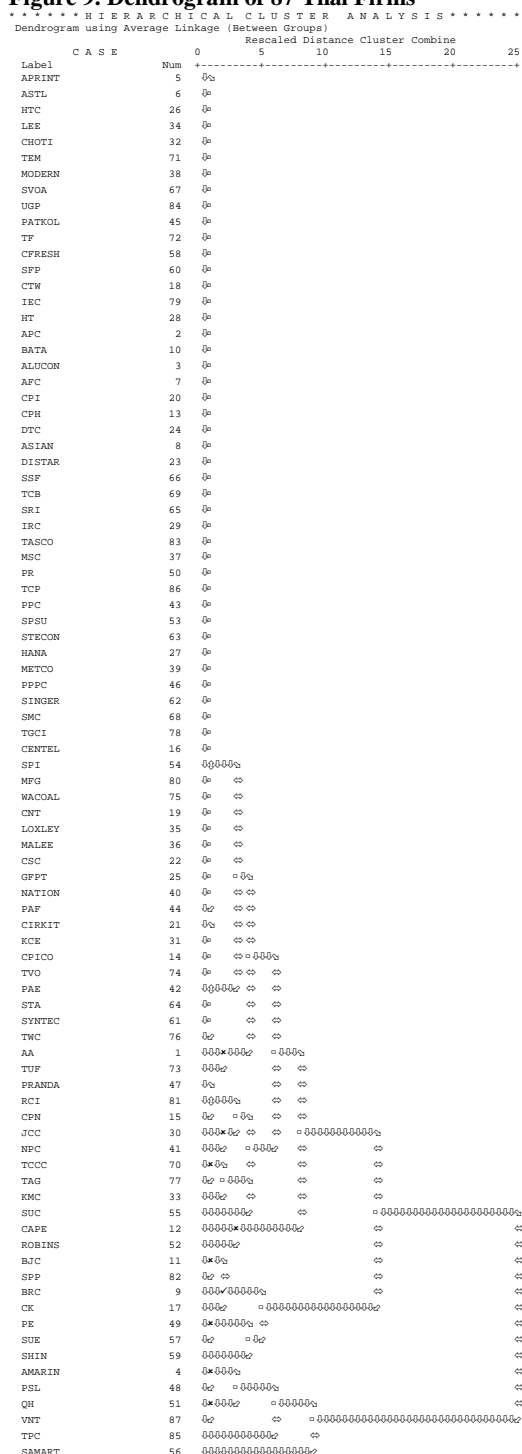
Figure 8. Plot of 87 Thai Firms - Components 2 and 3



39. Figure 8 is unusual in a sense that the two components that are plotted in this figure score high on the same two variables, long-term loans and debt securities. The fact, however, that on Component 3 (vertical axis) debt securities score high negative value and long-term loans high positive value, makes it easier to identify which companies relied on long-term loans to a larger extent and which ones on debt securities. Firms heavily relying on both debt securities and long-term loans are located in the centre right of the figure such as QH (Quality Housing PCL, property development) or PSL (Precious Shipping PCL, transportation).

40. Hierarchical cluster analysis of the 2000 sample of Thai data resulted in Figure 9. Interpretation of this dendrogram involves the same arbitrariness as in the case of the 1997 sample and the same rules are kept as principle upon determining clusters.

Figure 9. Dendrogram of 87 Thai Firms



41. In Figure 9 six clusters can be identified if making the cut at 5 in the rescaled distance bar (in the top of the Figure). Cluster membership is summarised in Table 9. The first cluster includes the huge communications firm, SAMART, which is heavily dependent on bank borrowing. The second cluster accommodates large chemicals & plastics, real estate and transportation companies such as AMARIN (Amarin Plaza PCL, real estate), PSL (Precious Shipping Lines PCL, transportation), QH (Quality Housing

PCL, real estate), VNT (Vinythai PCL, chemicals & plastics) and TPC (Thai Plastic & Chemicals PCL, chemicals & plastics). These companies are also heavily long-term bank-loan dependent and issue some debt securities as well. In the third cluster, firms from various industries are found with huge short-term loans and trade credit such as BJC (Berli Jucker PCL, commerce), SPP (Siam Pulp & Paper PCL, pulp & paper), BRC (Bangkok Rubber PCL, textiles & footwear), CK (CH Karnchang PCL, real estate), PE (Premier Enterprise PCL, commerce), SUE (Sanyo Universal Electric PCL, electrical products & computer) and SHIN (Shinawatra Computer & Communications PCL, communications). The fourth cluster contains only two firms, ROBINS (Robinson Department Store PCL) one of the largest commercial enterprises in Thailand and CAPE (Capetronic International PCL) an electronics company. They are unique in the sample because they mainly rely on trade credit and to a smaller extent on short-term bank loans but do not borrow long-term or do not issue debt securities. The fifth cluster accommodates firms such as PRANDA (Pranda Jewellery PCL, jewellery & ornaments), RCI (Royal Ceramic Industry PCL, building & furnishing materials), CPN (Central Pattana PCL, real estate), JCC (Jalaprathan Cement PCL, building & furnishing materials), NPC (National Petrochemical PCL, chemicals & plastics), TCCC (Thai Central Chemical, chemicals & plastics), TAG (Thai Asahi Glass, building & furnishing), KMC (Krisola Mahanakorn, real estate) and SUC (Saha Union, textiles and footwear) mainly from the chemicals & plastics, building & furnishing materials and real estate sectors. These firms are heavily dependent on long-term bank borrowing, though they also use trade credit and short-term borrowing for financing. The sixth and last cluster includes all the remaining firms of the sample. These firms have a relatively balanced capital structure and many of them issue corporate debt securities. This is a considerable change compared to 1997, when debt securities financing was largely confined to large enterprises in the energy and infrastructure sector. Firms in cluster 6 mainly belong to light industries such as food and beverages, agribusiness, pulp and paper, textiles & footwear, electronics, packaging, though there are also some firms from heavy industries such as building and furnishing materials, vehicles and from commerce and property.

Table 9. Cluster Membership

Cluster No.	Firms	Main Characteristics
Cluster 1	SAMART	Large bank loans Sector: communications
Cluster 2	AMARIN PSL QH VNT TPC	Large long-term bank loans, some debt securities Sector: chemicals & plastics, real estate, transportation
Cluster 3	BJC SPP BRC CK PE SUE SHIN	Large short-term bank loans and trade credit Sector: various
Cluster 4	ROBINS CAPE	Large trade credit and some short-term bank loans Sector: commerce, electronics
Cluster 5	PRANDA RCI CPN JCC NPC TCCC TAG KMC SUC	Heavy reliance on long-term bank loans, some short-term loans and trade credit Sector: mainly building & furnishing, real estate and chemicals & plastics
Cluster 6	rest of the sample	Balanced choice of financing methods, many debt-securities issuers Sector: mainly manufacturing & light industries

42. The principal components and hierarchical cluster analyses investigated the major changes in financing methods of listed corporations in Thailand by comparing a cross section of firms in 1997 and 2000. Given the subjectivity involved in the interpretation of the results of these types of analyses, they should be considered as supplements to the descriptive analyses of firm data in the main text of the study.

The findings of principal components and hierarchical cluster analyses support the results of the descriptive data analyses.

43. Financing methods of corporations have considerably changed after the 1997 crisis. In 1997 borrowing from banks was the major way of financing. As is widely known, the Thai banking sector borrowed in international markets short-term and lent on to domestic firms long-term. International lending rates were relatively low and the double-digit growth of the Thai economy masked structural weaknesses such as over-borrowing by corporations, over-lending by banks and decreasing profitability in both sectors. Before 1997 the debt securities market was relatively under-developed and although there were some firms such as EGCOMP (Electricity Generating PCL) and PTTEP (PTT Exploration and production PCL) mainly in the energy and communications sectors that met their huge financing needs by issuing debt securities, most firms were able to borrow from banks, therefore they did not consider debt securities financing.

44. After the crisis the situation has, however, changed. Access to bank loans became limited to firms with good reputation and no debt-servicing difficulties of previous loans. Banks, on the other hand, also became more cautious when extending loans and more stringent regulatory requirements such as loan loss provisioning pushed lending interest rates higher. The phenomenon of credit crunch became widespread and firms in need of fresh funds had to find other sources of funds than bank loans. Share prices sharply decreased during the 1997 crisis, implying that equity financing was not the best option for firms. The only remaining choice was debt securities financing and due to the prevailing credit crunch and sluggish stock market, the corporate debt securities market experienced unprecedented growth during the past years.

45. If trying to trace the preponderance of debt securities financing after 1997 in the above analyses, the case of AA (Advance Agro PCL) could provide an illustrative example. In 1997 it belonged to large debt securities issuers in Cluster 3 (Table 6 and Figure 5), while in 2000 it belongs to Cluster 6 with the largest number of firms. In other words, in 1997 it was distinct from the majority of the sample with its large debt securities; in 2000 it became an “average” firm, though the amount of its debt securities outstanding did not change much. Long-term loans, on the other hand disappeared from its balance sheet, partly repaid by debt securities, partly restructured. Among the new debt securities issuers, broadly two types of firms could be identified. The first type of firms are firms that borrowed heavily from banks before the 1997 crisis and after the crisis they replaced some of their loans by debt securities. This could be because of lower costs of debt securities financing compared to bank financing after 1997 or due to defaults on loans and following restructuring. Firms of this type are SHIN (Shinawatra Computers and Communications PCL) in Cluster 3 in 2000 (Table 9 and Figure 9) or NPC (National Petrochemicals PCL) in Cluster 4 in 2000 (Table 9 and Figure 9) in the communications and chemicals & plastics industry, respectively. In Figures 7 and 8 both firms are located in the lower half. Both are large companies with good reputation what makes them relatively easy to acquire funds from the debt securities market.

46. The other type of firms are relatively smaller in terms of assets, they were cautious with bank borrowing before the 1997 crisis and/or were fast to recover after 1997. This type includes TUF (Thai Union Frozen Products PCL), WACOAL (Thai Wacoal PCL) and CENTEL (Central Plaza Hotel PCL), all located in the lower half of Figures 7 and 8 and all belong to Cluster 6 in 2000 (Table 9 and Figure 9). They belong to the food & beverages, textiles & footwear & hotels & travel services industries, respectively. The key to their survival of the 1997 crisis and keeping profitable is that they face favourable external demand (thus they are not affected by sluggish domestic demand to that large extent), their receipts are in foreign currency and they did not rely heavily on bank financing before 1997 (thus they do not have to deal with debt restructuring). TUF is one of the best performer Thai companies with proceeds from selling canned tuna and frozen shrimp¹⁶ almost entirely in foreign currency. WACOAL's garments

16. After the easing of strict testing of Thai shrimp in the European Union, its sales further increased. (*Bangkok Post* 28 February, 2003).

similarly, go primarily to the Japanese and other foreign markets. CENTEL profits from its exports of tourism-related services.

47. Principal components and cluster analyses supports the finding of the descriptive analyses of corporate data. The most dynamic firms (in terms of recovery after the 1997 crisis) showed that they can survive without relying on banks or the equity market for financing. On the other hand, other firms, that heavily borrowed from banks before 1997 and that depend on the domestic market, are locked in the long process of debt renegotiation or in the worst case are under liquidation. By addressing the NPL problem in the banking sector, also firms that are non-exporters and/or not large would get access to financing and in parallel with financial restructuring, would be able to restructure their operations and find their way to survive in a more competitive environment amid still high excess capacities in many sectors.

4. BACK TO FACTS

48. Sections 2 and 3 investigated the underlying factors to changing bank-firm relationship. Before the 1997 crisis corporate lending was the major activity for banks and bank loans were the major source of financing for enterprises in Thailand. Hit by the 1997 crisis, both the banking and corporate sector have started to diversify their activities. Saddled with large amounts of NPLs and foreclosed assets, banks have become more cautious about their lending decisions and have started to diversify their asset portfolios. They have got engaged in securities investment and off-balance activities. Enterprise surveys conducted after the 1997 crisis confirm difficulties with obtaining new bank loans. To finance their investments (and even working capital needs), Thai firms have increasingly been turning to the debt securities market and relying on trade credit.

49. All banks and most listed firms have been seriously affected by the consequences of “over-lending” and “over-borrowing” before the 1997 crisis. Many banks have been bailed out by the government, some were forced to cease operations and some have been taken over by foreign financial institutions. The costs of meeting loan loss provisioning and other regulatory requirements have raised interest rates. At the same time, the uncertainty following the crisis and lack of information concerning enterprise solvency made banks cautious about whom to lend. Amid high lending interest rates and cautious lending behaviour by banks, enterprises have started to tap other sources of financing. Many firms have issued debt securities for financing their new investments and also to pay back their bank loans.¹⁷

50. The experience of the past five years shows that banks have succeeded in diversifying into securities investments and off-balance activities and firms have managed to acquire funds for investments without relying on bank loans. Given, however, that there has not been sufficient progress with resolving the NPL problem of the banking sector and restructuring of corporate debt, addressing these problems should be priority concern. Cleaning up banks’ balance sheets would enable them to lend to enterprises at more favourable conditions and restructuring corporate debt would make possible for corporations to resume operations.

17. *Vichyanond (2002)* provides a more detailed analysis of difficulties in the post-1997 restructuring.

5. CONCLUSION

51. The financial crisis and the recent economic downturn have been reshaping bank-firm relationship in Thailand. Bank lending has been decreasing causing economy-wide credit crunch and shifting banks to non-core activities. Banks themselves have been struggling with restructuring NPLs, meeting new regulatory requirements and facing competition from MNBs. The most adversely affected are firms with more inferior rating or without rating, especially small and medium-size enterprises. The best-rated firms have been coping with the credit crunch by diversifying their capital structures and tapping bond and equity markets.

52. The changing bank-firm relationship is investigated and high NPLs, the heavy burden of foreclosed assets and stricter regulatory requirements have been identified as major factors leading to credit crunch. On the corporate side, the major change is that firms have been financing their investment by bank loans to a lesser extent in 2000 compared to 1997 and bond financing has become available also to firms outside the energy and infrastructure sectors. The combination of the above two types of analyses of changes of both banking and corporate behaviour has been helpful to assess some major aspects of reshaping of the financial landscape in Thailand.

53. The major lesson to be drawn from the analyses is that diversification of banking portfolio and firms' capital structure can be considered as a good direction in terms of reducing vulnerability of the banking and corporate sector to external shocks. Nevertheless if banks respond to decreasing profits and capital adequacy requirements merely by venturing into new activities and gaining new customer segments, and do not adequately address their non-performing loans, it will offset the positive risk-sharing effect of portfolio diversification. On the corporate side, if firms have limited access to bank credit, it is an alternative to diversify into non-bank financing, especially bond financing given that financial reforms to foster bond markets have been put in place. Therefore, a rigorous plan to resolve the NPL problem and financial reforms to ensure the availability of alternative ways of financing for businesses should be implemented simultaneously.

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APPENDIX - DESCRIPTION OF DATA

Balance sheet items – Banks

Data are obtained from the quarterly balance sheets of banks including banks incorporated in Thailand and foreign branches. Definitions of data applied for analyses are as follows:

Capital is total capital including Tier-1 and Tier-2 capital. The capital-asset ratio is total capital to total assets.

Assets is total assets as stated in balance sheet.

Loans is credit advances net of allowance for doubtful accounts.

Non-performing loans: under the five-category loans classification system, loans past due over 90 days. The NPL ratio is non-performing loans outstanding to total loans outstanding.

Properties foreclosed: consisting of land and buildings, stated at acquisition cost or take-over value minus reserve for decline in value (which is the valuation method approved by the Bank of Thailand).

Firms

The main source of data is the official listed company financial information, published by the Stock Exchange of Thailand. Listed companies in Thailand are required to submit quarterly Balance Sheets, Income Statements, Cash Flow Statements, Statements showing changes in equity and Notes to financial statements. The financial statements must comply with generally accepted accounting principles in Thailand, which in most instances are based on and are similar to international accounting standards. By 1999 all International Accounting Standards (IAS) were adopted. Banks, finance companies and those offering finance-related services are excluded from the sample of listed companies due to their different profile and way of financing. All figures are accounting-year-end data, ending on September 30th.

The sector distribution of the over 100 non-financial companies (Table 10) shows great variability: there is a considerable number of real-estate, agribusiness, building and furnishing material-producers, chemicals and plastics producers, energy-related, foods and beverages producers, electrical product and computer makers, electrical components manufacturers, textiles and footwear manufacturers and commercial companies. Other sectors like hotels and travel services, vehicles and parts makers, printing and publishing, packaging, communication, household goods producers, pulp and paper, jewellery and ornaments and transportation are represented to a lesser extent; nevertheless in terms of size, sales volume or acquired financing they are not negligible. The above sectors are defined by the Stock Exchange of Thailand. The size of the 100 companies - measured by paid-in capital - varies between B25 million and B 22.23 billion. The sample represents about 22 per cent of all listed firms and 25 per cent of non-financial listed firms. Further, to illustrate the importance of listed companies among the largest 5000 companies in Thailand, about 9.5 per cent belong to the category of listed companies and their combined annual turnover

accounted for as much as 32 per cent of the total annual turnover of the 5000 firms in 1997 (*Suehiro, 2001*). The weight of listed companies is also high among companies that belong to business groups; their combined turnover makes up 60 per cent of total turnover in 1997 (*Suehiro, 2001*).

Table 10. **Distribution of Firms by Sector**

Sector	1997		2000	
	Number of companies	Percentage of total	Number of companies	Percentage of total
Agribusiness	13	13	12	11.54
Building and constructing	8	8	9	8.65
Catering	2	2	2	1.92
Chemicals and plastics	5	5	7	6.73
Commerce	7	7	6	5.77
Communications	6	6	5	4.81
Computer	6	6	8	7.69
Electronics	4	4	3	2.88
Energy	6	6	7	6.73
Food and beverages	7	7	8	7.69
Household goods	1	1	1	0.96
Jewelry	1	1	1	0.96
Machinery	1	1	2	1.92
Packaging	2	2	2	1.92
Printing	3	3	2	1.92
Property	11	11	11	10.58
Pulp and paper	3	3	5	4.81
Textiles	8	8	9	8.65
Transportation	2	2	1	0.96
Vehicles	4	4	3	2.88

Note: The total number of companies is 100 and 104 in 1997 and 2000, respectively.

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