Financial Inclusion and Financial Fragility: An Empirical Note

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1. Introduction

In recent years, policymakers and academia in both developed and emerging economies have focused their attention on increasing the outreach of formal finance (European Commission, 2008; Government of India, 2008; ADB, 2007; Kempson, 2006; HM Treasury, 2004). Countries have nationalized private banks, prescribed interest rate ceilings on credit to low-income households, established dedicated agencies for broad basing access to formal finance by low-income households and even enacted legislations defining the right of access to formal banking services. Some countries have also actively promoted reforms in the existing structure of credit delivery and extant institutional infrastructure (e.g., post offices) and even fostered community-based savings and credit societies.

This trend towards financial inclusion is part of a growing development towards expanding the role of formal finance in the economy. In a number of emerging economies in particular, financial inclusion is also part of a larger strategy of poverty alleviation by broadening the access to development finance. Although not entirely conclusive, the balance of evidence appears to support the fact that improved access to finance could be instrumental in lowering poverty. Empirical evidence finds a robust effect of finance on poverty reduction: countries with higher levels of financial development experience faster reduction in the share of 'poor' (living on less than $ 1 a day) population (Beck *et al.,* 2007a). Burgess and Pande (2005) uncover evidence that the redistributive nature of bank branch expansion strategy pursued by Indian authorities led to a faster decline in poverty especially in states with lower levels of initial financial development. Jayaratne and Strahan (1996) found that easing of restrictions on intra- and interstate branching accelerated annual growth rates in US states by 0.5-1 percentage point. Recent findings by Beck *et al.* (2007b) also suggest that bank branching deregulation is associated with a statistically significant reduction in income inequality.

This positive view of financial inclusion has been somewhat clouded by the increase in financial fragility experienced by both developed and emerging countries alike. In particular, banking sectors around the world have been confronted by a spate of problems, several of which have erupted into full blown systemic crisis (Laeven and Valencia, 2008).

The recent crisis in US subprime markets is a case in point. Policy makers have often endorsed marketing to subprime borrowers as a means of financial inclusion (Collard and Kempson, 2005). With hindsight, it seems clear that such over-extension of credit could have sown the seeds of financial fragility. Banks and financial institutions across the globe have been badly affected by the subprime meltdown, having experienced significant losses, forcing national governments to undertake drastic steps to restore confidence and stability in their financial systems (Fed, 2007; Bank of England, 2008). Banks have already written off nearly US $ 600 billion of non-performing loans alone (IMF, 2008); these losses are likely to mount once write-offs on securities, as also losses by non-banks, including insurance and pension institutions are taken into consideration.

The interconnect between financial inclusion and financial fragility has not yet been subjected to systematic empirical investigation. On the one hand, financial inclusion has been potential to engender financial fragility, as the subprime episode would testify. On the other hand, high levels of non-performing loans could lower the volume of lendable resources with banks and thereby, curtail the

Towards this end, the paper chooses India as a case study and investigates the interaction between financial inclusion and financial fragility, using data on state-owned banks for 1997-2007. Borrowing from the recent literature in this area (Beck *et al*., 2007c), it utilizes a consistent set of indicators of financial inclusion and explores their empirical association with financial fragility, after controlling for other factors influencing both sets of variables.

The analysis proceeds as follows. We outline the Indian experience with financial inclusion (Section 2) and the empirical strategy along with data and variables (Section 3). An analysis of the results is contained in Section 4. The final section concludes.

2. The Indian experience with financial inclusion

In the Indian case, the foundation for promoting greater financial access can be traced to the findings of the all-India Rural Credit Survey in the early 1950s. The findings of the Survey indicated that, out of the total borrowings of farmers in 1951-52 estimated at Rs. 7.5 billion, commercial banks provided less than 1%, while moneylenders provided 70%. The distribution of bank branches was also highly skewed, with nearly 38% of the bank branches being located in urban and metropolitan/port town locales in 1969. Even in terms of distribution of bank credit, the share of private corporate business exhibited an overwhelming increase, from 44% during 1957-61 to over 60% for the quinquiennum ending 1969 (See, Nachane *et al*., 2007).

These egalitarian features in the pattern of credit extension coupled with several other disquieting features culminated in the process of bank nationalization. The first phase of nationalization, beginning July 1969, led to the advent of 'social banking' where the State took control of the banking sector and made it a tool for promoting social objectives. A critical ingredient of this strategy entailed the imposition of the 1:4 license rule in 1977, wherein banks could open a branch in a location with one or more branches only if it had opened four in a location with no branches ('unbanked location'). Thus, over the period 1969-91, over 50,000 new bank branches were built, predominantly in rural areas. The outstanding deposits of these branches at Rs. 678 billion (US$ 35 billion) in March 1991 constituted 35% of their total deposits, while loans outstanding at Rs. 438 billion (US$ 22 billion) comprised two-fifths of outstanding credit.[1] As Burgess and Pande (2005) demonstrate, by improving access to cheap formal credit for the rural poor, this redistributive nature of branch expansion strategy made a significant dent on rural poverty.

The second phase of public policy towards promoting greater financial inclusion can be traced to the inception of financial sector reforms. Salient features of this period included higher allocation of credit to private sector, lower pre-emption by the government sector, graduating away from administered to market-determined interest rates both for commercial and government borrowing, increased competitiveness with entry of *de novo* private banks and liberal entry of foreign banks. The 'market discipline' wrought in through broad-basing the equity base of state-owned banks made them consciously focus on their bottomlines, contain delinquent loans, introduce better risk management practices and extend banking outreach through better adoption of information technology (Chairlone and Ghosh, 2009). Although priority sector lending norms exist, the norms have progressively been expanded to encompass increasing number of sectors and activities. In a sense, the period demonstrated that policies for inclusive banking coexist with encouraging strong and efficient financial institutions.

On a broader plane, the Indian central bank has adopted a two-pronged strategy to generate greater awareness and expand the reach of banking services – which can be termed as empowerment and protection (Mohan, 2006). As regards the former, financial inclusion is the first stage of the process. This has been buttressed by inculcating awareness among the masses about financial products through financial education. Concurrently, an advisory mechanism in the form of credit counseling has been encouraged to help distressed borrowers and bring them within the fold of formal finance. As regards protection, a Banking Codes and Standards Board of India (BCSBI) have been established recently to

[1] In 1991, US$1≈Rs. 19.6, which has been employed for purposes of computation.

ensure a comprehensive code of conduct for minimum standards of banking services to be offered by banks. In addition, a Banking Ombudsman Scheme has been instituted to redress deficiencies in customer service by banks.

3. Data and Research Design

We focus exclusively on banking outreach for two major reasons. First, in a majority of countries including India, the banking sector intermediates most of the funds in the economy: bank asset to GDP is well over 80%. Second, the disaggregated statistical information for this sector is easily obtainable as compared to other non-bank service providers.

Following from Beck *et al.* (2007c), we utilize the following four indicators:

(a) geographic inclusion: number of bank branches per 1000 sq. km
(b) demographic inclusion: number of bank branches per 100000 people
(c) Loan accounts per capita
(d) Loan-income ratio: average size of loans to per capita gross domestic product (GDP)

These indicators take on board the three major dimensions of an inclusive financial system: penetration, availability and usage. In particular, indicators (a) and (b) measure the *outreach* of the financial sector. More specifically, while geographic inclusion focuses on penetration, the latter considers the availability of banking services. These measures however, have limitations as indicators of access to physical banking outlets. More importantly, these measures implicitly assume a uniform distribution of bank outlets within a country's area and across its population. In reality, bank branches could be concentrated across population groups, delimiting its utility in certain cases. To overcome this drawback, indicators (c) and (d) measure the *use* of banking services. We focus exclusively on the credit side, since credit extension is one of the main services offered by banks which could be affected by banking fragility.

To measure financial fragility, we employ the ratio of non-performing loans to total bank loans (*NPL*). This was one of the measures utilized by Demirguc-Kunt and Detragiache (1998) in their cross-country analysis of the interlinkage between financial liberalization and financial fragility.

Table 1 presents the correlation coefficients of the endogenous variables. The correlation between loan-income ratio and the fragility measure is 74%. Since lower loan-income ratios are tantamount to greater use of banking services, this would suggest that greater use of banking services is associated with lower fragility. The raw correlations do not however, control for bank-specific or business cycle effects.

Table 1. Correlation matrix of the endogenous variables

Panel A	Geog inclusion	Fragility	**Panel B**	Demo Inclusion	Fragility
Geog. Inclusion	1.00		Demo. Inclusion	1.00	
Fragility	0.049	1.00	Fragility	0.087	1.00
	Loan a/c pc	Fragility		Loan/ Income	Fragility
Geog. Inclusion	1.00		Demo. Inclusion	1.00	
Fragility	0.006	1.00	Fragility	-0.742***	1.00

*** denotes statistical significance at 1%
See Table 2 for variable definitions

To explore this further, we employ multivariate regression analysis, while taking on board several bank-specific and macroeconomic factors expected to influence both fragility and inclusion. Following from the earlier discussion, the empirical framework comprises of estimating the following simultaneous equation system for bank *s* at time *t*:

$$Fragility_{st} = f_1(Inclusion_{st}; Size_{st}, CIR_{st}, Gr\_loan_{st}, CRAR_{st}, Merger_{st}, REG_t, dy\_GDP_t, dy\_RoI_t, Bank\ effects) \quad \textbf{(1)}$$

$$Inclusion_{st} = f_2(Fragility_{st}; Size_{st}, Gr\_branch_{st}, Merger_{st}, Sh\_AGR_t, Sh\_Mfg_t, MCAP_t, Bank\ effects) \quad \textbf{(2)}$$

where *Fragility* and *Inclusion* are the two endogenous variables, the remaining ones are as defined in Table 2.

Table 2. Bank-specific variables: Description and summary statistics

Variable	Definition	Obs.	Mean	Std. dev.
Endogenous				
Financial inclusion measures				
Geographic	bank branches per 1000 sq. kms	308	0.516	0.515
Demographic	bank branches per 1 lac people	308	0.164	0.163
Loan a/c pc	Loan accounts per capita	308	0.001	0.002
Loan/ income	Average size of loan/ per capita GDP	308	0.639	0.217
Financial fragility measure				
NPL	Non-performing loans/Total loans	307	0.105	0.073
Exogenous				
Bank-specific measures				
Size	Natural log of total bank asset	308	10.221	0.947
Capital to risk-weighted asset ratio (CRAR)	Total capital (tier-I *plus* tier-II)/Risk weighted asset	308	0.115	0.034
Gr_Loan	First difference of natural log of real loan	308	0.195	0.504
Cost income ratio (CIR)	Operating expense/(Total income *less* interest expense)	308	0.582	0.165
dy_Merger	Dummy=1, for the acquirer bank in the year of merger, else zero	308	0.036	0.186
Banking industry measures				
dy_Reg	Dummy=1 beginning 2004 coinciding with the move towards 90-day norm for delinquent loan classification, else zero	308	0.273	0.446
Macroeconomic measures				
dy_GDP	Dummy=1, if real GDP growth in a year exceeds the median over the sample period, else zero	308	0.545	0.499
dy_ROI	Dummy=1, if real interest rate in a year exceeds the median over the sample period, else zero. The real interest rate is computed as: [(1+lending rate)/(1+WPI inflation}-1	308	0.545	0.499
Sh_Agr	Share of agriculture in Gross domestic product (GDP)	308	0.212	0.028
Sh_Mfg	Share of manufacturing in GDP	308	0.152	0.004

All equations control for bank-effects, but these are not reported in the regressions. We employ the system-based method of estimation as given by 3SLS procedure, which has the advantage of removing simultaneity as well as contemporaneous correlation and is asymptotically more efficient than other related procedures such as 2SLS.

In the first equation, termed *fragility equation*, higher financial inclusion could entail higher financial fragility, as the recent sub-prime fallout would testify. The exogenous variables in (1) comprise a set of bank-specific, banking industry and macroeconomic variables. Under the first category, we include logarithm of total assets to control for size effects, since bigger banks might be better able to contain problem loans through portfolio diversification. Bank level inefficiency is captured through the cost income ratio (CIR). Banks with high problem loans have been observed to be less efficient, as the evidence from the US banking industry would testify (Berger and DeYoung, 1997). We capture the solvency aspects of bank operations by including the ratio of capital to risk-weighted assets (CRAR). On the one hand, the higher the solvency ratio, the lower the incentives to take more risks. Alternately, higher solvency ratios could also provide incentives to banks to pursue higher profits by following high risk-return strategies. The sign of the coefficient on this variable is left to be econometrically determined. Evidence for the US banking industry suggests that solvent banks assume lower risk (Kwan and Eisenbis, 1997). A target of rapid increase in market share though credit over-extension can force the bank to compromise on the quality of borrowers, which, in turn, might manifest itself in higher problem loans. We take this aspect on board by including the real loan growth. All equations control for the impact of mergers.

At the banking industry level, we include a dummy to account for tightening of the definition of problem loans. Finally, at the macro level, we include the real GDP growth and real interest rate. To moderate the influence of noise, we employ dummies instead of these continuous variables.

In equation two, the *inclusion equation,* higher fragility could engender higher or lower levels of financial equation, the sign of which is not clear *a priori*. We include the squared of fragility to allow for possible non-linearities in its relationship with financial inclusion. Following from the earlier discussion, if financial fragility tends to dampen financial inclusion, the coefficient on this variable would be negative. The bank level control in (2) includes bank size. Besides, control for the structure of the economy by including the shares of agriculture and manufacturing, expressed as percentage to GDP. It is not evident *a priori* whether higher shares of these sectors improve financial inclusion; the signs are left to be econometrically determined.

The data for the analysis are drawn primarily from *Statistical tables relating to banks in India*, a yearly publication by the Indian central bank that reports bank-wise balance sheet numbers and profit and loss figures. The prudential ratios for banks are culled out from *Report on trend and progress of banks in India,* a statutory yearly publication submitted to the Indian Parliament that provides bank-level prudential and financial ratios. Taken together, these two publications account for almost all of the bank-level variables employed in the analysis. The macro variables for the study come from the *Handbook of Statistics on Indian economy*, another yearly publication that provides time series data on monetary and macro variables.

The sample covers the period 1997-2007, the most comprehensive time frame for which data on the relevant variables is available on a consistent basis. To be included in the study, a bank needs to be a state-owned bank. We limit our study to these banks since they are the ones most likely to be used as conduits by the government for improving access. Importantly as well, state-owned banks constitute the single most important segment of financial sector, accounting for nearly 75% of commercial banking assets and over 80% of loans extended. Given that data on several of the relevant variables are available beginning at different time points over the sample period, we have an unbalanced panel, comprising of a maximum of 308 bank-years.

4. Results and discussion

Table 3 reports the 3SLS estimates of the specification as defined by (1) and (2). Model 1 provides the estimates of the fragility equation. The measures of fragility are variously defined, as outlined at the top of each model. The coefficient on geographic is not significant, suggesting that penetration of financial services exerts a limited impact on financial fragility.

In terms of the exogenous variables, *Size* carries a negative and significant coefficient. To the extent that large banks present better risk diversification opportunities, this suggests that their delinquent loans are better contained. Banks with relatively more capital are less prone to credit risk. This mutually reinforcing relationship between credit risk and capital has been well-documented, both internationally (Shrieves and Dahl, 1992; Rime, 2001) and in Indian context (Ghosh, 2005). The coefficient on CIR is negative, suggesting that inefficient banks are more prone to risk taking, consistent with evidence for US banking industry (Kwan and Eisenbis, 1997). Higher credit extension lowers NPLs, hinting at the improvements in banks' credit evaluation practices. At the banking industry level, the coefficient on the regulation dummy is negative and significant, indicative of the fact that despite tightening of prudential regulations for loan classification, banks have lowered their NPLs, reiterating

the improved credit risk management standards. All equations control for the real interest rate and the business cycle. Wherever significant, these display expected signs. Thus, acceleration in GDP as well as a decline in real interest rates, leads to a decline in problem loans.

Table 3. 3SLS Model of financial inclusion and financial fragility

	Fragility	Geographic	Fragility	Demographic	Fragility	Loan a/c pc	Fragility	Loan/income
	(1)		(2)		(3)		(4)	
Constant	0.218 (0.056)***	0.345 (0.089)***	-0.297 (0.129)**	0.041 (0.022)*	0.419 (0.066)***	-0.011 (0.001)***	-0.175 (0.066)***	1.341 (0.265)***
Endogenous								
Fragility								
NPL		-0.409 (0.142)***		0.051 (0.054)		-0.007 (0.002)***		-2.420 (0.430)***
NPL squared		1.359 (0.327)***		0.115 (0.125)		0.022 (0.005)***		4.114 (0.996)***
Inclusion								
Geographic	0.288 (0.224)							
Demographic			1.019 (0.089)***					
Loan a/c pc					1.095 (0.126)***			
Loan/ income							-0.249 (0.024)***	
Exogenous								
SIZE	-0.027 (0.009)***	0.012 (0.005)***	-0.052 (0.008)***	0.004 (0.001)***	-0.042 (0.006)***	0.006 (0.0007)***	0.042 (0.008)***	0.084 (0.014)***
CRAR	-0.476 (0.083)***		-0.005 (0.049)		-0.489 (0.084)***		-0.478 (0.064)***	
CIR	0.187 (0.017)***		0.014 (0.013)		0.123 (0.019)***		0.112 (0.015)***	
Gr_Loan	-0.008 (0.004)**		-0.002 (0.003)		-0.009 (0.004)**		-0.001 (0.003)	
dy_Ref	-0.056 (0.007)***		-0.007 (0.006)		-0.051 (0.007)***		-0.021 (0.006)***	
dy_GDPGR	-0.007 (0.004)*		-0.005 (0.006)		-0.018 (0.006)***		-0.0007 (0.004)	
dy_ROI	0.005 (0.003)*		0.006 (0.004)		0.016 (0.004)***		0.001 (0.003)	
Sh_Agr		-0.303 (0.149)**		0.012 (0.039)		-0.012 (0.002)***		-0.407 (0.443)
Sh_Mfg		0.727 (0.418)*		-0.039 (0.054)		0.024 (0.011)**		-0.341 (0.184)*
dy_Merger	0.027 (0.009)***	0.012 (0.007)*	-0.102 (0.025)***	0.011 (0.002)***	0.004 (0.012)	0.001 (0.001)	0.004 (0.009)	-0.013 (0.020)
Bank fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
Period, N. Obs.	1997-2007, 307	1997-2007, 307	1997-2007, 307	1997-2007, 307	1997-2007, 307	1997-2007, 388	1997-2007, 307	1997-2007, 307
R-squared	0.844	0.978	0.289	0.879	0.725	0.975	0.859	0.920
F-statistic	16.69***	23.49**	4.02***	13.01***	11.42***	12.44***	20.28***	40.77***

Standard errors in parentheses

***, ** and * indicate statistical significance at 1, 5 and 10%, respectively.

The second model explores the factors influencing geographic inclusion. NPL carries a negative sign and the squared term carries a positive sign. The inflection point in the relationship is 0.150.[2] This convex quadratic relationship is suggestive of the fact that an increase in NPLs leads to a lowering of banking penetration in the initial stages as banks lower their branch expansion in response to rising delinquent loans, but once *NPLs* exceeds this threshold, the informational advantages of on-site branching outweigh the adverse selection effects, leading to an increase in branch expansion (See, for instance, Bofondi and Giorgio, 2006).

Among the exogenous variables, the coefficient on *Size* is positive, indicating that financial inclusion is higher for bigger banks. The structure of the economy does appear to have a bearing on the financial inclusion strategy of banks. More specifically, higher share of agriculture tend to dampen geographic inclusion. To the extent that that higher share of agriculture in total output is a proxy for poverty (Ravallion and Datt, 1996), it seems to suggest that inclusion is lower when the economy is relatively less developed.

In Model 2, the coefficient on demographic is positive: in other words, an increase in availability of banking services is associated with an increase in financial fragility. This could be interpreted to mean that an increase in availability could lead banks to compromise on their credit evaluation, with possibilities of higher NPLs in future. The coefficient above unity on demographic indicates that non-performing loan grows more than proportionally with greater financial inclusion, which is not surprising given the high levels of adverse selection that could be associated with greater outreach.

Models 3 and 4 consider the use of banking services. In model 3, a rise in per capita loan accounts (signifying greater use of credit services) is found to raise NPLs: a rise in loan accounts per capita raises NPLs by roughly 1.1%. The evidence is consistent with cross-national evidence that indiscriminate credit extension could leave banks saddled with higher levels of NPLs in its books (Demirguc Kunt and Detragiache, 1998). In the inclusion equation likewise, an overwhelming increase in the number of credit accounts raises NPLs in the initial stages, but declines subsequently as banks adopt more conservative credit risk management strategies.

In the final model, a decline in loan income ratio which is tantamount to greater use of credit facilities raises fragility, consistent with evidence obtained earlier. The coefficients suggest small effects: a one standard decline in loan income ratio produces a 0.08 rise of standard deviation in NPLs. In both (3) and (4), the inflection points are close to that obtained in the first model.

[2] The inflection point is calculated as the derivative of geographic inclusion with respect to NPLs. The other inflection points are computed in a similar manner.

5. Concluding remarks

Two major observations follow from the analysis. First and more generally, financial inclusion and financial fragility are intertwined, with each tending to reinforce the other. In terms of specifics, financial fragility is a non-linear determinant of both availability and use of banking services. From the policy standpoint, while the move towards financial inclusion is a welcome development, it needs to be dovetailed to suit the needs of the economy. Calibrated financial inclusion, seems to be the way forward so that the health of the banking sector is not jeopardized

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