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SUOMEN PANKIN KESKUSTELUALOITTEITA • FINLANDS BANKS DISKUSSIONSUNDERLAG

Suomen Pankki
Bank of Finland
P.O.Box 160, SF-00101 HELSINKI, Finland
☎ + 358 0 1831

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Abstract

The paper focuses on the proximate causes of the Finnish savings and cooperative banks' non-performing assets in the current banking crisis. Specifically, the effects of the lending structure at the outset of the crisis and the rate of growth of lending in the latter half of the 1980s are investigated.

The main findings are: (1) Lending structure alone is not sufficient to explain the variation in the share of non-performing assets among the local banks. (2) Growth of lending is a major explanatory factor: the faster the growth in the second half of the 1980s, the higher the later share of non-performing assets. (3) Growth of lending is a particularly important "cause" in the case of the savings banks, where lending structure does not seem to have had much of an impact. (4) Lending to manufacturing, construction and trade has had a significant negative effect on the cooperative banks' asset quality. (5) Differences in the rate of lending growth go a long way in explaining why there are on average much more problem loans in the savings bank group than in the cooperative bank group. (6) The share of foreign currency loans is not an important factor when the effect of growth is accounted for, although the roles cannot be fully separated due to multicollinearity. (7) Assuming that growth of lending is more under the control of a bank than the structure of lending, the findings support the view that "bad luck" is not the only explanation of the Finnish banking problems but "bad banking" in the form of either ignorance of risks or deliberate risk taking is a major factor as well.

Tiivistelmä

Keskustelualoitteessa tarkastellaan suomalaisten säästö- ja osuuspankkien järjestämättömien luottojen välittömiä syitä nykyisessä pankkikriisissä. Mielenkiinto kohdistuu ennen kaikkea luotonannon rakenteen ja 1980-luvun lopun luottoekspansion vaikutuksiin.

Päätulokset ovat: (1) Järjestämättömien luottojen osuudessa pankkien välillä havaittavaa vaihtelua ei ole selitettävissä yksin pankkien luottojen rakenteella. (2) Luottojen kasvuvauhti on keskeinen selittävä tekijä: mitä nopeampaa kasvu 1980-luvun jälkipuoliskolla, sitä suurempi järjestämättömien luottojen osuus myöhemmin. (3) Luottojen kasvuvauhti on erityisen tärkeä tekijä säästöpankkien osalta, joiden järjestämättämien määrään luotonannon rakenteella ei näytä olleen merkittävää vaikutusta. (4) Luotonanto teollisuuteen, rakennustoimintaan ja kauppaan on lisännyt selvästi järjestämättömien osuutta osuuspankeissa. (5) Erot luotonannon kasvuvauhdissa selittävät pitkälle, miksi säästöpankeilla keskimäärin on tuntuvasti enemmän ongelmaluottoja kuin osuuspankeilla. (6) Valuuttaluottojen osuus ei ole merkittävä tekijä, kun kasvun vaikutus otetaan huomioon, mutta näiden tekijöiden keskinäisen riippuvuuden takia vaikutuksia ei voida täysin erottaa. (7) Olettaen että luotonannon kasvuvauhti on suuremmassa määrin pankkien päätettävissä kuin luotonannon rakenne tulokset tukevat käsitystä, ettei "huono onni" ole riittävä selitys Suomen pankkiongelmille vaan että myös joko ymmärtämättömyyteen tai tietoiseen riskinottoon perustunut "huono pankkitoiminta" on keskeinen tekijä.

Contents

1 Introduction

In countries having experienced serious banking problems in the recent years it has become commonplace to classify the causes of the banks' losses into three main categories: bad banking, bad policies and bad luck. The bad luck (and bad policies) story essentially says that the banking sector has been hit by external shocks, for which the bankers really could not have prepared.

Thus given that the Finnish economy slid into a very severe recession with especially domestic demand decreasing steeply, all banks having significant exposure to the firm sector operating in the domestic markets (basically all major Finnish banks) unavoidably saw their assets deteriorate.[1] And, as some banks were more exposed than others to the closed sector, it should be no surprise that the banks' relative performances have varied substantially.

Given the banks' traditional specializations and the importance of customer relationships, one may furthermore argue that the portfolio structures are to a significant extent exogenous to the banks even in a couple of years' horizon. Consequently, the fact that some banks incurred more losses than others could be interpreted as reflecting more bad luck than ignorance of risk or deliberate risk taking.

However, the speed at which credit is expanded is probably more controllable by the banks, even in the short run. And what might be called the "reckless lending" story suggests that rapid expansion of credit was a major factor leading to vulnerable portfolios both at the aggregate level and at the bank level.[2]

That growth of lending is associated with later banking problems is clear at the aggregate level. Basically in all countries with serious banking problems in the recent past – Norway, Sweden, Finland, Japan, parts of the US, and in a lesser degree the UK and France), credit expansion was very rapid in the second half of last decade.

But this aggregate level correlation may just indicate that households and firms borrowed heavily from whatever sources in the boom period, and the following strong increase in problem assets was a result of a general collapse of demand and asset values. No linkage is necessarily implied at the bank level between the speed of credit extension and the later amount of problem assets.

Some observations suggest, nevertheless, that there indeed is a relationship between growth and problem assets also at the bank level. In Finland, it was the savings banks and the commercial bank owned by savings banks, Skopbank, which as a group both increased credit fastest and later ended up in the most serious asset quality problems (Figure 1). Studies on banking problems in the

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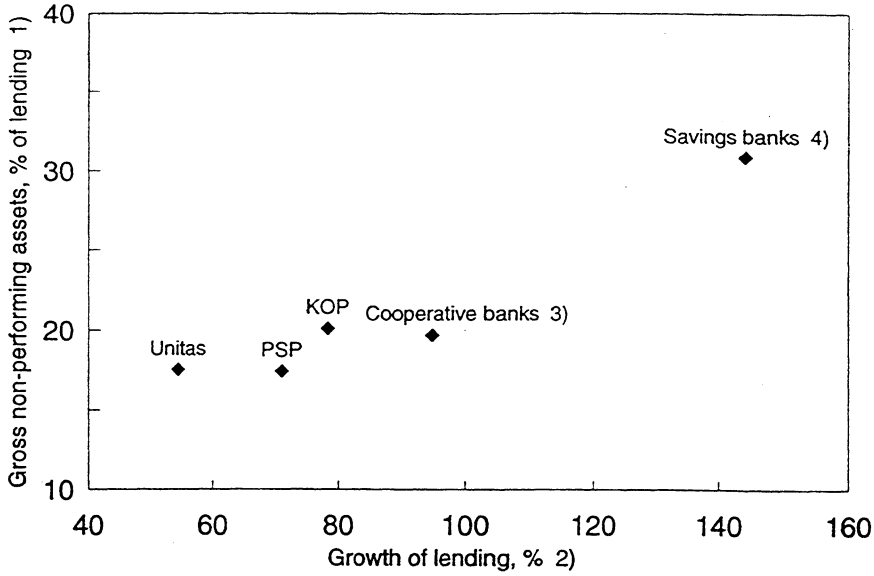
[1] The evolution of the Finnish banking crisis has been described by eg. Nyberg and Vihriälä (1994), and Koskenkylä and Vesala (1994). Koskenkylä (1994) compares the banking problems of different Nordic countries.

[2] "Overextension" of credit has been considered a major factor in the makings of financial crises particularly by Minsky (eg. 1977) and Kindleberger (eg. 1982). With reference to recent UK and Nordic experiences growth of lending has been taken up as a factor contributing to the fate of financial institutions eg. by Pettersson (1993) and Benink and Llewellyn (1994). Randall (1993) discusses the issue in the context of American banking problems.

serious asset quality problems. Studies on banking problems in the US suggest also that lending growth is among the major determinants of bank failures.

Figure 1. **Growth of lending and non-performing assets**



1) Non-performing assets on 31.8.1994 plus credit losses 1.1.1991 through 31.8.1994 of bank groups (including daughter credit institutions) per cent of lending outstanding on 31.12.1990.
2) Growth of lending of bank groups (including daughter credit institutions) between 31.12.1986 and 31.12.1990.
3) Including Okobank
4) Including Skopbank and Arsenal Ltd.

In this paper, we investigate the importance of lending growth as opposed to asset structure as a factor determining the share of problem assets at the bank level. We use cross-section data on Finnish savings and cooperative banks. The relatively large number of observations (85 savings banks and 316 cooperative banks in the data set) should allow discriminating between the hypotheses much better than looking just at a few commercial banks and the local banks as groups.

2 Formulation of the problem

Assume that the probability of a markka of lending to turn "bad" ie. non-performing at a later stage is P_i for sector i (eg. real estate). Assume further that this probability can be presented as a sum of a truly sector specific factor p_i common for all banks, and bank specific factor $p^0 + \Sigma p^k x^k(n)$, common for all sectors. The bank specific factor is thus assumed to be a linear function of bank dependent variables $x^k(n)$. Then, for bank n, the expectation of the share of non-performing assets ("NPA") in all assets "A" ("NPASH") is simply

$$NPASH(n) = \frac{\sum_{i=1}^{I} NPA_i(n)}{A(n)} = \frac{\sum_{i=1}^{I} P_i A_i(n)}{A(n)}$$

$$= \frac{\sum_{i=1}^{I} (p_i + p^0 + \sum_{k=1}^{K} p^k x^k(n)) A_i(n)}{A(n)} \qquad (1)$$

$$= \sum_{i=1}^{I} p_i \frac{A_i(n)}{A(n)} + p^0 + \sum_{k=1}^{K} p^k \cdot x^k(n)$$

Our exercise is basically to estimate the p_i (i = 1,...,I) and p^k (k = 0, ...K) parameters of this equation. The p_i's are the coefficients of sectoral asset shares, while the p^k's are the coefficients of bank specific variables such as the rate of growth of lending.

It would, of course, be more informative to analyze bank dependent factors within every sector. However, this is excluded, as there are no comprehensive data available on the break-down of non-performing assets by sectors. Data on non-performing assets and credit write-offs by sector have been collected only for commercial banks and a sample of cooperative and savings banks. Those data are displayed in the appendix.

Nevertheless, the availability of information on the sectoral break-down of non-performing assets at the aggregate level gives us an aggregate level probability p_i^{AGG} of non-performing assets in every sector i. Using these probabilities together with bank specific asset shares $A_i(n)/A(n)$ allows us to compute the prediction for the share of non-performing assets for every bank under the assumption that banks differ only with regard to asset structures. The predicted share NPASHE(n) is:

$$NPASHE(n) = \sum_{i=1}^{I} p_i^{AGG} \frac{A_i(n)}{A(n)} \qquad (2)$$

We thus have two ways of modelling the dependence of the npa share of the bank's asset structure: (i) as in the above equation (1) by including the sectoral asset shares in the equation and estimating the individual coefficients ("probabilities") or (ii) by including the prediction of the npa share in the above equation instead of the asset shares and estimating its coefficient α:

$$NPASH(n) = \alpha NPASHE(n) + p^0 + \sum_{k=1}^{K} p^k x^k(n) \qquad (3)$$

These two approaches differ in the sense that the prediction version limits the influence of a given asset share strictly to translating a universal sector-specific probability into a contribution of that sectors' assets to the bank's non-performing assets as a whole. In the former version any asset share variable can also function as a proxy for some other factor. Thus a share of some asset may

correlate strongly with the overall npa share even if the share is as such far too small to generate much npa's.

In addition to the sector specific variable(s) the equation includes variables that reflect credit risk associated with all lending of a given bank in the same proportion. Should the "bad-luck" story be the whole truth, only the sectoral asset share variables or the predicted npa share should obtain a coefficient significantly different from zero. In the prediction version, the bad-luck case would additionally imply that the coefficient of the predicted npa share should be unity.

If, on the other hand, the bank characteristics have significantly affected asset quality, also the bank dependent variables should obtain significant coefficients. As noted earlier, the "reckless lending" view suggests a prime candidate in the latter group of variables: the rate of growth of bank lending (or preferably total credit risk exposure) as a whole.

There are several reasons why rapid credit expansion could be associated with a deterioration of asset quality. First, rapid growth could be an objective of a bank to the extent that creditworthiness could be disregarded as a factor by the loan officers. Second, rapid growth could simply overwhelm a bank's resources for risk analysis so that assessment of credit quality becomes indequate. Third, more fundamentally, adverse selection could be a major phenomenon when a bank attracts customers that earlier have been rationed out completely or are served by other banks. The current lender is likely to "release" only customers whose creditworthiness is questionable, which may largely be private information. Fourth, growth could be a deliberate means of assuming risks in a "gamble for resurrection".

Apart from the overall growth of lending, also other bank specific factors could affect asset quality. Assuming that adverse selection problems are more serious when a bank expands lending to sectors where the bank has little earlier expertise, one would expect the credit risk of the portfolio to be positively associated with the degree of change in the asset structure in the period of rapid credit extension.

On the other hand, the diversity of asset portfolio should as such diminish overall credit risk, provided that the shocks to individual sectors are less than fully correlated.

Asset quality could also be affected by bank size. On the one hand, the larger the bank the better it probably is diversified. A bigger bank may also have more specialized resources to assess the clients' creditworthiness and monitor their behaviour. These factors work to improve asset quality.

However, the management of a large savings or cooperative bank could behave in a less risk averse manner than that of a small bank. This could be the case for at least two reasons. First, the consequences of a failure could be more severe for a small bank than a big one. Bankruptcy is a much more likely outcome for small banks than bigger banks (which may be "too big to fail"). Moreover, even without bankruptcy a small bank could easily disappear through merger while a bigger bank might be rescued as an independent entity.

Secondly, there is no effective owner control in the savings banks and cooperative banks. There are no true owners at all in the first case and the stake of an individual member of a cooperative is miniscule. The management has from this point of view substantial freedom of action. In small local banks the management might, however, be discouraged from using this freedom for risk

taking. The standing in the local community and the future job opportunities of the manager of a small local bank could be seriously jeopardised by bad results while the reward in the case of favourable realisations might be modest. This suggests that small banks might be less prone to take risk in relative terms than large banks.

Finally, in the period of our analysis, the extent to which a bank has intermediated foreign currency loans can be assumed to have had a significant impact on a bank's credit risk. Local banks namely supplied credit mainly to the domestic sectors of the economy implying that the firms' debts in foreign currency were not normally hedged against the substantial depreciation of the markka between November 1991 and the Spring of 1993. We thus include the share of foreign currency loans in all loans as an explanatory variable.

Some care should be exercised when interpreting the results that can be obtained from estimating the sort of equation that we have postulated. The analysis is about the proximate causes of problem assets: lending structure and lending growth. Both of them are choice variables for the banks. It is only under the assumption that structure is more predetermined than lending growth that one can make inference about the relative merits of "bad luck" and "reckless lending" or "bad banking" stories.

And even if the structure is not predetermined, there could be bad luck. An example: The banks were certainly able to choose whether or not to supply loans denominated in foreign currencies in the late 1980s. Nevertheless, a strong effect of this variable could still be consistent with the "bad luck" story: the depreciation of the markka could be considered legitimately a bad luck phenomenon, given the consistently articulated and successful policy of no devaluations since 1982.

More generally, our analysis does not as such provide any explanations why certain banks might have chosen a given pace of credit growth or a given asset structure. For example, the factors discussed above that might be associated with bank size may affect asset quality more through growth and asset structure (as measured by us) than directly, which is what we test.

3 The data and some preliminary observations

The portfolios with which the Finnish banks entered the recession were created essentially in the years of very rapid credit expansion 1987 through 1989. In 1990 the growth of assets was already very small. The recession really started in 1991. In the early phases of the crisis the banks' write-offs were rather conservative. Furthermore, all banks did not compile systematic statistics on non-performing assets in this stage. Only in 1992 all banks started to produce statistics on non-performing assets in a consistent manner.[3] 1992 was also the first year when banks wrote off significant parts of their non-performing assets (and of so-called soft loans).

[3] According to the regulation of the Bank Supervision Office (now Financial Supervision), a claim on a customer is to be classified as non-performing, if interest or principal payments are in arrears for at least three months.

In 1992 and 1993 the savings bank group underwent a very significant restructuring. First, in 1992 43 savings banks were merged into the Savings Bank of Finland (SBF), implying a disappearance of roughly half of the units in the group. In 1993 the good assets of SBF were sold to four competitors, and the non-performing assets were transferred to an asset management company (Arsenal Ltd.) owned by the State.

These changes imply that the evolution of asset quality in the very interesting savings bank group is difficult to follow in the most recent period. Because of these difficulties, we have used April 1993 as a cut-off date in the sense that we have constructed the non-performing asset variable (NPA) to be used in the analysis as the sum of non-performing loans (net of credit losses) at the end of April 1993 and the credit losses booked by the bank in the course of 1992 and the four first months of 1993. Not taking into account the assets that have turned non-performing later should not distort the analysis too much, as the growth on non-performing assets decelerated rapidly through 1993.

The non-performing assets due to guarantee obligations are excluded, as data on corresponding liabilities are not readily available. In principle, this should not pose a big problem for the analysis either, as normally there should not be good grounds to believe that credit risks would have differed significantly between these two types of claims. A caveat nevertheless is that guarantees may have been given disproportionally to foreign currency loans provided to the customers by the central banks of the savings banks and the cooperative banks (Skopbank and Okobank, respectively). If foreign currency loans have turned out to be more risky than other loans, omitting the problem assets stemming from this source distorts the results.

Thus we use the ratio of (gross) non-performing loans in April 1993 over the stock of loans at the end of 1990 as the problem asset variable (dependent variable in regressions); the variable name is NPASH. The timing of the denominator in the ratio was selected to be the end of 1990 in order to measure the peak of exposure.

Other variables to be used in the analysis are constructed in the following manner:

Asset structure: Banks' loan books are disaggregated into 9 sectors according to the classification used by the Statistics Finland (the names in parenthesis refer to the respective asset share variables):

(1) manufacturing (MANSH)
(2) construction (CONSH)
(3) real estate (RESSH)
(4) retail & wholesale trade (TRASH)
(5) hotels & restaurants (HORSH)
(6) other services (SERSH)
(7) agriculture and forestry (AGRSH)
(8) other firms (OTHSH)
(9) households excluding farming households (HOUSH)

Sectors (1)–(4) are also aggregated into a wider "business" sector (BUSSH) for reasons that become

obvious later. In the analysis we use shares calculated at the end of 1990.

The share of foreign currency lending in all lending is also calculated at the end of 1990, and denoted by FORSH.

Predicted npa share: The variable is computed by multiplying the above asset shares with respective aggregate level probabilities, based on the data in the appendix. As even at the aggregate level not exactly as fine split is available as above, for the agricultural sector the probability of the households is used, and for hotels and restaurants and other services the probability of the "other" sector. The predicted npa share is denoted by NPASHE

Growth: As the asset growth variable we use the percentage change of total lending from 31/12/1986 to 31/12/1990; symbol GROWTH.

Diversification: Diversification of the loan portfolio is measured by $DIV90 = 1 - \Sigma s_i^2$, where s_i is the share of sector i at the end of 1990. DIV90 is thus 1 – the Herfindahl index, and measures the evenness of the sectoral portfolio shares.

Change of structure: We compute an analogous measure for the change of asset structure $DELTA2 = \Sigma(s_i(90) - s_i(86))^2$, where the number in parenthesis refers to the year of observation.

Size: Bank size is measured by the total lending outstanding at the end of 1986 (millions of FIM). The variable name is SIZE.

Some basic statistics on the relevant variables are given in table 1. The average share of problem assets is 9.2 per cent of the 1990 stock of loans, being clearly higher for the savings banks (13.2) than for the cooperative banks (8.2). Similarily the growth of lending between 1986 and 1990 was also clearly higher (101.5 %) for the savings banks than for the cooperative banks (70.5 %).

It can be seen that the average savings and cooperative banks have lent mainly to households. Agriculture has also a significant share in lending, particularly for the cooperative banks. Various non-agricultural business sectors are clearly more important for the savings banks than the cooperative banks. For both banks there was a substantial increase in the share of business lending between 1986 and 1990.

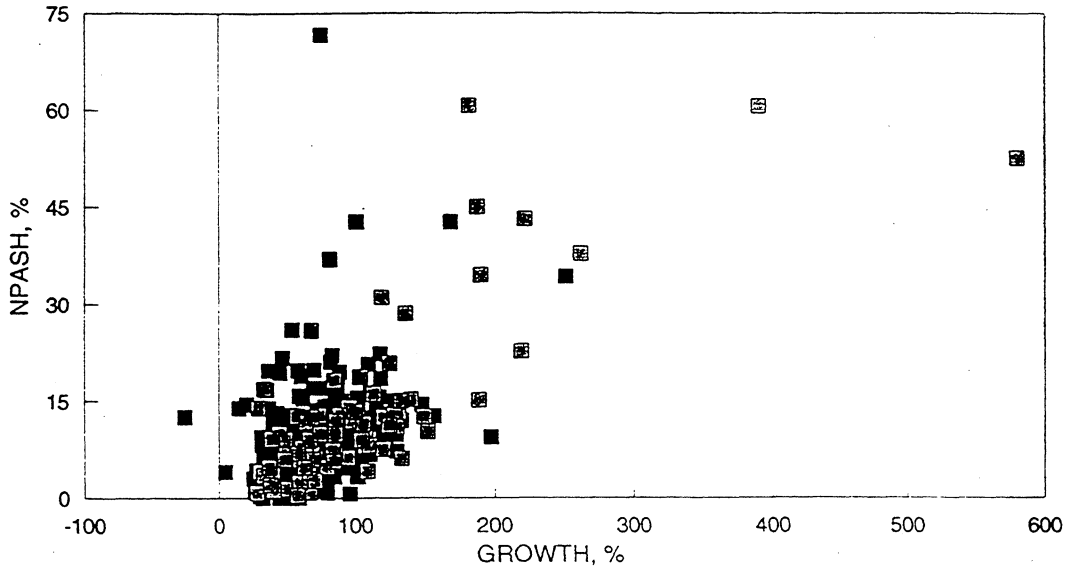
Table 1. **Descriptive statistics on the variables used**

	All observations				Average	
	average	standard deviation	minimum	maximum	savings banks	cooperative banks
NPASH	9.2	8.5	0.0	71.6	13.2	8.2
NPASHE	11.6	1.6	8.5	21.9	12.6	11.3
GROWTH	77.1	45.3	−25.2	579.2	101.5	70.5
DIV90	57.1	7.0	25.2	72.3	56.2	57.4
DELTA2	1.9	2.1	0.0	25.5	2.3	1.8
SIZE*	197.7	336.2	2.7	3006.9	449.9	129.8
FORSH	1.3	4.7	0.0	45.5	6.1	0.0
MANSH	3.5	2.3	0.0	15.1	4.1	3.4
CONSH	2.8	2.5	0.0	29.8	3.9	2.4
TRASH	4.5	2.4	0.0	14.4	6.0	4.1
HORSH	0.7	1.1	0.0	13.4	1.1	0.7
RESSH	3.0	3.2	0.0	20.6	3.8	2.8
SERSH	0.8	1.4	0.0	12.9	1.5	0.7
AGRSH	28.7	15.9	0.1	85.3	18.1	31.6
OTHSH	4.1	1.9	0.0	11.7	4.7	4.0
HOUSSH	51.7	12.2	13.7	82.5	56.8	50.4
BUSSH	13.8	6.5	0.0	49.7	17.8	12.7

* In millions of markka

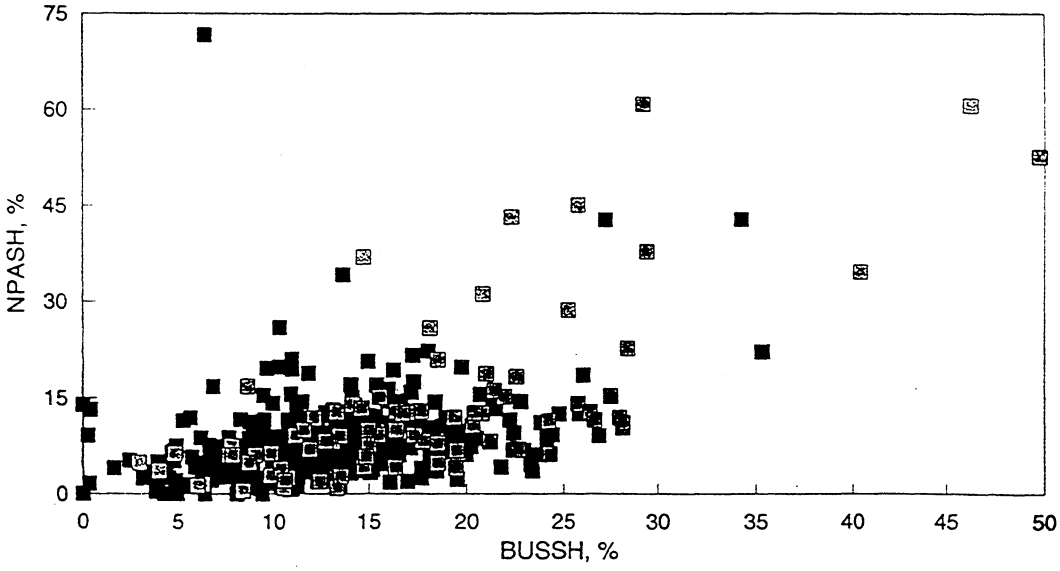
As noted in the introduction and evident from the table in the appendix, at the level of the banking system as a whole, lending to the business sectors that depend mainly on domestic demand has resulted in much higher shares of problem assets than lending to households. Therefore the asset structure should help in explaining the differences between the problem asset shares of the savings banks and the cooperative banks. However, the table in the appendix also indicates that in all sectors the share of problem assets is substantially higher in the savings bank group than in the cooperative or commercial bank group. That suggests strongly that asset structure is not the only important factor. Scatter diagrams (Figures 2 and 3) indicate how also in our data on individual banks high npa shares are associated with both high rates of lending growth and high shares of business lending.

Figure 2. **NPASH and GROWTH**



Dark gray = Cooperative bank
Light gray = Savings bank

Figure 3. **NPASH and BUSSH**



Dark gray = Cooperative bank
Light gray = Savings bank

4 The results

Individual asset shares as explanatory variables

We investigate first the sample as a whole assuming that the behaviour is the same for all of the 85 savings banks and the 316 cooperative banks of our data set. The equations are estimated by OLS. The equations with all sectoral lending shares except the household share and various bank dependent variables as explanatory variables are reported in table 2.

Including only asset shares in the equation indicates that the asset structure indeed has an important effect on the amount of non-performing assets. All of the shares obtain coefficients with positive signs indicating thus that lending to all other sectors has been more risky than lending to the households, which is the baseline. However, in two cases the sectoral "probababilities" exceed unity. That suggests that either the model is wrong or the variables act to a large extent as proxies which should not be interpreted as probabilities.

Adding growth of lending to the equation improves the fit significantly and the coefficient obtains the highest t-value among the explanatory variables.[4] At the same time, the coeffifients of the share variables become smaller and less variable. In particular, the share of construction lending gets now a coeffient that does not differ any more much from that of most other share variables. Also, in general the levels of these coefficients appear reasonable, although the implied probabilities exceed somewhat the aggregate level shares shown in the appendix.

A notable exception from this reasonable pattern is the share of other services, SERSH. The coefficient of this variable still exceeds unity indicating that it indeed is mainly a proxy variable or that the model is still misspecified.

The other bank specific variables (FORSH, DIV90, DELTA2, and SIZE) do not get significant coefficients when growth is included, but the signs are as expected.[5] As a whole, GROWTH and the share of "other" services SERSH appear as the strongest explanatory variables. It is noteworthy that the coeffient of MANSH does not differ very much from those of the other business sectors. This suggests that for the savings banks and the cooperative banks, the risks in manufacturing lending have been closer to those in services while for commercial banks lending to manufacturing has clearly been less risky. The sample based data in the appendix suggest a similar difference between the banking groups, although not quite as clearly as the coefficient estimates. An explanation could be that the manufacturing firms financed by the savings and

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[4] Also constant is included in equations from number 2 onwards, consistently with the original formulation of the problem with bank specific effects. One asset share, that of the least risky household sector is simultaneously dropped from the equation. The change in fit between equation (1) and (2) in table 2 stems solely from GROWTH.

[5] This result does not change even if one tries the sum of absolute deviations instead of the sum of squared deviations in constructing the diversification variable and the structural change variable. Similarily, a logarithmic transformation of the size variable does not work any better. Without growth the diversification variable gets a significant coefficient (with negative sign), but the improvement in fit through its inclusion remains small.

Table 2. **Equation with individual asset shares; all banks, n=401**

	(1) Coeff.	(t-value)	(2) Coeff.	(t-value)	(3) Coeff.	(t-value)
CONSTANT			−4.6		−1.2	
				(−2.40)*		(−.34)
MANSH	.31		.34		.38	
		(2.13)*		(2.43)*		(2.33)*
CONSH	1.04		.37		.34	
		(6.82)**		(2.13)*		(1.69)
TRASH	.42		.32		.37	
		(2.56)*		(1.94)		(1.96)
HORSH	.29		.16		.14	
		(.91)		(0.53)		(.45)
RESSH	.30		.26		.24	
		(2.45)*		(2.15)*		(1.93)
AGRSH	.01		.06		.06	
		(.78)		(1.96)		(1.60)
SERSH	1.84		1.34		1.24	
		(6.75)**		(4.96)**		(4.22)**
OTHSH	.19		.20		.21	
		(1.07)		(1.00)		(.96)
HOUSH	.01					
		−.54				
GROWTH			.074		.064	
				(6.80)**		(5.02)**
FORSH					.11	
						(.97)
DIV90					−.063	
						(−.80)
DELTA2					.18	
						(.91)
SIZE[a]					.02	
						(.19)
$\bar{R}^2$(%)	36.2		42.8		42.6	
BPS	.75		.85		.96	

[a] In 100 millions of markka

* significant at the 5 % level
** significant at the 1 % level

BPS is the significance level of the Breusch-Pagan test for heteroskedasticity

cooperative banks have mainly been small home-market firms hit harder by the collapse of domestic demand than other manufacturers.

The fit of the equations appears relatively high for cross-section data. Neither is there need to worry about heteroskedasticity that often is a problem in work with this type of data; the Breusch-Pagan test clearly rejects the hypothesis of heteroskedasticity.

The "condensed" asset share and the predicted npa share as explanatory variables

Given that the shares of manufacturing, construction, trade, and real estate business obtain roughly the same coefficient values, we use the sum of these four shares, BUSSH, in some further experiments.

Table 3 contains the results obtained with either BUSSH or the predicted npa share NPASHE and different other variables as explanatory variables.

The results in table 3 suggest, first, that not very much explanatory power is lost when the four most important share variables are aggregated. Secondly, the condensed business share variable and the share of other services plus growth again are the important explanatory variables, while other (banks specific) variables remain insignificant.

Replacing the business share variable by the predicted npa share variable in the equation does not change much the explanatory power or the coefficients of the other variables. Thus these two variables appear to contain almost exactly the same information.

Two other things are of particular interest in table 3. First, the coefficient of the predicted npa share is not significantly different from unity, the point estimate being particularly close to unity in the equation containing only growth and SERSH as explanatory variables. It seems thus that the aggregate level sectoral probababilities can be used to get unbiased estimates of the npa share of an individual bank, but only if the effects of growth of lending and the information in the share of "other services" are taken into account.

Secondly, the share of other services SERSH gets consistently a coefficient exceeding unity. This is puzzling. The branch contains activities such as technical and unspecified services for businesses. The importance of the whole branch on the banks' balance sheets is on average very small (0.9 %, 1.5 % and 0.7 % for the whole sample, the savings banks and the cooperative banks, respectively). One factor explaining the high coefficient value could be that lending to this sector has been particularly weakly collateralized, as the firms probably have lacked collateralizable assets.[6]

Nevertheless, it is likely that SERSH is more carrying information about a bank's portfolio choices than as such affecting the outcome in terms of bad assets. One rather depressing explanation could be that the banks that have been singularly careless in lending decisions have also failed to classify properly their lending and have instead often times used this residual service category.

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[6] To the extent these firms use tangible assets – mainly premises – in their production, the assets may be owned by separate companies, eg. real estate firms.

Table 3. **Equation with the condensed asset share or the predicted NPA share; all banks, n=401**

	(4) Coeff.	(t-value)	(5) Coeff.	(t-value)	(6) Coeff.	(t-value)	(7) Coeff.	(t-value)	(8) Coeff.	(t-value)	(9) Coeff.	(t-value)
CONSTANT	−1.79	(−2.25)*	−1.06	(−1.35)	−1.88	(−.59)	−13.1	(−4.67)**	−9.11	(−3.13)**	−9.73	(−2.40)*
BUSSH	.32	(5.05)**	.26	(4.17)**	.23	(3.23)**						
NPASHE							1.40	(4.99)**	1.02	(3.51)**	.79	(2.50)*
GROWTH	.086	(9.43)**	.073	(7.88)**	.063	(5.42)**	.080	(7.99)**	.073	(7.31)**	.066	(5.56)**
SERSH			1.22	(4.67)**	1.13	(4.01)**			1.14	(4.15)**	1.04	(3.64)**
FORSH					.15	(1.38)					.15	(1.40)
DIV90					.027	(.50)					.058	(1.12)
DELTA2					.19	(1.03)					.13	(.67)
SIZE[a]					.005	(.05)					.03	(.32)
$\bar{R}^2$(%)	39.9		42.9		43.1		39.8		42.2		42.5	

[a] In 100 millions of markka

* significant at the 5 % level
** significant at the 1 % level

Firms classified in other services (eg. business consultancy firms) may also have been used in complex swindling operations. In fact, as we shall see later, the estimated effect of SERSH stems in a large degree, although not alone, from a couple of extreme savings bank observations. Therefore, it should not be given too much weight as a general factor.

Differences between savings banks and cooperative banks?

In table 4 we report results obtained when allowing the coefficients to differ between the savings banks and the cooperative banks. Only the version with all individual asset shares as explanatory variables are reported, as the estimated coefficients do not any more justify aggregating the various "business shares" into one. The equations with the predicted npa share as an explanatory variable are not reported either, as the equations are not qualitatively different but fit somewhat less well with the data. The first column contains the formal tests of equality of coefficients across the banking groups. The test is done by including savings bank dummies both for the intercept and the slope coefficients.

Several interesting differences exist between the two banking groups. First, the fit is much better for the savings banks. Partially this may reflect the much smaller number of observations in the savings bank sample. But it also suggests that stochastic elements indeed play a bigger role in the case of the cooperative banks. A reason could be that given the smaller average size in terms of assets and also in terms of geographical coverage, the cooperative banks may not be able to diversify as much as the savings banks.[7] Consequently, idiosyncratic risks are of greater importance for the cooperative banks.

Second, growth of bank lending is very significant in both sub-samples. The point estimate of the coefficient of growth for the savings banks is almost douple the one obtained for the cooperative banks. Nevertheless, the difference fails to be significant even at the 5 per cent level.

Third, for the savings banks, the only other variable obtaining a significant coefficient in addition to GROWTH is the perplexing SERSH. In contrast, for the cooperative banks, the shares of manufacturing and construction lending and bank size obtain significant coefficients with expected signs. Also the share of foreign currency lending would get a significant positive coefficient for the cooperative banks (equation not reported). However, that is not very meaningful statistically, as there are only two banks that have positive FORSH values among the 316 cooperative banks, and one of them is an exceptional case in other respects as well.

The unimportance of the share of foreign currency lending as an explanatory variable for the savings banks is clearly contrary to a priori beliefs. We return to this issue after investigating the importance of outliers for the results.

[7] It should be remembered that our indicator of diversification is very partial measuring only the evenness of sectoral lending shares.

Table 4. **Equations with separate coefficients for the savings banks and the cooperative banks**

	(10) All banks n=401		(11) Savings banks n=85		(12) Cooperative banks n=316	
	Coeff.	t-value	Coeff.	t-value	Coeff.	t-value
CONSTANT	1.98	(.49)	-10.9	(-1.31)	1.98	(.52)
INTERCEPT-DUMMY	-11.5	(-1.48)				
MANSH	.40	(2.09)*	.50	(1.23)	.40	(2.16)*
MANSH-DUMMY	.09	(.22)				
CONSH	.56	(2.37)*	-.24	(-.42)	.56	(2.46)*
CONSH-DUMMY	-.82	(-1.51)				
TRASH	.31	(1.42)	.74	(1.57)	.31	(1.47)
TRASH-DUMMY	.40	(.87)				
HORSH	.30	(.82)	.30	(.41)	.30	(.85)
HORSH-DUMMY	-.05	(-.06)				
RESSH	-.02	(-.01)	.49	(1.68)	-.02	(-.14)
RESSH-DUMMY	.48	(1.66)				
ARGSH	.03	(.79)	.24	(1.78)	.03	(.81)
ARGSH-DUMMY	.20	(1.61)				
SERSH	.09	(.24)	2.48	(3.96)**	.09	(.25)
SERSH-DUMMY	2.30	(3.59)**				
OTHSH	.29	(1.27)	.02	(.03)	.29	(1.32)
OTHSH-DUMMY	-.34	(-.59)				
GROWTH	.054	(3.45)**	.108	(3.38)**	.054	(3.57)**
GROWTH-DUMMY	.050	(1.63)				
SIZE[a]	.54	(2.69)**	-.09	(-.54)	.54	(2.79)**
SIZE-DUMMY*	-.65	(-2.70)**				
DIV90	-.09	(-1.03)	-.03	(-.13)	-.09	(-1.06)
DIV90-DUMMY	.06	(.27)				
DELTA2	.28	(1.21)	-.17	(-.36)	.28	(1.26)
DELTA2-DUMMY	-.47	(-.98)				
FORSH			-.09	(-.41)		
$\bar{R}^2$(%)	46.2		68.1		18.2	

[a] 100 millions of markka

* significant at the 5 % level
** significant at the 1 % level

The effect of outliers

The data contains a couple of relatively extreme observations, the behaviour of which may primarily be due to other factors than those considered in this study. For three savings banks and one cooperative bank the share of non-performing loans exceeds 50 per cent. The three savings banks are also among the four banks with the highest values of the problematic SERSH variable. Two of these three banks have the highest rates of growth of the whole sample (over 300 and 500 per cent, respectively). Furthermore, the managements of all of the three savings banks have been sued for damages and in two cases also criminal processes are underway. The cooperative bank is the only bank with the NPASH exceeding 70 per cent.

In terms of bank size, one cooperative bank is a clear outlier in the group; its size is almost douple that of the two second biggest cooperative banks and over 20 times that of the average cooperative bank. The bank was formed by merging three banks after the outset of the crisis. Managers and members of board have been sued for damages in two of these banks.

It is reasonable to test the robustness of the results by excluding the aforementioned 3 savings banks and 2 cooperative banks from the sample. The estimation results for three equations are reported in table 5.

In terms of fit, the exclusion of the outliers makes the results somewhat more similar between the two banking groups. R^2 declines clearly for the savings banks, suggesting that the earlier good fit was in part a result of a few exceptional observations. For the cooperative banks the opposite is true: the fit improves substantially when only two observations are dropped from the sample of 316.

Excluding the outliers also strengthens the conclusions made on the basis of earlier equations: growth of lending is the most important explanatory variable in the sample as a whole and also for the savings banks and the cooperative banks separately.

In fact, for the savings banks, GROWTH is the only variable that gets significant coefficient at the 1 per cent level (at the 5 per cent level also the the share of lending to agriculture is significant). In particular, the coefficient of the puzzling SERSH variable ceases to be a significant. Its impact stems thus almost solely from a few extreme observations.

The coefficient of GROWTH is now significantly higher for the savings banks than for the cooperative banks (point estimates in free regressions about .12 and .6, respectively).

If we use the coefficient value .12 in calculating the effect of the differential between average growth rates of the savings banks and the cooperative banks respectively, we get the result that 3.6 percentage points or over 70 per cent of the difference between the average NPASH values of the two banking groups stems from the higher average lending growth among the savings banks.

Table 5. **Equations excluding outliers**

	(13) All banks n=396		(14) Savings banks n=82		(15) Cooperative banks n=314	
	Coeff.	t-value	Coeff.	t-value	coeff.	t-value
CONSTANT	1.42	(0.43)	-9.11	(-1.12)	1.42	(.48)
INTERCEPT-DUMMY	-7.97	(-1.24)				
MANSH	.55	(3.55)**	.52	(1.32)	.55	(3.94)**
MANSH-DUMMY	-.05	(-.14)				
CONSH	.60	(3.14)**	.28	(.45)	.60	(3.49)**
CONSH-DUMMY	-.37	(-.76)				
TRASH	.36	(2.09)*	.75	(1.61)	.37	(2.32)*
TRASH-DUMMY	.32	(0.84)				
HORSH	.43	(1.40)	.24	(.33)	.42	(1.55)
HORSH-DUMMY	-.28	(-.47)				
RESSH	-.03	(-.22)	.47	(1.60)	-.03	(-.25)
RESSH-DUMMY	.42	(1.74)				
AGRSH	.04	(1.20)	.27	(2.02)*	.04	(1.33)
ARGSH-DUMMY	.21	(2.07)*				
SERSH	-.02	(-.06)	1.16	(1.41)	-.02	(-.07)
SERSH-DUMMY	.11	(1.67)				
OTHSH	.24	(1.26)	.16	(.27)	.24	(1.40)
OTHSH-DUMMY	-.20	(-.42)				
GROWTH	.059	(4.66)**	.127	(4.00)**	.060	(5.17)**
GROWTH-DUMMY	.059	(2.32)*				
SIZE[a]	.17	(0.94)	-.0029	(-.02)	.18	(1.04)
SIZE-DUMMY*	-.23	(-1.07)				
DIV90	-.10	(-1.38)	-.13	(-.57)	-.10	(-1.53)
DIV90-DUMMY	-.04	(-.21)				
DELTA2	.24	(1.28)	.18	(.30)	.24	(1.42)
DELTA2-DUMMY	-.06	(-.12)				
FORSH			-.18	(-.79)		
$\bar{R}^2$(%)	39.0		45.9		25.2	

[a] 100 millions of markka

* significant at the 5 % level
** significant at the 1 % level

Excluding the two outliers from the cooperative bank sample increases the coefficients of three business sector lending shares (MANSH, CONSH and TRASH) and turn them (even more) significant. Interestingly also, the diversification and change-of-structure variables continue to obtain coefficients with the expected signs, although they still remain insignificant. The SIZE variable, on the other hand, loses significance when in fact just one outlier is excluded. So it seems that the direct effect of bank size on asset quality is not generally very strong. That does not mean, though, that the indirect effects through growth and asset structure of the factors that are likely to be associated with bank size were unimportant.

The role of foreign currency loans

There is strong anecdotal evidence that many bankruptcies were triggered by the increased debt service burden of the loans denominated in foreign currencies due to the depreciation the markka 1991 through 1993. It is therefore surprising that we do not detect the impact of the share of these loans on banks' asset quality in our data.

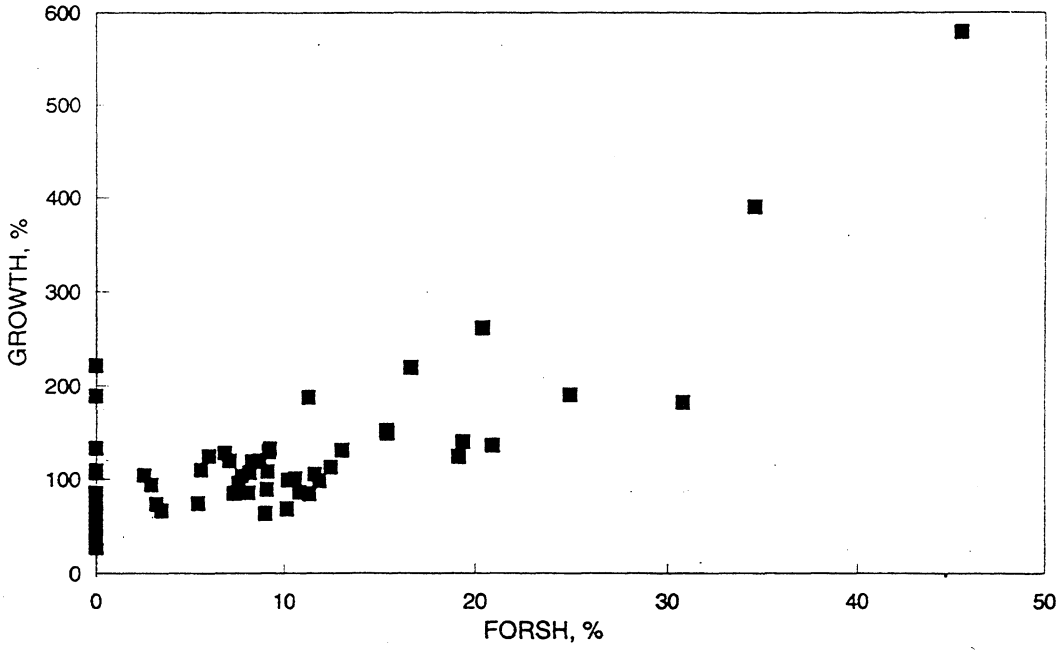
One explanation could be the fact – noted in section 3 – that non-performing assets related to guarantee obligations are not covered by the data. However, the importance of this factor is very difficult to assess.

Another obvious explanation relates to the fact that the share of foreign currency loans is highly correlated with growth. The correlation coefficient is .82 and .66 for all savings banks and the savings banks with positive FORSH values, respectively; see also Diagram 4. Thus precisely those banks that increased lending rapidly also supplied a high fraction of their loans in foreign currencies. As a consequence, it is difficult to distinguish between the effects of these two factors with our data. Nevertheless, statistically growth is a better sole explanatory variable than than the share of foreign currency loans.[8]

More insight into the issue may be gained by looking separately at the savings banks with foreign currency loans (42 banks in all) and those without such loans (43). In particular, if GROWTH captures partially also the effect of FORSH in the sample of all savings banks, one would expect that the coefficient of GROWTH were larger in the sample of the banks with foreign currency loans than in the sample of the banks without such loans in an equation where FORSH is excluded as an explanatory variable. Four separate regressions are reported in table 6 and various sample means of some variables are listed in table 7.

[8] Including constant and only GROWTH or FORSH as an explanatory variable in the savings bank equation gives R^2-values of 56 and 49 per cent, respectively.

Figure 4. **GROWTH and FORSH, Savings banks**



Surprisingly, the point estimate of the coefficient of GROWTH is smaller in the sample of the banks with foreign currency loans, and statistically the coefficients cannot be said to differ.[9] In any case, the idea that GROWTH would partially stand as a proxy for FORSH is not supported by these separate regressions.

Importantly GROWTH continues to obtain the highest t-value in all equations except in the equation for all banks with foreign currency loans, where no single variable is significantly different from zero.

Including FORSH in the sample of the banks with positive FORSH values (the last equation in table 6), results in FORSH getting a relatively large negative coefficient (the significance level 5.9 per cent). Thus among the banks with foreign currency loans, the higher the share of such loans, the less, ceteris paribus, problem assets. That this may not just be a statistical artifact due to multicollinearity is suggested by the observations that the inclusion of FORSH improves the fit substantially, and makes the coefficients of other variables obtain the expected signs with larger although still insignificant t-values. An economic explanation for the negative coefficient might be that banks with positive FORSH values also gave guarantees to foreign currency loans, and that a low positive FORSH value is associated with large amounts of guarantees.

[9] A t-test about the equality of the GROWTH coefficients while restricting all other coefficients to be the same across the two sub-samples clearly rejects the hypotesis that the coefficients would be different (significant levels .56 and .86 with and without outliers in the sample with foreign currency loans, respectively).

Table 6. **Equations separately for the savings banks with and without foreign currency loans**

	(16) Banks with FORSH = 0 n = 43		(17) All banks with FORSH > 0 n = 42		(18) Non-outlier banks with FORSH > 0 n = 39		(19) Non-outlier banks with FORSH > 0 n = 39	
CONSTANT	-5.24		-26.4		-20.4		-16.9	
t-value		(-.52)		(-.93)		(-.79)		(-.69)
MANSH	.50		-.12		-.44		.97	
t-value		(1.07)		(-.07)		(-.29)		(.60)
CONSH	-.27		-.72		.03		1.97	
t-value		(-.37)		(-.43)		(.02)		(1.02)
TRASH	.33		1.30		-.34		1.38	
t-value		(.50)		(.86)		(-.22)		(.80)
HORSH	-.61		-.47		-1.38		1.08	
t-value		(.54)		(-.22)		(-.67)		(.47)
RESSH	.99		.40		-.24		.43	
t-value		(1.60)		(.85)		(-.50)		(.76)
AGRSH	.18		.13		-.40		.97	
t-value		(1.25)		(.10)		(-.33)		(.71)
SERSH	3.36		2.41		-.64		1.12	
t-value		(2.16)*		(1.62)		(-.35)		(.57)
OTHSH	-.60		1.98		.80		2.61	
t-value		(-.79)		(1.15)		(.48)		(1.43)
GROWTH	.127		.071		.098		.156	
t-value		(3.27)**		(1.31)		(2.03)		(2.87)**
SIZE	-3.43		.14		.20		.29	
t-value		(-1.86)		(.64)		(1.04)		(1.55)
DIV90	-.00		.15		.48		-.63	
t-value		(-.01)		(.11)		(.38)		(-.47)
DELTA	-.28		.36		2.88		1.58	
t-value		(-.33)		(.27)		(1.65)		(.88)
FORSH							-.84	
t-value								(-1.98)
$\bar{R}^2$(%)	40.1		72.5		49.2		54.4	

* significant at the 5 % level
** significant at the 1 % level

Table 7. **Sample means of selected variables**

	SAMPLE			
	All savings banks with FORSH > 0 n = 42	Non-outlier savings banks with FORSH > 0 n = 39	Savings banks with FORSH = 0 n = 43	Non-outlier cooperative banks with FORSH = 0 n = 313
NPASH*	18.0	15.0	8.4	7.8
GROWTH*	136.6	117.6	67.2	70.3
BUSSH*	22.7	21.2	13.0	12.6
FORSH*	12.4	10.5	0.0	0.0
SIZE**	819.1	848.6	89.3	117.5

* per cent
** millions of markka

A look at the sample means in table 7 reveals that supplying loans denominated in foreign currency was typical for the savings banks that not only grew rapidly but also were big, supplied disproportionally loans to risky business sectors, and ended up with an average share non-performing asset that is douple that of other savings banks.[10] Interestingly, the savings banks without foreign currency loans do not differ much from their cooperative counterparts with respect to growth, share of business loans, or size.

It is impossible to fully disentangle the effects of growth and the share of foreign currency loans on the basis of our data. As a whole, our findings nevertheless lend support to the view that growth is more fundamental and a positive and furthermore a high share of foreign currency loans was a feature of the rapidly growing savings banks that perhaps added to banks' asset quality problems but was not a strong independent factor.

It should also be noted that the foreign currency loans supplied by the savings banks and the cooperative banks amounted to FIM 10.4 billion in all at the end of 1990. That is about one fourth of all problem assets in these banks implying that even a strongly above-average proportion of problem assets among these loans could not be decisive for the outcome as a whole for these banks. However, even though the local banks on average may not have suffered too much from the depreciation of the markka, for the three outlier savings banks the high foreign currency shares (over 30 per cent of lending) were a significant factor. Also the commercial banks that intermediated the bulk of all foreign currency loans (about FIM 100 billion) had very likely many customer

[10] Incidentally, 36 of the banks with foreign currency loans were among the 43 banks that in 1992 formed the ill-fated Savings Bank of Finland.

whose debt service burden was fatally increased through the depreciation of the markka.[11]

5 Conclusions

The empirical results obtained with data on individual savings banks and cooperative banks suggest unambiguously that the banks' lending structures at the outset of the banking crisis cannot alone explain why different banks ended up with different amounts of problem loans later in the crisis.

Instead, the results indicate that growth of lending in the late 1980s is a major determinant of the later non-performing assets: the faster credit expansion in 1986–1990, the more problem assets in 1993.

This basic result is very robust to small changes in the model. It furthermore holds both for the savings banks and for the cooperative banks, although the effect is stronger for the savings banks.

In fact, for the savings banks, growth seems to be the only important factor explaining bank level variation in the share of non-performing loans. For cooperative banks also the share of business lending (particularly to manufacturing, construction and trade) has contributed significantly to high shares of problem assets. Nevertheless, in the case of cooperative banks a much smaller fraction of the bank level variation can be explained by growth and asset structure than in the case of the savings banks by growth alone.

A somewhat surprising observation is that the share of foreign currency loans does not explain much if anything of the variation in the share of problem assets, when the effect of growth is accounted for. As growth and the share of foreign currency loans are highly correlated, the effects cannot be fully separated in our data, and strong conclusions are not warranted in this regard. Supplying foreign currency loans was a feature of rapidly growing and usually big savings banks. These loans added greatly to the asset quality problems of some big savings banks but were not a generally important factor explaining why banks ended up with different amounts of problem assets.

The results suggest that perhaps as much as 70 per cent of the some 5 percentage point difference in the share of non-performing assets between the two banking groups can be explained directly by higher lending growth in the savings bank group during the boom years. Put differently, had the savings banks on average been as "conservative" in lending as their cooperative counterparts, the average share of non-performing assets might have been slightly over 9 per cent instead of 13. Such a difference had probably been sufficient to keep a substantial number of the savings banks that later ceased to exist from loosing their capital. It is noteworthy that the smaller savings banks, which in general have fared relatively well, resemble very much the average cooperative banks with regard to both asset structure and growth of lending.

Our findings are consistent with and complement the results of Murto (1994) about the pricing of loans by the Finnish savings banks in the late

[11] This conclusion is particularly relevant for the central bank of the saving banks Skopbank. However, in the case of some other commercial banks, the customers may have been rather well hedged, as they operate mainly in the open sector.

1980s. He found that not only did the savings banks grossly underprice credit risk but that they also failed to take into account all useful information about their loan customers contained in the banks' data files.

On the assumption that lending growth was more under the banks' control than lending structure, which we find plausible, both our and Murto's results support the view that "bad luck" alone does not explain the fortunes of individual banks in the Finnish banking crisis. At least most of the savings banks but probably also many other banks either neglected the essentially risky nature of lending or deliberately assumed high risks in their quest for rapid growth. Further empirical work is called for to explore these hypotheses.[12]

[12] An interesting question is particularly the role of bank capital and capital regulations as constraints or facilitating factors of lending growth. A preliminary look at the data suggests for example that the increase in bank capital through value adjustments of fixed property (requiring an authorization by banking supervision) correlates very strongly with lending growth.

Appendix

Banks' credit risk exposure, non-performing assets, and credit losses 1993, billions of markka

	Commercial banks[1]			Savings banks[2]			Cooperative banks[2]			All banks		
	Gross exposure	Gross NPA's	The share of NPA's %	Gross exposure	Gross NPA's	The share of NPA's %	Gross exposure	Gross NPA's	The share of NPA's %	Gross exposure	Gross NPA's	The share of NPA's %
Total	402.82	50.93	12.6	88.44	26.59	30.0	100.25	14.24	14.2	591.51	91.76	15.5
Firms	197.75	29.97	15.2	37.89	19.95	52.6	32.46	9.06	27.9	268.10	58.97	22.0
Manufacturing	73.35	4.12	5.6	6.17	2.31	37.4	4.84	0.91	18.8	84.36	7.33	8.7
Construction	19.57	6.13	31.3	4.93	3.50	71.0	4.54	1.57	34.6	29.04	11.20	38.6
Trade	40.28	7.59	18.8	8.28	4.15	50.1	7.41	2.36	31.8	55.96	14.10	25.2
Real estate	23.25	5.45	22.6	10.28	5.76	56.0	7.92	2.77	35.0	41.45	13.98	33.7
Other	41.10	6.68	16.3	8.33	4.23	50.8	7.76	1.46	18.8	57.19	12.37	21.6
Households[3]	78.16	6.35	8.1	45.58	4.86	10.7	63.47	4.68	7.4	187.21	15.89	8.5
Other[4]	127.03	14.61	11.5	4.97	1.78	35.8	4.20	0.50	11.9	136.20	16.89	12.4

Gross exposure = exposure (on and off balance sheet) at the end of 1993 plus credit losses in 1992 and 1993
Gross NPA's = non-performing assets at the end of 1993 plus credit losses in 1992 and 1993

[1] Bank groups i.e. including daugther credit institutions, and Skopbank and Okobank.
[2] Parent companies only, based on a sample
[3] Including farming households
[4] Mainly foreign clients

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