Does activity mix and funding strategy vary across ownership?
Evidence from Indian banks

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Abstract

Using data on Indian banks during 1996-2007, the paper examines the impact of bank activity and short-term funding for bank returns and risks. The findings indicate that larger, fast growing financial firms tend to have higher fee income shares. In addition, banks with greater reliance on fee income generating activities exhibit higher profitability. On the contrary, the impact of non-deposit funding share on bank profitability is weak. In terms of bank riskiness, the evidence is consistent with the conjecture that big, cost efficient and capitalized banks are less risky. As in case of bank profitability, there is limited evidence on any non-linear relationship between risk and fee incomes as also between risk and non-deposit funding share. Finally, the analysis supports the fact that foreign and *de novo* private banks exhibit lower risk as compared to old private banks.

Resumen

Utilizando datos de bancos de la India para el periodo 1996-2001, este documento analiza el impacto de la actividad bancaria y las financiaciones a largo plazo sobre los rendimientos y riesgos bancarios. Las conclusiones obtenidas muestran que las empresas bancarias más importantes y con un crecimiento más rápido tienden a obtener mayores cuotas de ingresos. Por el contrario, el impacto sobre las cuotas de financiamiento sin depósito sobre la rentabilidad bancaria es débil. En términos de riesgos bancarios, las evidencias confirman la conjetura de que los grandes bancos, de coste eficiente y capitalizados, son menos arriesgados. Como ocurre en el caso de la rentabilidad bancaria, son escasas las pruebas de que exista una relación no-lineal entre el riesgo y los ingresos, así como entre el riesgo y la cuota de financiaciones sin depósito. Finalmente, nuestro análisis apoya el hecho de que los bancos extranjeros y recientemente privatizados muestran menores riesgos en comparación con los tradicionales bancos privados.

1.- Introduction

In tandem with growing liberalization of financial systems worldwide, banks have increasingly veered towards wholesale funding at the expense of relatively stable retail deposits. Edwards and Mishkin (1995) had stated this more than a decade back wherein they observed that …*As a source of funds for financial intermediaries, deposits have steadily diminished in importance".* Aggregate bank-level data for OECD economies indicates that in several of such countries (Germany, Italy, Portugal, Spain and Switzerland), deposits have steadily lost ground at the expense of non-deposit funds (ECB, 2008a; 2008b).

This change in the funding composition was called into question in the wake of the recent financial meltdown. In particular, such wholesale funding created significant maturity mismatches with banks devoting limited attention to the consequences of potential risks of drying up of such funds. As confidence withered and depositors began withdrawing their funds *en masse*, banks found it increasingly difficult to meet such large and sudden withdrawals and took recourse to inter-bank markets to fund maturity mismatches. With confidence in financial institutions having eroded, the inter-bank market also came to a standstill, leaving banks with no recourse but to seek government intervention. Across countries and continents, besides conventional (cuts in key policy rates, liquidity injections, *etc*) and unconventional (collateral swaps, introduction of foreign currency swap lines, quantitative easing, *etc.*) policy measures, governments have heavily intervened in banks, including resorting to outright nationalization (as in US, UK, Russia, Belgium), increasing depositor protection limits (as in US, UK, Germany, Australia, Hungary, Czech Republic), injecting capital in troubled banks (as in US, UK, France, Germany, Switzerland, Russia), to mention a few.

In this article, we examine the implications of bank's activity mix and funding strategy for its risk and return, using India as a case study. We represent a bank's activity mix by its share of fee income in total income. On the sources side, we distinguish between deposits and non-deposit funding sources. The objective is to shed light on the risk-return trade-offs involved in the choice of different activity and funding strategy employed by the bank.

Extant theories of banking provide conflicting predictions about the bank's optimal asset or activity mix. Banks gather information about their clients in the provision of a financial service which could be utilized at a later date in the provision of other financial services to the same customers. This information-intensive nature of bank assets would suggest that banks combine activities of various kinds in an optimal manner (Diamond, 1991; Rajan, 1992; Stein, 2002). Critiques contend that the optimal size and scope of a banking firm would also reflect potential

agency problems that arise if it becomes too complex (Jensen and Meckling, 1976). Hence, even if further diversification may not be optimal in terms of the risk-return trade-off, banks could still persist with such diversification as long as it enhances their ability to extract private benefits.

On the funding side, a bank's composition of debt and its ability to fund itself in wholesale capital markets signals banks creditwhiness that are relevant to potential bank depositors. Therefore, although banks need to be part-financed through equity to provide bankers with appropriate incentives (Diamond, 1984), often banks resort to non-deposit funding sources such as subordinated debt which enables the holders of such debt to credibly monitor the bank (Calomiris, 1999). To provide an example, the on-site inspection system for banks in Argentina obligated banks to issue 2 percent of deposits as subordinated debt each year, so as to harness the elements of market discipline into the supervisory process. Owing to several reasons including the timing of its introduction, the proposal did not perform along expected lines and had to be subsequently replaced (See Calomiris and Powell, 2001 for details).

Deposit and non-deposit funding tend to carry different risks. While the volume and price of wholesale funding tends to adjust quickly in response to bank riskiness, retail deposits tend to be relatively less price responsive, partly because of the presence of deposit insurance schemes. Fama (1985) and Rajan (1992) emphasize the advantage of monitored debt such as bank borrowings in reducing informational and monitoring costs as compared to arms' length debt, such as bonds and related debt instruments.

Several studies have, in recent years, explored the issue of banks wholesale funding and its role in the recent subprime crisis. Ratnovski and Huang (2009) examines the factors behind the unusual resilience of Canadian banks during the recent global meltdown and finds that they relied less on wholesale funding than their peers in other advanced countries. Other studies show that banks that relied heavily on wholesale funds were more affected by the liquidity crunch, experienced a large abnormal decline in their share prices (Adrian and Shin, 2009). Using quarterly data on US banks during the subprime crisis, Cornett *et al.* (2010) finds that banks with lower reliance on wholesale funds were better able to continue lending. Cross country evidence advanced by Raddatz (2010) also supports the fact that investment banks relied more on wholesale funds as compared to commercial banks and therefore, were more prone to deposit-runs as compared to the latter. In effect, the evidence strongly suggests that greater use of wholesale funding exposed banks to new types of liquidity-related risks. Whether and to what extent did this vary across bank ownership is an under-researched aspect of study and is one of the major concerns of the paper.

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Other researchers consider the joint determination of bank activities and bank funding and provide a rationale for why traditional deposit-taking and lending services are more likely to be observed within the same firm. One argument is that the opaqueness of relationship lending enhances bank fragility. Therefore, in order to minimize such fragilities, banks make "relationship loans" financed through core deposits, which are less likely to witness premature withdrawal (Petersen and Rajan, 1994; 1995). Another possible reason for lending and deposit-taking services to be provided within the same banking firm is that both services entail the provision of liquidity to bank customers, which could lead to an improvement in an overall liquidity management of the institution (Kashyap et al., 2002).

The paper has a three-fold purpose. First, we document the trend in the bank's activity and funding mix for an extended sample of banks across ownership categories for the period 1996-2007. This is interesting since it coincides with the financial sector reforms period and provides insights as to how banks' funding and activity mix has changed over this period. Second, we present empirical evidence on the determinants of fee and non-deposit funding shares, by examining how these variables are affected by a range of bank-specific, banking industry and macroeconomic factors. And finally, we assess how bank activity and funding patterns are associated with bank-level risk and return variables. We measure bank return by its profitability, defined as net profit to total asset or, return on asset (RoA). Our measure of bank risk is the Z-score, defined as the number of standard deviations that a bank's return on asset has to decline for the bank to become insolvent. Being an accounting measure of the "distance to default", it has been widely employed in the empirical banking literature in recent times (Laeven and Levine, 2009; Mercieca et al., 2007; Furlong and Kwan, 2005; De Nicolo, 2000).[2]

The paper fills a gap in the literature since empirical studies on the implications of bank's funding for its risk and return are limited. Several papers have however, examined the implications of combining various banking activities for bank risk. Stiroh (2004) finds that Z-scores are the highest for US banks with a non-interest income share close to zero. Laeven and Levine (2009) consider a cross-country sample of banks from 48 countries to examine how bank risk, measured by the Z-score and stock return variability, is affected by bank level corporate governance factors and national banking regulations. The findings appear to indicate the importance of both these sets of factors in impacting bank risk. Laeven and Levine (2007) estimate the factors influencing bank diversification and their charter value. Using data for the period 1998-2002, their results provide support for the fact that well-diversified banks have low charters.

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[2]Contextually, the RBI utilized the Z-score measure as part of its assessment of financial soundness of Indian banks (See, RBI, 2009).

In a recent exercise, RBI (2007) examined the liability structure of banks and within the liability structure, the ownership and maturity pattern of deposits of commercial banks, during the entire post-reform period. The analysis finds (a) an unchanged share of borrowings in total liabilities of commercial banks during 1991-2007 and if any, an increase in the share of deposits; (b) a decline in the share of household sector in banks' total deposits, at the cost of increase in the share of government sector (a) a significant shortening of the maturity of term deposits, with a significant rise in the proportion of deposits with shorter (upto 1 year) maturities. Based on the findings, the study argues:

> *In this new environment, thus, banks face the challenge of proper assessment of risks associated with borrowed liquidity vis-a-vis stored liquidity inherent in core deposits. Regulators also need to be proactive in dealing with the emergence of any systemic risks arising out of increased recourse to borrowings*

However, the interconnect between bank activity mix and its funding composition and the possible implications for bank risk and returns have not been adequately examined, an aspect which the present paper seeks to address.

The rest of the paper unfolds as follows. Section II provides descriptive evidence on the funding and liability structure of the banks. The following two sections delineate the empirical strategy and the results. The final section gathers the concluding remarks and encapsulates the policy concerns.

2.- Funding mix and liability structure : Indian evidence

The time period of the study spans 1996, coinciding with the functioning of *de novo* private banks, through 2007, just prior to the onset of the global meltdown. The sample comprises of 66 banks including all state-owned, 6 *de novo* private, 15 old private and 17 foreign banks, accounting, on average, for over 90% of banking assets. The data for the analysis are extracted from *Statistical tables relating to banks in India* (STB), a yearly publication by the Indian central bank that reports bank-wise balance sheet and profit and loss numbers. The ownership and related variables for banks are culled out from *Report on trend and progress of banks in India* (RTP)*,* a statutory annual publication by the Indian central bank. Taken together, these two publications account for almost all of the bank-level variables employed in the analysis. The macro variables are drawn from the *Handbook of Statistics on Indian economy* (HBS), an annual central bank publication that reports time-series data on monetary and macro variables.

Table 1 enlists the activity mix along with bank risk and returns at four time points during the sample period. The first year of the sample coincides with the commencement of operations of *de novo* private banks, the year 1999-2000 marks the process of 'second generation' banking reforms, post Narasimham Committee II Report in 1998, the third period marks the beginning of a high point of global (and Indian) growth wherein banks in India also made windfall gains on their treasury portfolio riding on the back of a benign interest rate regime and the final year is just prior to the onset of the global meltdown (See Chart 1).

We measure activity mix as the ratio of fee income to total income (the Appendix contains the variable definitions). Across bank groups, the evidence appears to suggest that state-owned banks and old private banks broadly belong to one category, with lower than median fee incomes, whereas new private banks, from being slow starters, have gradually improved their fee income component.[3] Foreign banks have the highest fee income component, as also the highest non-deposit funding, as well, both being in excess of the sample median. State-owned and old private banks, in contrast, tend to exhibit the lowest reliance on non-deposit funds.

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[3] The median values for fee income and non-deposit funding are respectively, 0.146 and 0.048, respectively (See Table 2).

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Table 1. Bank risk and activity indicators according to bank groups

Panel A	1995-96	1999-2000	2003-04	2006-07
All banks				
Fee income	0.144	0.146	0.228	0.204
Non-deposit funding	0.102	0.096	0.078	0.085
RoA	0.002	0.007	0.011	0.009
Z-score	0.230	0.229	0.261	0.262
State-owned banks (SOBs)				
Fee income	0.133	0.135	0.201	0.159
Non-deposit funding	0.097	0.093	0.076	0.078
RoA	-0.001	0.006	0.011	0.008
Z-score	0.182	0.181	0.206	0.199
New private banks (NPBs)				
Fee income	0.135	0.176	0.240	0.202
Non-deposit funding	0.105	0.109	0.114	0.131
RoA	0.020	0.008	0.012	0.009
Z-score	0.383	0.172	0.161	0.156
Old private banks (OPBs)				
Fee income	0.150	0.165	0.223	0.128
Non-deposit funding	0.096	0.089	0.064	0.079
RoA	0.011	0.008	0.012	0.007
Z-score	0.002	0.010	0.031	0.004
Foreign banks (FBs)				
Fee income	0.184	0.217	0.313	0.281
Non-deposit funding	0.182	0.243	0.247	0.238
RoA	0.016	0.012	0.016	0.016
Z-score	0.352	0.327	0.428	0.471
Panel B	**Correlation matrix for bank groups (p-Value)**			
	Fee income	Non-deposit funding	RoA	Z-score
Fee income	1.000			
Non-deposit funding	0.723 (0.00)	1.000		
RoA	0.054 (0.71)	-0.309 (0.00)	1.000	
Z-score	0.612 (0.00)	0.635 (0.00)	-0.485 (0.00)	1.000

The Z score variable is scaled by 100

Chart 1: Bank activity and funding
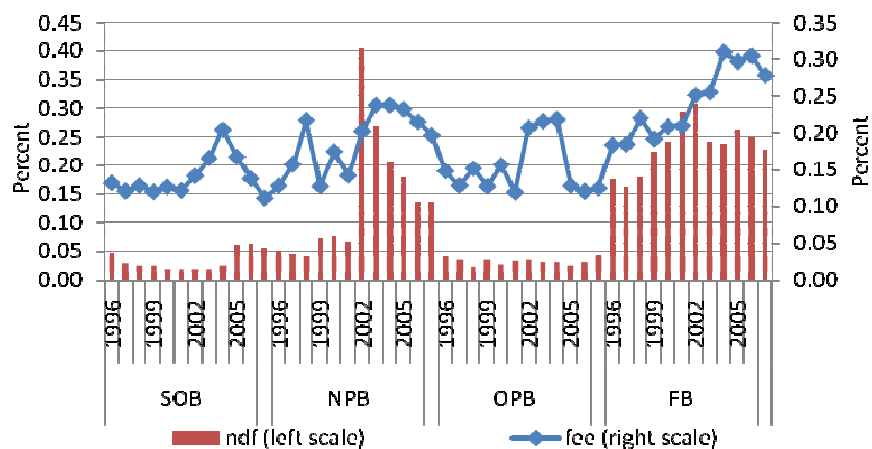
The position with regard to bank returns appears to indicate a gradual convergence in profitability across bank ownership, although foreign banks display the highest profitability ratio. In terms of bank risk as well, it is the old private bank group that appear to be the most vulnerable; state-owned and new private banks, as a group, appear to be having similar Z-scores, the figure for foreign banks being well higher than   that obtaining for these bank groups.

The correlation matrix among these variables is presented in Panel B of bank return on assets and its income mix. The correlation between bank risk and fee income is positive and significant, indicating that banks with greater reliance on fee incomes tend to have lower risk. Fee income and non-deposit funding have a positive correlation which is statistically significant as well. Thus, banks which are non-traditional in having a relatively high fee income share tend to be non-traditional in the sense of high non-deposit funding share. This is consistent with the analytical framework advanced by Rajan and Stein (2002) which justifies the co-existence of lending and deposit-taking within the same financial institution. However, there appears to be no significant relation between the bank's return and its fee income. These raw correlations however, do not control for bank-specific or business cycle effects.

Table 2 provides further evidence as regards the reliance on non-deposit funding and proportion of fee income across bank ownership categories. It appears from the table that while foreign banks have a high proportion of fee income, the majority of them also have high reliance on non-deposit funding. As well, new private banks also appear to be on the same ground as foreign banks. In general, the non-deposit funding/ fee income combination for most state-owned banks seems to be on the lower side; exceptions being 2003 and 2004, wherein these banks generated substantial treasury incomes riding on the back of benign interest rates. In 2003 for instance, roughly 40 percent of the banks had fee income, non-deposit funding combination in excess of the median levels of these variables; the percentage of banks was slightly higher in 2004.

A number of factors make the banking sector in India an interesting case to study the interlinkage between bank risk and funding strategy. First, over the 1990s, India has undergone liberalization of the banking sector with the objective of enhancing efficiency, productivity and profitability (Government of India, 1991). Second, the banking sector has witnessed important transformation, driven by the need for creating a market-driven, productive and competitive economy in order to support higher investment levels and accentuate growth (Government of India, 1998). Third, most studies on bank income mix pertain to developed country markets (Stiroh, 2004; Lins and Servaes, 1999; Laeven and Levine, 2007). The issue as to the interplay between funding strategy and bank risk in emerging markets as India where the financial system

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is pre-dominantly bank-based and government-owned remains a moot issue. Fourth, in tandem with the process of financial sector reforms, the capital base of state-owned banks has been broad-based through infusion of equity capital from the market, while still retaining majority government holding, a process commonly referred to as *equity privatization* (Boubakri *et* al., 2005). To our knowledge, this is perhaps the first study for India to systematically explore the association between funding strategy and bank risk.

Table 2. Number of banks with fee income and non-deposit funding above median

Variable	Non deposit funding (Median = 0.078)					
	Year	SOB	NPB	OPB	FB	Total
Fee income (Median = 0.146)	1996	5	1	5	10	21
	1997	2	4	4	7	15
	1998	4	5	3	12	24
	1999	3	1	2	8	14
	2000	4	4	1	13	22
	2001	1	2	1	9	13
	2002	6	4	2	14	26
	2003	11	4	2	10	27
	2004	10	4	2	13	29
	2005	8	5	1	12	26
	2006	5	4	1	13	23
	2007	0	5	1	14	20
Memo: **Number of banks**		**28**	**6**	**15**	**17**	**66**

See Table 1 for notations

The present article augments the empirical literature in several distinct ways. First, we contribute to the debate as to whether funding mix matters for bank risk and return. Evidence suggests that short-term wholesale funding was the prime culprit that helped to sink Northern Rock, a leading mortgage bank in the UK. The bank's failure in September 2007 is indelibly associated with images of Britain's first retail bank run since the late 1800s. Second, the paper contributes to the debate on bank ownership. Empirical research appears to suggest that ownership matters for bank performance (Megginson and Netter, 2001; Megginson, 2005; Bonin *et al.*, 2005; Sapienza, 2004; Dinc, 2005). In the Indian case, research uncovers a gradual convergence in the performance of state-owned *versus* other bank groups (Das and Ghosh, 2006), although there appears to be wide divergence in profit efficiency across bank ownership (Das and Ghosh, 2009). Whether there exists any such variation in funding strategy across bank ownership categories remains an issue of empirical investigation. Third, by linking bank funding and bank risk and returns to bank ownership, we also contribute to the ownership-performance-bank risk debate, an aspect hitherto unexplored in the Indian context. Finally, the study belongs to the broader literature that focuses on the financial intermediation role of banks. Empirical studies have examined the link between lending and deposit taking activity of banks. Berlin and

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Mester (1999) suggest that core deposits, *i.e.*, deposits with inelastic interest rates, represent an important basis for relationship lending. In the Indian context, research uncovers that bank-firm relationship vary significantly by ownership : while foreign banks are more likely to be associated with listed (and hence, transparent) manufacturing firms, state-owned banks typically forge relationships with small firms having limited credit access (Berger *et al.,* 2008).

These papers build on the theoretical models that propose the co-existence of lending and deposit-taking that is based on information or liquidity shortages (Kashyap *et al.*, 2002; Mester *et al.*, 2005). There is, however, admittedly limited empirical evidence of the nexus among returns, risk and bank activity, which is the major concern of the paper. These findings emanating from our analysis could have implications for the nexus among these important variables in other emerging markets as well.

To anticipate the results, the findings indicate that larger, fast growing financial firms tend to have higher fee income shares. Furthermore, the analysis appears to suggest that banks with greater reliance on fee income generating activities exhibit higher profitability. On the contrary, the impact of non-deposit funding share on bank profitability is weak. Focusing on bank risk, the evidence indicates that neither fee income nor non-deposit funding is important in explaining bank riskiness, although bank ownership matters for bank risk.

3.- Empirical strategy

As a starting point, we first conduct univariate tests to examine the differences in the relevant bank-level variables across bank ownership. Later in the analysis, we employ dummy variables to control for ownership.

Table 3. Univariate tests of bank-level variables: Means and standard deviation (SD)

Variable	RoA		Z-score		Fee income		Non-deposit funding	
Bank group	N.Obs	Mean (SD)	N.Obs	Mean (SD)	N.Obs	Mean (SD)	N.Obs	Mean (SD)
SOB	336	0.006 (0.008)	324	0.053 (0.029)	336	0.137 (0.042)	335	0.028 (0.063)
NPB	72	0.009 (0.011)	60	0.051 (0.094)	72	0.178 (0.048)	71	0.078 (0.096)
OPB	180	0.008 (0.009)	168	0.048 (0.092)	180	0.149 (0.067)	179	0.056 (0.142)
FB	195	0.009 (0.026)	149	0.049 (0.097)	195	0.217 (0.116)	193	0.234 (0.179)
t-test for difference								
SOB *vs.* NPB	-2.193**		18.054***		-6.718***		-4.201***	
SOB *vs.* OPB	-2.499***		-0.577		-2.184**		-2.509***	
SOB *vs.* FB	-1.569		9.851***		-9.284***		-15.446***	
NPB *vs.* OPB	-0.685		-14.818***		-3.843***		1.413	
NPB *vs.* FB	-0.261		-7.069***		-3.881***		-9.070***	
OPB *vs.* FB	-0.505		-8.654***		7.016***		10.663***	

See Table 1 and Appendix for notations and definitions
The Z-score variable is scaled by 100
*** and ** denote statistical significance at 1 and 5%, respectively

The univariate results in Table 3 are strongly supportive of significant differences, primarily in activity and funding strategy. Take, for instance, non-deposit funding. On average, roughly 3 percent of funding for SOBs is from non-deposit sources as compared to well over 20 percent for foreign banks. This difference is statistically significant at the 0.01 level. Fee income demonstrates the greatest difference across bank groups. On average, fee income constitutes roughly 22 percent of total income for foreign banks, which are over 60 percent higher as compared to SOBs and 22 percent as compared to NPBs. Similar differences are in evidence across bank risk, although the differences in terms of bank returns are much less compelling.

These univariate tests do not take into consideration several bank-specific variables. By way of example, funding strategy could differ across bank size. The risk appetite of fast-growing banks could differ from others. Similarly, the state of the banking industry as also the macroeconomic environment could impinge on bank activity and funding mix. Taking these concerns on board, we employ a multivariate regression framework, by specifying a reduced-form equation for bank *s* at time *t* of the following form:

$$y_{st} = \varphi_0 + \varphi_1 B_{st} + \varphi_2 Z_t + \varphi_3 M_t + \varphi_4 OD_t + \varepsilon_{st}$$
(1)

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where *s* indexes bank and *t* denotes year; φ s' are the parameters to be estimated.

In (1), the dependent variable (*y*) is assumed to be a function of bank-level controls (*B*), time-varying banking industry specific variables (*Z*) and macroeconomic controls (*M*). The bank-level controls include the following. First, the log of bank assets is employed as a proxy for bank size. Second, the equity-to-asset ratio is employed to measure bank capitalization. Third, we construct the bank (real) asset growth variable to allow for the possibility that fast growing banks could have different funding and income profiles. Finally, the cost-to-income ratio controls for bank-level efficiency.

At the banking industry level, we control for the asset share of foreign banks and deposit concentration variables. Higher foreign bank presence could engender higher competition, leading to lower fee incomes. Alternately, higher competition could lead certain bank groups to undercut others, leading to unequal distribution of fee incomes across bank ownership. Finally, we control for the macroeconomic environment by introducing controls for the real GDP growth and the interest rate. To moderate the influence of noise in the macroeconomic variables, we employ dummies instead of the continuous variables. Finally, following from the univariate results, we utilize ownership dummies (OD), since bank income and funding mix are found to differ across ownership. Throughout, the reported standard errors take on board the possibility of serial correlation and heteroskedasticity pertaining to the same bank (i.e., bank-level clustered standard errors).

4.- Discussion of the results

4.1 Determinants of interest income shares and funding pattern

Table 4 presents the results of regression that relates fee income to a set of bank-level variables and macroeconomic controls. Larger, fast growing financial firms tend to have higher fee income shares. On the whole, controlling for everything else, fee-generating activities appear to be associated with greater equity. Fee incomes are higher in an environment of low interest rates and GDP growth. Across bank ownership, state-owned banks rely less on fee incomes, whereas foreign banks tend to exhibit greater reliance on fee income as compared to old private banks (the omitted category).

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In specifications (2)-(3), we include indicators of the market structure of banking systems. Specifically, the variable *concentration* is defined as the deposits of top 5 banks in a given year, while *foreign* denote the fraction of banking sector assets that are owned by foreign banks, respectively.

The coefficient on *foreign* is negative and statistically significant. In economic terms, everything else equal, greater dominance of foreign banks appear to lower fee incomes presumably by weaning away more creditworthy customers, consistent with "cherry picking".

Table 4. Regression analysis : Fee income and non-deposit funding

Variable	Dep. Var =Fee income			Dep. Var = Non deposit funding		
	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	-0.036	0.257	0.709	-0.039	-0.013	-0.163
	(0.057)	(0.077)***	(0.135)***	(0.126)	(0.118)	(0.172)
Size	0.033	0.030	0.023	0.016	0.016	0.018
	(0.010)***	(0.010)***	(0.011)**	(0.022)	(0.021)	(0.021)
Equity/Asset	0.309	0.301	0.258	0.018	0.017	0.027
	(0.074)***	(0.073)***	(0.076)***	(0.199)	(0.199)	(0.201)
Asset growth	0.008	0.008	0.008	0.025	0.025	0.025
	(0.002)***	(0.002)***	(0.002)***	(0.011)**	(0.011)**	(0.011)**
CIR	-0.029	-0.025	-0.020	0.019	0.019	0.018
	(0.019)	(0.018)	(0.018)	(0.039)	(0.039)	(0.039)
Foreign		-0.354			-0.317	
		(0.051)***			(0.895)	
Concentration			-0.161			0.269
			(0.023)***			(0.318)
dy_GDPGR	-0.004	-0.029	-0.017	-0.002	-0.004	0.008
	(0.004)	(0.006)***	(0.004)***	(0.009)	(0.013)	(0.010)
dy_Interest	-0.001	-0.016	0.015	0.009	0.008	0.006
	(0.005)	(0.006)***	(0.004)***	(0.008)	(0.011)	(0.008)
dy_SOB	-0.038	-0.036	-0.029	-0.033	-0.033	-0.034
	(0.014)***	(0.014)***	(0.014)**	(0.025)	(0.025)	(0.026)
dy_NPB	0.009	0.012	0.016	0.013	0.013	0.012
	(0.012)	(0.011)	(0.011)	(0.025)	(0.025)	(0.025)
dy_FB	0.055	0.057	0.059	0.178	0.179	0.177
	(0.023)***	(0.023)***	(0.023)***	(0.042)***	(0.042)***	(0.042)***
dy_merger	-0.002	-0.002	-0.0001	0.055	0.055	0.055
	(0.017)	(0.016)	(0.016)	(0.060)	(0.061)	(0.061)
Time period	1996-2007	1996-2007	1996-2007	1996-2007	1996-2007	1996-2007
N.Obs, banks	779; 66	779; 66	779; 66	779; 66	779; 66	779; 66
R-squared	0.252	0.286	0.313	0.324	0.324	0.324
Clustering level	Bank	Bank	Bank	Bank	Bank	Bank

Standard errors within brackets
***, ** and * denote statistical significance at 1, 5 and 10%, respectively

In specification (3), *concentration* is negative and significant with a point estimate equal to 0.16. In other words, an increase in concentration (and thus lower competition) by 1 percent lowers fee incomes by roughly 0.2 percent, perhaps because banks under-cut each other through price wars.

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The remaining three regressions have the non-deposit funding share as the dependent variable and are otherwise fully analogous to the previous regression. Among the independent variable, it is only the association with asset growth which matters. This suggests that fast-growing banks appear to be relatively heavily financed through non-deposits, increasing leverage. Additionally, the coefficient on *dy_foreign* is significant and positive, conforming to anecdotal evidence that this bank category relies more on non-deposit funds as compared to others (See Table 3 above).

Since all models control for the business cycle and the monetary policy as also for bank mergers, it seems less likely that these results are driven by macroeconomic or such related considerations.

4.2 Evaluation of bank risk and return

Next, we examine the relationship between fee income and non-deposit funding shares on the one hand and bank risk and return, on the other. To start with, Table 5 reports the results of regression with return on assets as the dependent variable. Regression 1 includes fee income share, in addition to a range of bank level and macroeconomic controls, including controls for bank ownership. The fee income share obtains a positive coefficient of 0.038 that is statistically significant. This implies that banks with focus on generating fee income tend to exhibit higher profitability. Besides the statistical significance, the economic magnitude of the coefficient is important as well: a one standard deviation rise in fee incomes raised return on asset by 0.2 standard deviation. Among the controls, *size* and *equity* are positive, whereas *CIR* is negative. All of these are statistically significant at the 0.05 percent or lower. This would indicate that big, well-capitalized and cost efficient banks tend to be more profitable. The ownership dummies indicate that profitability of all bank groups is higher as compared to old private banks.

Regression 2 relates RoA to the non-deposit funding share and other controls, as earlier. The variable is estimated to have a negative but insignificant impact on bank profits. The sign and significance of control variables are the same as earlier.

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Table 5. Determinants of Return on Asset

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	-0.002	-0.004	-0.002	-0.001	-0.017	-0.062
	(0.008)	(0.009)	(0.008)	(0.009)	(0.007)***	(0.023)***
Size	0.003	0.004	0.003	0.003	0.003	0.003
	(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.001)***	(0.001)***
Equity/Asset	0.037	0.045	0.036	0.036	0.035	0.037
	(0.016)**	(0.017)***	(0.015)***	(0.015)**	(0.015)**	(0.015)***
Asset growth	0.0002	0.0007	0.0005	0.0005	0.0005	0.0005
	(0.0004)	(0.0004)	(0.0004)	(0.0006)	(0.0005)	(0.0005)
CIR	-0.023	-0.024	-0.023	-0.023	-0.023	-0.024
	(0.008)***	(0.007)***	(0.008)***	(0.008)***	(0.008)***	(0.007)***
Fee income	0.038		0.043	0.029	0.034	0.040
	(0.020)*		(0.021)**	(0.036)	(0.035)	(0.039)
NDF		-0.005	-0.012	-0.009	-0.011	-0.013
		(0.005)	(0.006)**	(0.016)	(0.016)	(0.015)
Squared fee income				0.031	0.025	0.022
				(0.049)	(0.049)	(0.052)
Squared NDF				-0.003	-0.002	0.0007
				(0.026)	(0.026)	(0.024)
Foreign					0.189	
					(0.113)*	
Concentration						-0.133
						(0.035)***
dy_GDPGR	0.0003	0.0002	0.0003	0.0002	0.002	0.001
	(0.0008)	(0.0007)	(0.0008)	(0.0009)	(0.0009)*	(0.001)
dy_Interest	0.0008	0.0009	0.0009	0.001	0.002	-0.0003
	(0.0008)	(0.0005)*	(0.0008)	(0.0008)	(0.002)	(0.0009)
dy_SOB	0.002	0.004	0.003	0.003	0.003	0.003
	(0.001)**	(0.001)***	(0.001)**	(0.001)**	(0.001)**	(0.001)***
dy_NPB	0.003	0.003	0.003	0.003	0.003	0.004
	(0.001)**	(0.001)**	(0.001)**	(0.002)*	(0.002)*	(0.002)**
dy_FB	0.004	0.001	0.002	0.002	0.002	0.003
	(0.002)**	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)
dy_merger	0.001	0.001	0.002	0.001	0.001	0.002
	(0.004)	(0.004)	(0.004)	(0.004)	(0.003)	(0.004)
Time period	1996-2007	1996-2007	1996-2007	1996-2007	1996-2007	1996-2007
N.Obs, banks	779; 66	779; 66	779; 66	779; 66	779; 66	779; 66
R-squared	0.258	0.230	0.266	0.267	0.269	0.277
Clustering level	Bank	Bank	Bank	Bank	Bank	Bank

Standard errors within brackets

***, ** and * denote statistical significance at 1, 5 and 10%, respectively

The specification in regression 3 includes both fee income and non-deposit funding shares in the regressions. While fee income retains its positive and significant sign, non-deposit funding has an observed negative coefficient with a point estimate equal to -0.012; in other words, a 10 percent rise in non-deposit funding lowers bank profitability by roughly 0.1 percent. This indicates that notwithstanding the higher profitability of banks from fee income, greater reliance on non-deposit funding dampens profitability. This implies that a change in the funding mix towards relatively costly market funding raises the overall cost of funds, putting pressure on their profitability. This concurs with evidence proffered in the Indian context which suggests that reliance on non-deposit funding may raise costs for banks by making them rely on more expensive funding.

To account for possible non-linearities in the estimation, regression 4 includes linear as well as quadratic terms for both the fee income and non-deposit funding variables. Post inclusion of these variables, both the linear as well as the quadratic terms lose their statistical significance, suggesting that the relation between profitability and fee income on the one hand, and between profitability and non-deposit funding on the other, do not have any non-linearity.

Models 5 and 6 sequentially include the banking industry variables, as earlier. It appears that higher presence of foreign banks improves profitability by compelling domestic banks to explore alternate ways of improving bottomlines. Higher competition, as expected, dampens bank profits.

The regressions control for the macroeconomic environment, including GDP growth and real interest rates. Whenever significant, these exhibits expected signs. Thus, profitability is higher in a boom as also under a high interest rate regime.

Table 6. Determinants of Z-score

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	-0.0006 (0.030)	-0.002 (0.029)	-0.0008 (0.030)	0.001 (0.029)	-0.043 (0.036)	-0.098 (0.054)*
Size	0.012 (0.005)***	0.013 (0.005)***	0.012 (0.005)***	0.012 (0.005)**	0.012 (0.005)***	0.013 (0.005)***
Equity/Asset	0.055 (0.031)*	0.060 (0.031)**	0.054 (0.033)	0.056 (0.034)*	0.054 (0.034)	0.058 (0.035)*
Asset growth	-0.003 (0.0009)***	-0.003 (0.0009)***	-0.003 (0.0009)***	-0.003 (0.0009)***	-0.003 (0.001)***	-0.003 (0.001)***
CIR	-0.039 (0.007)***	-0.040 (0.007)***	-0.038 (0.007)***	-0.039 (0.007)***	-0.039 (0.007)***	-0.041 (0.008)***
Fee income	0.033 (0.023)		0.038 (0.024)	0.010 (0.048)	0.028 (0.049)	0.033 (0.049)
NDF		-0.005 (0.017)	-0.012 (0.016)	0.007 (0.043)	0.002 (0.041)	-0.002 (0.041)
Squared fee income				0.062 (0.080)	0.039 (0.083)	0.040 (0.081)
Squared NDF				-0.029 (0.050)	-0.023 (0.043)	-0.019 (0.048)
Foreign					0.543 (0.176)***	
Concentration						0.217 (0.077)***
dy_GDPGR	0.003 (0.001)***	0.002 (0.001)**	0.003 (0.001)***	0.002 (0.001)**	0.006 (0.002)***	0.004 (0.001)***
dy_Interest	0.005 (0.001)***	0.005 (0.001)***	0.005 (0.002)***	0.005 (0.001)***	0.007 (0.002)***	0.003 (0.001)**
dy_SOB	-0.011 (0.007)	-0.012 (0.008)	-0.012 (0.007)	-0.011 (0.007)	-0.012 (0.007)	-0.012 (0.008)
dy_NPB	-0.049 (0.007)***	-0.049 (0.007)***	-0.049 (0.007)***	-0.049 (0.007)***	-0.050 (0.007)***	-0.051 (0.007)***
dy_FB	-0.032 (0.008)***	-0.029 (0.008)***	-0.030 (0.009)***	-0.032 (0.009)***	-0.032 (0.009)***	-0.032 (0.009)***
dy_merger	0.014 (0.011)	0.014 (0.012)	0.015 (0.011)	0.014 (0.011)	0.014 (0.012)	0.014 (0.012)
Time period	1996-2007	1996-2007	1996-2007	1996-2007	1996-2007	1996-2007
N.Obs, banks	701; 59	701; 59	701; 59	701; 59	701; 59	701; 59
R-squared	0.346	0.342	0.348	0.349	0.355	0.356
Clustering level	Bank	Bank	Bank	Bank	Bank	Bank

Standard errors within brackets

***, ** and * denote statistical significance at 1, 5 and 10%, respectively

The Z-score regressions in Table 6 are similar to those obtained under the profitability regressions. Specifically, big, cost efficient and capitalized banks have higher Z-scores (low insolvency risk). Unlike the findings related to bank return however, fast-growing banks are found to display lower Z-score. Unbridled expansion of the loan book to fund asset expansion comes could manifest itself in high delinquent loans at a future date, with adverse implications for bank solvency. This is consistent with cross-country evidence which suggests that high credit growth could act as a potential harbinger for financial stability (Demirguc-Kunt and Detragiache, 1998; Borio and Lowe, 2002; Cottarelli *et al.*, 2005).

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In regressions (1) and (2), the coefficients on *fee income* and *non-deposit funding* are not statistically significant. Allowing for non-linearity in Models (3) and (4) does not alter the results. Thus, it appears that while banks income and funding strategy impacts its return, its influence on bank risk is limited. Examining bank risk by ownership, the results indicate that risk varies across ownership. More specifically, foreign and *de novo* private banks appear to exhibit lower risk.

Table 7. Determinants of Z-score: Disaggregated into trading and non-trading income

Variable	(1)	(2)	(3)	(4)	(5)	(6)
	Dep. Var = Return on Asset			Dep. Var = Z - score		
Intercept	-0.002 (0.007)	-0.003 (0.009)	-0.002 (0.008)	-0.001 (0.030)	-0.0001 (0.029)	0.007 (0.029)
Size	0.003 (0.001)***	0.003 (0.001)***	0.002 (0.001)***	0.013 (0.005)**	0.012 (0.005)***	0.012 (0.005)***
Equity/Asset	0.045 (0.017)***	0.042 (0.016)***	0.037 (0.016)**	0.063 (0.031)**	0.054 (0.030)*	0.052 (0.031)*
Asset growth	0.0003 (0.0004)	0.0005 (0.0003)	0.0002 (0.0004)	-0.003 (0.0008)***	-0.003 (0.0009)***	-0.003 (0.0009)***
CIR	-0.023 (0.008)***	-0.025 (0.008)***	-0.023 (0.008)***	-0.039 (0.007)***	-0.043 (0.007)***	-0.042 (0.008)***
Trading income	0.034 (0.024)		0.039 (0.026)	0.009 (0.003)		0.015 (0.031)
Non-trading, non-int. income		0.031 (0.013)**	0.038 (0.017)**		0.058 (0.039)	0.059 (0.039)
dy_GDPGR	0.0006 (0.0009)	0.0006 (0.0007)	0.0003 (0.0009)	0.002 (0.001)**	0.001 (0.001)*	0.002 (0.001)*
dy_Interest	0.0006 (0.0009)	0.001 (0.0008)	0.0008 (0.0009)	0.005 (0.001)***	0.005 (0.002)***	0.005 (0.001)***
dy_SOB	0.003 (0.001)***	0.003 (0.001)***	0.002 (0.001)**	-0.012 (0.008)	-0.012 (0.007)	-0.011 (0.007)
dy_NPB	0.002 (0.001)**	0.003 (0.001)***	0.003 (0.001)**	-0.049 (0.007)***	-0.050 (0.007)***	-0.050 (0.007)***
dy_FB	0.002 (0.001)*	0.003 (0.002)	0.004 (0.002)**	-0.031 (0.008)***	-0.033 (0.009)***	-0.033 (0.009)***
dy_merger	0.001 (0.004)	0.001 (0.004)	0.001 (0.004)	0.014 (0.012)	0.014 (0.011)	0.015 (0.012)
Time period	1996-2007	1996-2007	1996-2007	1996-2007	1996-2007	1996-2007
N.Obs, banks	779; 66	779; 66	779; 66	701; 59	701; 59	701; 59
R-squared	0.246	0.237	0.259	0.341	0.349	0.350
Clustering level	Bank	Bank	Bank	Bank	Bank	Bank

Standard errors within brackets
***, ** and * denote statistical significance at 1, 5 and 10%, respectively

It is interesting in this context to decompose the fee income variable into a trading income and a non-trading, non-interest income part (both variables defined as shares to total income). This seems relevant, since the share of trading income, especially for state-owned banks, has risen substantially over the past few years, on the back of significant gains on their investment portfolio, aided by a soft interest rate regime. For other bank groups, especially new private and foreign banks, non-trading, non-interest income has also been a noteworthy contributor, since many of them are active players in the foreign exchange market.

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The first three models of Table 7 report regressions of the bank rate of return that include a trading income variable, a non-trading, non-interest income variable and these two variables together, respectively. The remaining three models conduct similar regression with bank risk as the dependent variable.

In models (2) and (3), the non-trading, non-interest income variable enters with a positive coefficient: non-trading, non-interest income appears to increase bank rate of return. In Model (3) for instance, the point estimate of the coefficient equals 0.038, which shows that a 10 percent rise in non-trading, non-interest income raises return on assets by around 0.4 percent. No discernible impact of trading income on bank profitability is in evidence.

On the other hand, there appears to be no perceptible impact of banks' income profile on bank risk; neither the trading income nor the non-trading, non-interest variable are significant in any of the remaining regressions.

We conclude the section by focusing specifically on state-owned banks (SOBs), which account for the majority of banking system assets. Apart from the standard variables as earlier, we explore the impact of privatization on these banks' risk and returns. To avoid possible endogeneity issues, the privatization variable is included with a lag. The privatization variable is insignificant across all models: there is no appreciable difference in bank risk and returns of privatized banks. Table 8 reports the findings.

In Model (2), non-deposit funding bears a negative and significant coefficient. This concurs with our earlier observation that SOBs with greater reliance on non-deposit funding tend to be less profitable. When both the variables are included as in Model (3), association with non-deposit funding is much stronger, indicating that it is non-deposit funding that overwhelms fee incomes in impacting bank returns. In Model (4) which allows for non-linearities, non-deposit funding loses its significance. The linear fee income share variable obtains a negative coefficient of -0.055 that is significant at the 0.05 level, and a positive quadratic coefficient of 0.183 that is significant at the 0.01 level.

Table 8. Bank return and risk: State-owned banks

Variable	Dep var = RoA				Dep. var = Z-score			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Intercept	0.030 (0.004)***	0.030 (0.005)***	0.032 (0.006)***	0.032 (0.005)***	-0.039 (0.076)	-0.055 (0.075)	-0.053 (0.072)	-0.062 (0.083)
Size	-0.001 (0.0006)	-0.001 (0.0006)	-0.0001 (0.0009)	-0.0006 (0.0007)	0.017 (0.012)	0.018 (0.012)	0.018 (0.012)	0.019 (0.012)
Equity/Asset	0.002 (0.014)	0.002 (0.014)	0.001 (0.014)	0.0006 (0.013)	0.200 (0.139)	0.221 (0.138)	0.222 (0.141)	0.221 (0.143)
Asset growth	-0.0002 (0.0002)	0.0001 (0.0002)	0.0007 (0.0002)**	0.0003 (0.0002)	-0.034 (0.021)	-0.034 (0.021)	-0.035 (0.020)*	-0.034 (0.021)
CIR	-0.030 (0.003)***	-0.030 (0.002)***	-0.039 (0.005)***	-0.029 (0.003)***	-0.060 (0.025)**	-0.057 (0.020)***	-0.058 (0.024)**	-0.057 (0.023)**
Fee income	0.0002 (0.006)		-0.009 (0.008)	-0.055 (0.021)**	0.015 (0.054)		-0.007 (0.058)	-0.107 (0.251)
NDF		-0.005 (0.002)*	-0.011 (0.005)**	0.004 (0.011)		0.197 (0.122)	0.199 (0.125)	0.419 (0.347)
Squared fee income				0.183 (0.063)***				0.338 (0.762)
Squared NDF				-0.015 (0.015)				-0.201 (0.307)
Lag (Pvt ownership)	0.0006 (0.002)	0.0007 (0.002)	0.0008 (0.002)	0.0004 (0.002)	0.027 (0.033)	0.024 (0.033)	0.023 (0.034)	0.024 (0.034)
dy_GDPGR	-0.0008 (0.003)	-0.0003 (0.003)	-0.002 (0.0006)***	-0.0002 (0.0004)	-0.0008 (0.003)	-0.002 (0.003)	-0.002 (0.003)	-0.003 (0.003)
dy_Interest	0.001 (0.0003)***	0.001 (0.0004)***	0.0001 (0.0003)	0.001 (0.0004)***	0.008 (0.003)**	0.007 (0.002)**	0.007 (0.003)**	0.008 (0.002)***
dy_merger	0.0003 (0.0009)	0.0007 (0.0008)	0.0009 (0.0009)	0.001 (0.0009)	0.018 (0.016)	0.022 (0.016)	0.022 (0.017)	0.021 (0.017)
Time period	1996-2007	1996-2007	1996-2007	1996-2007	1996-207	1996-2007	1996-2007	1996-2007
N.Obs, banks	308; 28	308; 28	308; 28	308; 28	297; 28	297; 28	297; 28	297; 28
R-squared	0.709	0.711	0.643	0.718	0.272	0.294	0.294	0.298
Clustering level	Bank	Bank	Bank	Bank	Bank	Bank	Bank	Bank

Standard errors within brackets

***, ** and * denote statistical significance at 1, 5 and 10%, respectively

What this suggests is that that an increase in fee income depresses the return on assets to begin with since banks have to incur substantial operating costs in the quest for such incomes, but once fee incomes exceeds a threshold, return on assets trend upwards, presumably as the benefits exceeds the costs. The inflection point in the relationship is computed to be 0.15, so that

fee income share in excess of 15 percent provides banks with higher returns.[4] Qualitatively, these results suggest that for SOBs in particular, there is an inverted U-shaped relationship between bank profits and fee incomes. The remaining control variables are unaltered in sign and significance.

In Models (5) to (8), there is no noticeable relationship between fee income and bank risk on the one hand, and between bank risk and non-deposit funding, on the other. Thus, while fee income and to a lesser extent, non-deposit funding exerts an impact on bank returns, their impact on bank risk is much less so.

4.3 Dealing with endogeneity

One possible concern is endogeneity. Since bank risk and returns may cause fee income share and non-deposit funding share to change, this would entail possible causality between these variables. To rectify this deficiency, we include lagged fee income and non-deposit funding shares, instead of the contemporaneous values of these variables. The revised regressions are presented in Table 9.

The results with respect of the control variables are similar to those obtained earlier (See Tables 5 and 6). In the RoA equation however, non-deposit funding enters with a negative sign, indicating that greater reliance on market funding depresses profits.

With Z-score as the dependent variable, the results broadly mirror earlier findings. Big, well-capitalized and cost efficient banks with moderate asset growth are the ones which exhibit lower risk, see models (5) to (8) of Table 10. When non-linearities are allowed for, the linear terms for both fee income and non-deposit funding are not significant, whereas the quadratic terms are significant in both cases. Thus, while fee income and non-deposit funding *per se* do not appear to affect bank riskiness, beyond a threshold however, their impact on bank risk gets pronounced. In case of non-deposit funding share for instance, the threshold is computed as 0.22. In other words, once the share of non-deposit funding exceeds this threshold, it exerts an adverse effect on bank risk.

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[4]The inflection point is computed as the derivative of *RoA* with respect to *fee income*. The other reported inflection points are computed in a similar manner.

Table 9. Bank return and risk: Dealing with endogeneity

Variable	Dep var = RoA				Dep. var = Z-score			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Intercept	-0.007 (0.009)	-0.007 (0.009)	0.009 (0.009)	-0.011 (0.010)	0.0004 (0.031)	-0.0002 (0.031)	-0.0004 (0.032)	0.007 (0.032)
Size	0.003 (0.001)***	0.004 (0.001)***	0.004 (0.001)***	0.003 (0.001)***	0.012 (0.005)***	0.013 (0.005)***	0.012 (0.005)***	0.011 (0.005)*
Equity/Asset	0.046 (0.020)***	0.052 (0.017)***	0.047 (0.017)***	0.046 (0.017)***	0.050 (0.026)**	0.055 (0.028)*	0.053 (0.028)*	0.060 (0.028)*
Asset growth	0.0001 (0.0004)	0.0005 (0.0004)	0.0002 (0.0004)	0.0002 (0.0003)	-0.005 (0.001)***	-0.004 (0.001)***	-0.004 (0.001)***	-0.005 (0.001)***
CIR	-0.021 (0.008)***	-0.022 (0.007)***	-0.021 (0.008)***	-0.020 (0.008)***	-0.041 (0.008)***	-0.042 (0.008)***	-0.041 (0.008)***	-0.043 (0.009)***
Lag (fee income)	0.027 (0.015)*		0.035 (0.018)*	0.060 (0.041)	0.031 (0.026)		0.050 (0.024)**	0.001 (0.045)
Lag (NDF)		-0.013 (0.007)*	-0.018 (0.009)*	-0.024 (0.029)		-0.009 (0.017)	-0.019 (0.017)	0.040 (0.037)
Lag (Squared fee income)				-0.057 (0.056)				0.114 (0.069)*
Lag (Squared NDF)				0.010 (0.038)				-0.090 (0.045)*
dy_GDPGR	-0.0005 (0.0007)	0.0003 (0.0007)	-0.0001 (0.0007)	-0.0006 (0.0007)	0.001 (0.001)	0.002 (0.002)	0.0009 (0.002)	-0.003 (0.003)
dy_Interest	0.002 (0.0005)***	0.001 (0.0007)*	0.002 (0.0005)***	0.002 (0.0005)***	0.005 (0.002)**	0.004 (0.001)**	0.006 (0.002)**	0.008 (0.002)***
dy_SOB	-0.002 (0.001)**	-0.004 (0.001)***	-0.002 (0.001)**	-0.003 (0.001)**	-0..011 (0.008)	-0.013 (0.008)	-0.012 (0.008)	-0.011 (0.008)
dy_NPB	-0.003 (0.001)***	-0.003 (0.001)**	-0.003 (0.001)**	-0.003 (0.001)**	-0.051 (0.007)***	-0.051 (0.007)***	-0.051 (0.007)***	-0.053 (0.008)***
dy_FB	-0.003 (0.002)*	0.0005 (0.002)	-0.001 (0.001)	-0.0006 (0003)	-0.032 (0.008)***	-0.028 (0.009)***	-0.029 (0.009)***	-0.035 (0.009)***
dy_merger	0.002 (0.004)	0.002 (0.004)	0.002 (0.004)	0.003 (0.004)	0.018 (0.012)	0.017 (0.012)	0.018 (0.012)	0.018 (0.012)
Time period	1996-2007	1996-2007	1996-2007	1996-2007	1996-207	1996-2007	1996-2007	1996-2007
N.Obs, banks	716; 66	716; 66	716; 66	716; 66	642; 59	642; 59	642; 59	642; 59
R-squared	0.219	0.216	0.238	0.241	0.353	0.347	0.357	0.365
Clustering level	Bank	Bank	Bank	Bank	Bank	Bank	Bank	Bank

Standard errors within brackets
***, ** and * denote statistical significance at 1, 5 and 10%, respectively

Summing up, the findings indicate that larger, fast growing financial firms tend to have higher fee income shares. In addition, banks with greater reliance on fee income generating activities exhibit higher profitability. On the contrary, the impact of non-deposit funding share on bank profitability is weak. In terms of bank riskiness, the evidence is consistent with the conjecture that big, cost efficient and capitalized banks are less risky. The results are summarized in Table 10.

Table 10: Summary of empirical findings

Variable	Impact on banks'			
	Activity	Funding mix	Risk	Returns
Size	+	..	+	+
Capital	+	..	+	+
Asset growth	+	+	-	..
Efficiency	-	..	-	-
Activity			..	+
Funding mix			..	..
Ownership				
State-owned	-	..	..	+
New private	..	..	-	+
Foreign	+	+	-	+

".." no discernible impact

5.- Concluding remarks

The recent global meltdown has witnessed the demise of leading banks across several developed and emerging markets. One prime suspect of such bank failures has been their funding strategy. In particular, banks that encountered financial distress were the ones that relied more heavily on non-deposit resources to fund asset expansion. These observations led us to examine this aspect in a comprehensive manner, using India as a case study. Accordingly, we use a cross-section of banks during 1996-2007 spanning across ownership categories to explore this issue.

The findings indicate that larger, fast growing financial firms tend to have higher fee income shares. On the whole, controlling for everything else, fee-generating activities appear to be associated with greater equity. The status of fee income by bank ownership suggests that foreign banks exhibit greater reliance on fee income.

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Investigating the micro level factors impacting bank returns, the analysis appears to suggest that banks with greater reliance on fee income generating activities exhibit higher profitability. On the contrary, the impact of non-deposit funding share on bank profitability is weak. As well, the evidence does not support the existence of possible non-linearities in the association between bank profitability and fee incomes, on the one hand and between profitability and non-deposit funding, on the other.

Coming to bank risk, the evidence is consistent with the conjecture that big, cost efficient and capitalized banks have are less risky. Unbridled expansion of the loan book to fund asset growth appears to have implications for bank risk profiles. As in case of bank profitability, there is limited evidence on any non-linear relationship between risk and fee incomes as also between risk and non-deposit funding share. In terms of bank risk by bank ownership, the analysis supports the fact that foreign and *de novo* private banks exhibit lower risk.

Focusing on SOBs in particular, while there is little evidence to support the fact that partially privatized banks exhibit higher risk or returns, the findings suggest that SOBs with greater reliance on non-deposit funding tend to be less profitable. When non-linearities in the relationship are allowed for, the analysis suggests that initially, increases in fee incomes depresses their profitability, but beyond a threshold, the revenues accruing from such activities overwhelms the costs, improving profits.

The findings have important ramifications for policy. For one, it appears that traditional banks – with a reliance on non-deposit funding - are relatively safe as compared to those with have a high proportion of market resources in their funding strategy. Illustratively, countries (Germany, Italy, UK, Spain, Iceland, Ireland, Switzerland) and banks (Northern Rock and Bradford and Bingley in the UK, Fortisbank of Belgium[5], UBS and *Credit Suisse* of Switzerland) with overt reliance on wholesale funding seem to have been hit hardest by the recent crisis. Therefore, in conjunction with other monetary and prudential ratios, the banks' funding mix can also provide important signals to policy makers regarding their health and viability. Second, uncontrolled expansion of the loan book in the quest for garnering market share could be a recipe for future problems. Across countries, over-stretched financial systems and "search for yields" has been found to lead to riskier banking systems, leading commentators to seek for imposition of "speed limits" (Honohan, 1997), either on their loan book or on segments that appear in danger of over-extension. In the Indian case, for example, in response to perceptible change in credit expansion, the risk weight on certain credit categories and exposures were temporarily increased. Similar measures to moderate growth in certain segments of the financial sector were also

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[5] Renamed as BNP Paribas Fortis after its merger with BNP Paribas in May 2009

undertaken in several other countries such as Korea (credit card business), Indonesia (housing loans), Estonia (residential property), Portugal (housing loans) and Romania (consumer and mortgage loans). Third, and as a corollary of the previous point is the issue of pro-cyclicality in bank lending. Presumably as a regulatory response, several countries have imposed risk weights on standard loans - a *de facto* general provision – as a rudiment of a forward looking system (See, for instance, World Bank, 2002). Others, most notably Spain (Poveda, 2000) and more recently, Peru (Breuer *et al.* 2009) have introduced a system of dynamic provisioning. Contextually, Flannery (2005) has proposed a "contingent capital" arrangement, which can be contracted in good times when the economy is in an upswing, and are therefore relatively cheap (compared to raising new capital in the midst of a recession) and thereby, easier to enforce (See also, Rajan, 2009a, b). As well, standard-setting bodies and international organizations (Basel Committee, 2008; Demirguc Kunt and Serven, 2009) as also the academia (Goodhart and Persaud, 2008; Griffith Jones and Persaud, 2008) have been exploring several possible alternatives, which are still being discussed and debated and importantly, are yet to be tested in a crisis. Fourth, while the literature provides ample evidence that ownership matters for bank profitability, there is little by way of research to suggest whether ownership affects for bank income mix and funding strategy or for that matter, for bank risk. Judged thus, the evidence proffered in the paper provides insights of the importance of ownership for bank funding strategy. Bank groups which show signs of greater reliance on market funding mixes could be potential candidates for close scrutiny. Finally, the analysis emphasizes the role of prudent liquidity management for a sound bank balance sheet. At the macro level, theoretical research has veered around towards making an explicit distinction between *funding liquidity* – ability to meet cash obligations when due – and *market liquidity* – ability of financial investors to literally liquidate a non-cash asset. These two liquidity risks are mutually reinforcing: shocks to funding liquidity can lead to asset sales and depress asset prices, with dire consequences for market liquidity. The loop is established when lower market liquidity leads to higher margin calls (margins are typically higher in an illiquid market), which increases funding liquidity risk as outflows rise. A downward spiral begins as a new round of asset sales is triggered off so that banks can remain liquid, leading to *liquidity spirals* (Brunnermeier and Pedersen, 2009).[6] The authors document significant episodes – the "Black Monday" of 1987, the Asian crisis of 1997, the LTCM crisis in 1998 and more recently, the subprime crisis – when weaknesses in one fed into the other, leading to an overall worsening of liquidity for both institutions and markets.

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[6] For example, holding a liquid instrument may be of little value in an emergency situation if suddenly, no trading partner willing to buy the supposedly liquid asset at a reasonable price can be found in the market.

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The world over, there is a growing trend towards universal banking, so that banks are relying on a combination of deposit and non-deposit funding to finance their asset book. While such a strategy could entail substantial benefits to the bank in terms of scale and scope economies, the results suggest that there are limits as to how far can banks veer away from traditional banking models, especially if there are to conduct their business in a safe, sound and cost-efficient manner.

References

Adrian, T. and H. S. Shin (2009). Money, liquidity and monetary policy. *American Economic Review* 99, 600-05.

Basel Committee on Banking Supervision (2008). *Principles for Sound Liquidity Risk Management and Supervision*. BIS: Basel.

Berger, A.N., L. F. Klapper, M. Soledad Martinez Peria and R. Zaidi (2008). Bank ownership type and banking relationships. *Journal of Financial Intermediation* 17, 37-62.

Berlin, M., and L. Mester (1999). Deposits and relationship lending. *Review of Financial Studies* 12, 579-607.

Bonin, J.P., I. Hasan and P. Watchel (2005). Privatization matters: Bank efficiency in transition economies. *Journal of Banking and Finance* 29, 2155-78.

Borio, C., and P. Lowe (2002). Asset prices, financial and monetary stability: Exploring the nexus. BIS Working Paper No.114. BIS: Basel.

Boubakri, N., J. Cosset, K. Fischer and O. Guedhami (2005). Privatization and bank performance in developing countries. *Journal of Banking and Finance* 29, 2015-41.

Breuer, L., G. Gasha and J. Peschiera (2009). Credit growth: Anatomy and policy responses. In *Peru: Selected Issues*. IMF: Washington DC.

Brunnermier, M., and L. Pedersen (2009). Market liquidity and funding liquidity. *Review of Financial Studies* 22, 2201-38.

Calomiris, C. (1999). Building an incentive-compatible safety net. *Journal of Banking and Finance* 23, 1499-1519.

Calomiris, C., and A. Powell (2001). Can emerging market regulators establish credible discipline? The case of Argentina 1992-99. In F. Mishkin (Ed.) *Prudential Supervision: What Works and What Doesn't.* Chicago IL: University of Chicago Press.

Chairlone, S., and S. Ghosh (2009). India. In P. Bongini, S.Chairlone, G.Ferri (Eds.) *Emerging Banking Systems.* Palgrave McMillan, UK.

Cornett, M., J. McNutt, P. Strahan and H. Tehranian (2010). Liquidity risk management and credit supply in the financial crisis. Boston College (manuscript).

Cottarelli, C., G. Dell'Ariccia and L. Vladkova-Hollar (2005). Early birds, late risers and sleeping beauties: Bank credit growth to private sector in Central and Eastern Europe and in the Balkans. *Journal of Banking and Finance* 29, 83-104.

Das, A., and S. Ghosh (2006). Financial deregulation and efficiency: An empirical analysis of Indian banks during the post reform period. *Review of Financial Economics* 15, 193-221.

Das, A., and S. Ghosh (2009). Financial deregulation and profit efficiency: A nonparametric analysis of Indian banks. *Journal of Economics and Business* 61, 509-28.

De Nicolo, G. (2000). Size, charter value and risk in banking: An international perspective. IFC Discussion Paper No.689. Board of Governors of the Federal Reserve: Washington DC.

Demirguc Kunt, A and E. Detragiache (1998). Financial liberalization and financial fragility. In G. Caprio, P. Honohan and J.E.Stiglitz (Eds.) *Financial Liberalization: How far, how fast?* Cambridge University Press.

Demirguc-Kunt, A., and L. Serven (2009). Are all the sacred cows dead? Implications of the financial crisis for macro and financial policies. World Bank Policy Research Working Paper No. 4807. World Bank: Washington DC.

Diamond, D. (1991). Monitoring and reputation: The choice between bank loans and directly placed debt. *Journal of Political Economy* 88, 689-721.

Dinc, I.S. (2005). Politicians and banks: Political influences on government-owned banks in emerging markets. *Journal of Financial Economics* 77, 453-79.

Edwards, F. ,and F. Mishkin (1995). The decline of traditional banking: Implications for financial stability and regulatory policy. FRB New York Economic Policy Review (July), 27-45.

European Central Bank (2008a). *EU banking structures 2008.* ECB: Frankfurt.

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European Central Bank (2008b). *Financial Stability Review* (December). ECB: Frankfurt.

Fama, E.F. (1985). What's different about banks? *Journal of Monetary Economics* 15, 29-39.

Flannery, M.J. (2005). No pain, no gain: Effecting market discipline *via* reverse convertible debentures. In H.S. Scott (Ed.) *Capital Adequacy beyond Basel: Banking Securities and Insurance*. Oxford: Oxford University Press.

Furlong, F., and S.Kwan (2005). Market-to-book, charter value and bank risk-taking: A recent perspective. Paper presented at the Basel Committee Research Task Force Conference. Vienna, April 2005.

Goodhart, C. A.E., and A.Persaud (20080. How to avoid the next crash? *Financial Times* (January 30).

Goodhart, C.A.E. (2009). The regulatory response to the financial crisis. *Journal of Financial Stability* (forthcoming).

Griffith-Jones, S. and A. Persaud (2008). *The Procyclical Impact of Basel II on Emerging Markets and its Political Economy*. New York: Oxford University Press.

Honohan, P (1997). Banking system failures in developing and transition countries: Diagnosis and predictions. BIS Working Paper No.39, BIS: Basel.

Jensen, M. and W. Meckling (1976). Theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal of Financial Economics* 3, 305-60.

Kashyap, A.K., R.G. Rajan and J.C. Stein (2002). Banks as liquidity providers: An explanation for the coexistence of lending and deposit-taking. *Journal of Finance* 57, 3307-33.

Laeven, L. and R. Levine (2007). Is there a diversification discount in financial conglomerates? *Journal of Financial Economics* 85, 331-67.

Laeven, L., and R. Levine (2009). Bank governance, regulation and bank risk-taking. *Journal of Financial Economics* (forthcoming).

Lins, K., and H. Servaes (1999). International evidence on the value of corporate diversification. *Journal of Finance* 54, 2215-40.

Megginson, W., and J. Netter (2001). From state to market: A survey of empirical studies on privatization. *Journal of Economic Literature* 39, 321–89.

Megginson, W.L. (2005). The economics of bank privatization. *Journal of Banking and Finance* 29, 1931-80.

Mercieca, S., K.Schaeck and S.Wolfe (2007). Small European banks: Benefits from diversification? *Journal of Banking and Finance* 31, 1975-98.

Mester, L., L. Nakamura and M. Renault (2005). Checking accounts and bank monitoring. Working Paper No.14, Federal Reserve Bank of Philadephia.

Petersen, M., and R.G.Rajan (1994). The benefits of lender relationships: Evidence from small business data. *Journal of Finance* 49, 3-37.

Petersen, M., and R.G.Rajan (1995). The effect of credit market competition on lending relationships. *Quarterly Journal of Economics* 110, 407-44.

Poveda, R. (2000). Reform of the system of insolvency provisions. Address delivered at the APD in Madrid (January). Available at <www. bse.es>

Raddatz, C. (2010). When the rivers run dry: Liquidity and the use of wholesale funds in the transmission of the US subprime crisis. World Bank Policy Research Working Paper No. 5203. The World Bank: Washington DC.

Rajan, R.G. (1992). Insiders and outsiders: The choice between informed and arms-length debt. *Journal of Finance* 47, 1367-1400.

Rajan, R.G. (2009a). Cycle-proof regulation. *The Economist (*April 8). The Economist: London.

Rajan, R.G. (2009b). The credit crisis and cycle free regulation. *Homer Jones Lecture delivered at the Federal Reserve Bank of St.Louis (*April 15). Available at <www.chicago. facultybooth.edu/raghuram.rajan>

32

Ratnovski, L and R. Huang (2009). Why are Canadian banks more resilient? IMF Working Paper No. 152. IMF: Washington DC.

Reserve Bank of India (2008). *Handbook of Statistics on the Indian Economy*. RBI: Mumbai.

Reserve Bank of India (2009). *India's Financial Sector: An Assessment* (Report of the Advisory Panel on Financial Stability Assessment and Stress Testing). RBI: Mumbai.

Reserve Bank of India. *Report on Currency and Finance 2006-07*. RBI: Mumbai.

Reserve Bank of India. *Report on Trend and Progress of Banking in India* (various years). RBI: Mumbai.

Reserve Bank of India. *Statistical Tables relating to Banks in India* (various years). RBI: Mumbai.

Sapienza, P. (2004). The effects of government ownership on bank lending. *Journal of Financial Economics* 72, 357-84.

Stein, J. C. (2002). Information production and capital allocation: Decentralized versus hierarchial firms. *Journal of Finance* 57, 1891-1921.

Stiroh, K. (2004). Diversification in banking: Is non-interest income the answer? *Journal of Money, Credit and Banking* 36, 853-82.

World Bank (2002). *Bank Loan Classification and Provisioning Practices in Selected Developed and Emerging Countries*. The World Bank: Washington DC.

Appendix

Variable	Description	Data source
Fee income	Non-interest income/ Total income	STB
Squared fee income	Squared (fee income)	STB
Non-deposit funding	Non-deposit funds (NDF)/(Deposits + non-deposit funds)	STB, Prowess
	where NDF = non-central bank borrowings + subordinated debt + amount raised through equity issue	
Squared fee income	Squared (non-deposit funding)	STB
Trading income	Income on investments/Total income	STB
Non-trading, non-interest income	(Total income – interest income – forex income – trading income)/Total income	
RoA	Net profit/Total bank asset	STB
CAR	Total bank equity/Total bank asset	STB
Z-score	Index of bank solvency constructed as (RoA+CAR)/Std.(RoA)	Computed based on STB
Size	Log(total bank asset)	STB
Asset growth	First difference of log(total bank asset)	
Cost income ratio	Operating expense/(Total income - interest expense)	Computed based on STB
Foreign	Total asset of foreign banks/Total banking assets	Computed based on STB
Concentration	Total deposits of top five (ranked in terms of assets) banks/ Total banking deposits	Computed based on STB
dy_GDP	Dummy=1 if real GDP growth in a given year exceeds the sample median, else zero	Computed based on HBS
dy_interest	Dummy=1 if real interest rate in a given year exceeds the sample median, else zero. The real interest rate is computed as : {[(1+nominal lending rate)/(1+WPI inflation)]-1}	Computed based on HBS
dy SOB	Unity if bank is state-owned, else zero	Computed based on RTP
dy NPB	Unity if bank is new private, else zero	Computed based on RTP
dy OPB	Unity if bank is old private, else zero	Computed based on RTP
dy_FB	Unity if bank is foreign, else zero	Computed based on RTP
dy_merger	Unity for the acquirer bank in the year of merger, else zero	Computed based on RTP and RCF

STB = Statistical Tables relating to Banks in India
HBS = Handbook of Statistics on Indian Economy
RTP = Report on Trend and Progress of Banking in India
RCF = Report on Currency and Finance
Prowess = Prowess database (CMIE)