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Journal of Business and Economic Issues
Barrackpore Rastraguru Surendranath College
85, Middle Road & 6, Riverside Road, Barrackpore
North 24 Parganas, Kolkata-700 120, West Bengal, India
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Assessing Financial Inclusion In The Nabinagar Village of Malda District on The Basis of Business Correspondent Model

Dr. Anupam Karmakar*
and
Arunima Rudra**

Abstract

The brick-and mortar branches cannot be opened by the banks in all the remote parts of the country and considering this difficulty the Reserve Bank has been encouraging banks to improve banking penetration through Business Correspondents (BCs). BC model has become an important measure of financial inclusion and the present study mainly focuses upon various aspects of the BC model including how the model is operating in Nabinagar village situated in Malda district of West Bengal. This paper also assesses the profitability aspect of the bank, the BC organizations and the Customer Service Points (CSPs) attached with the Nabinagar village of Malda district.

1. Introduction

The vast network of the banking system in the country has prompted the adoption of a bank-centric approach in the delivery of financial services in the rural sector. However, one of the major factors affecting further expansion of outreach of the banking sector is the cost of expanding the branch network and increasing the number of people manning a branch. The relatively high transaction cost of dealing with a number of small accounts also negatively impacts further expansion. When the focus

**Assistant Professor of Commerce New Alipore College, Kolkata.*

Email: anupam_2013@yahoo.com

***Contractual Whole Time Teacher; S.A. Jaipuria College, Kolkata.*

Email: arunimarudra@yahoo.co.in

is on cost reduction and improving profit, banks naturally shy away from areas and activities which are cost-intensive, low yielding and fraught with uncertainties. The orientation/ attitude of banks staff is also not favourable in many cases. In such a scenario, it becomes difficult for banks to cover more and more customers located in far-flung areas all by themselves. Hence, there arises the need for innovative products and processes and alternative modes of delivery.

The concern that in spite of the formidable network, the banking system in the country had not been able to reach a vast segment of the population and provide them with basic banking services led the Reserve Bank of India to emphasize the importance of financial inclusion. Financial inclusion refers to providing banking service at an affordable cost to the disadvantaged and low income group of people. It involves delivery of financial services viz., access to payments and remittance facilities, savings, loans and insurance service facilities. Financial exclusion is just the opposite of financial inclusion. Financial exclusion refers to the group of persons who do not have access to formal financial services like banking services.

II. Business Correspondent Model:

In line with the objective of inclusive growth, the Reserve Bank has given high priority to the agenda of financial inclusion over the past few years. Initiatives were taken by the Reserve Bank in recent years to expand banking services to remote areas of the country. This includes relaxation of branch authorisation policy, and instruction for commercial banks to open at least 25 per cent of their total branches in hitherto unbanked areas of the country. In addition, considering the difficulty of opening brick-and mortar branches in all the remote parts of the country, the Reserve Bank has been encouraging banks to improve banking penetration through Business Correspondents (BCs). With the objective of ensuring greater financial inclusion and increasing the outreach of the banking sector, Reserve Bank of India has instructed banks to use the service of Non-governmental organization (NGOs) / Self-help groups (SHGs), (Microfinance institutions (MFIs), and other Civil Society Organizations (CSOs) as intermediaries in providing financial and banking services through Business Facilitator and Business Correspondent models. BC can be

- Individual / kiranna / medical / fair price shop
- Agent of small saving schemes of GOI / Insurance companies
- Individual public call office operators (pco)

- Individual who own petrol pumps
- Retired teacher
- Authorized functionaries of well own SHGs Operations common service centres (CSCs)
- Farmers' club

Different banks adopt different models. Some banks have appointed individual as BC/BF and some banks have appointed agency/corporate body as BC/BF. The BCs are found to use two models viz. 1) The Smart Card based Kiosk Model and 2) Mobile Hand set based Model. Under the mobile based model there are two types viz. one where a GPRS based mobile is used to access the server through the internet and the other through Short Messaging Service (SMS) or Unstructured Supplementary Service Data (USSD) technology.

Further, according to a Wharton School study during March,2011, the average cost per transaction in India at a BC outlet is the lowest at INR 4.50 (\$1 = INR 45 approx.) per transaction as compared to an ATM (INR 18) and a bank branch (about INR 45). Finally, Indians are already familiar in dealing with individuals as agents for transacting in financial products especially for insurance and postal savings, etc.

III. Review of Research and Development in the subject

■ International status

Now a day's financial inclusion is a burning issue even in developed countries. In USA, 9% of the population does not have any bank account (Mohan, 2006). In Sweden, lower than 2% of adults did not have an account and in Germany, the figure was about 3%. It is interesting to note that the countries with high levels of inequality record higher levels of banking exclusion. To accentuate, in Portugal, about 17% of the adult population had no account of any kind. In France, the law on exclusion (1998) emphasises an individual's right to have a bank account. The German Bankers' Association launched a voluntary code in 1996 providing for a so-called "everyman" current banking account that facilitates basic banking transactions. In South Africa, a low-cost bank account, called **Mzansi**, was initiated for financially excluded people in 2004 by the South African Banking Association. Several African countries have harness the unique aspects of mobile banking to drive financial inclusion.

■ National Status

In India, financial inclusion first featured in 2005, when it was launched by K C Chakraborty, the chairman of Indian Bank. Mangalam Village became the first village in India where all households were provided with banking facilities. RBI has been undertaking financial inclusion initiatives in a mission mode through a combination of strategies ranging from provision of new products, relaxation of regulatory guidelines and other supportive measures to achieve sustainable and scalable financial inclusion. Some of these steps are: facilitating no-frills accounts and General Credit Cards (GCCs) for small deposits and credit, norms were relaxed for people intending to open accounts with annual deposits of less than 50,000. GCCs were issued to the poor and the disadvantaged with a view to help them access easy credit. In January 2006, RBI permitted commercial banks to make use of the services of non-governmental organizations (NGOs/SHGs), micro-finance institutions, and other civil society organizations as intermediaries for providing financial and banking services. These intermediaries act as business facilitators or business correspondents by commercial banks.

IV. Objective of the study:

- The major objective of the study is to find out how the BC model is operating in Nabinagar village of Malda district.
- To assess the profitability aspect of the bank, the BC organisation and the CSPs attached to Nabinagar village of Malda district.

V. Methodology:

The DEPR (Department of Economic and Policy Research), Kolkata office of RBI instructed the UBI Head Office to assist the principal investigator in the field study of NGO-BC. Accordingly the Assistant General Manager, UBI, Head office Kolkata has given an idea about the data collection for the survey and instructed Alinagar Branch in Malda to arrange for the survey in Nabinagar village located in taluk of Alinagar in the Malda district, West Bengal. Besides the AGM, has enlightened me with sufficient information regarding BC model and detailed primary data collection had been done from the base branch of UBI at Alinagar Branch and from the ultra small branch where the CSPs/ Kiosk Operators work, through a structured questionnaire which has been annexed. The BC organisation associated with the

village is Sarala Women Welfare Society in the Malda district which is basically a NGO. The organisation has been engaged as BC agent by State Bank of India, CBI, HDFC and UCO Bank. This study is concerned with how Sarala Women Welfare Society, UBI Alinagar Branch and the CSPs/ Kiosk Operators have been impacted by the implementation of the BC model in Nabinagar village. The BC agent is using web based Kiosk Banking system through Atyati which has been taken over by Genpact. The beneficiaries had also been interviewed on the basis of the Likert statements prepared.

• **Period of Study:**

A survey had been conducted during the period April 2015 to December 2015 in the Nabinagar village located in taluk of Alinagar in the Malda district of West Bengal and a case study has been prepared based on the survey so as to get a view of how the business correspondent model has been successfully operating in the district.

VI. Data Analysis:

Analysis of data has been done on the basis of the responses by the banks, BCs, CSPs and District Project Coordinator of Technology provider on the basis of the questions listed in the questionnaire.

ANALYSIS AND FINDINGS - NABINAGAR VILLAGE OF MALDA DISTRICT

Summary of the data collected from the BCs and few assumptions thereon required for analysis in Nabinagar village:

Profile of Nabinagar village

| | |
|--|------|
| Population | 6764 |
| Average Members per household | 5 |
| Average Banking customer per household | 3 |
| Market penetration by CSPs | 89% |

| Bank's business through BC | | |
|-----------------------------------|-----------|------------------------|
| Product | Customers | Avg. o/s balances (Rs) |
| Savings a/c | 6000 | 500 |
| Loan a/c | 3600 | 1000 |

| Assumptions | |
|----------------------------------|-----|
| Increase in bank's business p.a. | 10% |
| Inflation p.a. | 6% |

Note: The assumption of increase in bank's business is based on the reporting of the CSP working in the Nabinagar village of Malda district and the assumption of inflation of 6% is based on Consumer Price Index (CPI).

| Item | Year 1 | Year 2 | Year 3 |
|----------------------|-------------------------------------|--------|--------|
| Capacity utilization | 60% | 80% | 100% |
| Product | Transactions per customer per month | | |
| Savings | 8 | | |
| Loans | 2 | | |

Fixed Cost

| Infrastructure Cost for CSP | Amt (Rs) |
|--|----------|
| Net book 2nd hand | 8000 |
| Printer | 3500 |
| Web based solution with biometric card reader called Kiosk Banking | 10500 |
| Total | 22000 |

Depreciation

| | |
|-------------------|-----|
| Depreciation p.a. | 30% |
| Human resource | No |
| No of CSPs | 1 |

Calculation of cost

| Outlet operating cost | Amount (Rs) p.m. |
|-----------------------|------------------|
| Rent | 700 |
| Electricity | 800 |
| Transportation cost | 300 |
| Connectivity | 150 |

Remuneration provided to CSPs

| | |
|--------------------------------|--------------------|
| Fixed salary | 4000 p.m. |
| Reimbursement transaction fees | Rs 6.5 per S/B a/c |

Cost structure for bank

| Funds received by banks from customers | |
|--|----------------|
| Particulars | Amt (Rs) |
| Account maintenance fees | 30 per quarter |

| Bank operating costs | |
|----------------------|----------|
| Expenses | Amt (Rs) |
| Per savings account | 20 |
| Per loan account | 20 |

| Cost incurred by bank on BC | |
|---|----------|
| Particulars | Amt (Rs) |
| Reimbursement Service fee for loan | 5.50% |
| Business Facilitation fees per Customer | Rs 7.5 |
| Trail fees per savings account | Rs 6.5 |
| Transaction fees | Re 0.55 |
| Loan loss | 0.40% |

| | |
|------------------------|-----|
| Interest rate on loans | 10% |
|------------------------|-----|

| | |
|---------------------------------------|----|
| Interest rate given by bank on SB a/c | 4% |
|---------------------------------------|----|

- **Analysis of the data collected pertaining to the CSP working for Nabinagar village :(Assessing its profitability)**

| No of accounts | Year 1 (Rs) | Year 2 (Rs) | Year 3 (Rs) |
|----------------|-------------|-------------|-------------|
| Savings a/c | 3600 | 4800 | 6000 |
| Loan a/c | 2160 | 2880 | 3600 |
| Total | 5760 | 7680 | 9600 |

| Income of CSP | Year 1 (Rs) | Year 2 (Rs) | Year 3 (Rs) |
|--------------------------------|--------------|--------------|--------------|
| Fixed salary | 48000 | 50880 | 53933 |
| Reimbursement transaction fees | 23400 | 31200 | 39000 |
| Total (A) | 71400 | 82080 | 92933 |

| Expenses of CSPs | Year 1 (Rs) | Year 2 (Rs) | Year 3 (Rs) |
|---------------------------|--------------|--------------|--------------|
| Rent p.a. | 8400 | 8904 | 9438 |
| Electricity expenses p.a. | 9600 | 10176 | 10787 |
| Transportation cost p.a. | 3600 | 3816 | 4045 |
| Connectivity | 1800 | 1908 | 2022 |
| Depreciation (30%) | 6600 | 6600 | 6600 |
| Total (B) | 30000 | 31404 | 32892 |

| Statement of Profit and Loss | | | |
|------------------------------|--------------|--------------|--------------|
| Particulars | Year 1 (Rs) | Year 2 (Rs) | Year 3 (Rs) |
| Total income(A) | 71400 | 82080 | 92933 |
| Less: Total expenses(B) | 30000 | 31404 | 32892 |
| Total profit | 41400 | 50676 | 60041 |

The capacity utilisation by the CSP reached 100% by the end of third year since they have been reputed to achieve 80-85% of their target by the end of second years from the time of their inception in 2012. They have reached the target of 6000 people by the end of third year (population being 6764 and over). But the number of loan accounts targeted reached 3600 (almost 60% of the savings account) by the end of third year which is low as compared to the savings account due to lack of familiarity and trust factor. The same kind of result was obtained in other similar researches made earlier in this field, by other research institutes working on BC model like IFMR or researcher like Dr. YSP Thorat.

The profit of the CSP over a period of 3 years show that their profits has increased over the period of time apparently but the profits are increasing at a decreasing rate. This perhaps might be due to the fact that their expenses like rent, electricity, transport, connectivity etc are growing at a proportion (considering inflation of 6% p.a.) which is more than that of the increase in their income. Moreover, if they can show an increase in the number of savings account over the period of time and can start providing other services like giving remittances and insurance facilities which is not yet implemented by the BC organisation and bank they can earn more profit in the future years. With the introduction of these services by CSP, the commission for each of these services should be provided and this would motivate them to work hard as the monetary incentives may boost them and thereby contribute towards promoting financial inclusion.

➤ **Assessing profitability of Sarala Women Welfare Society (BC Organisation) for Nabinagar village :**

| <u>Statement of Income</u> | | | |
|----------------------------|---------------|---------------|---------------|
| Particulars | Year 1 (Rs) | Year 2 (Rs) | Year 3 (Rs) |
| Trail fees | 23400 | 31200 | 39000 |
| Transaction fees | | | |
| • Savings account | 190080 | 253440 | 316800 |
| • Loan account | 28512 | 38016 | 47520 |
| Payment from bank | 118800 | 158400 | 198000 |
| Business facilitation fees | 43200 | 57600 | 72000 |
| Total (A) | 403992 | 538656 | 673320 |

| <u>Statement of Expenses</u> | | | |
|--------------------------------|--------------|--------------|--------------|
| Particulars | Year 1 (Rs) | Year 2 (Rs) | Year 3 (Rs) |
| Fixed salaries of CSPs | 48000 | 50880 | 53933 |
| Reimbursement transaction fees | 23400 | 31200 | 39000 |
| Total (B) | 71400 | 82080 | 92933 |

| <u>Statement of Profit and Loss</u> | | | |
|-------------------------------------|---------------|---------------|---------------|
| Particulars | Year 1 (Rs) | Year 2 (Rs) | Year 3 (Rs) |
| Total income(A) | 403992 | 538656 | 673320 |
| Less: Total expenses (B) | 71400 | 82080 | 92933 |
| PBIT | 332592 | 456576 | 580387 |
| Less: Interest on term loans | 5000 | 12000 | 20000 |
| Profit (A-B) | 327592 | 444576 | 560387 |

➤ **Term loan details by the BC organisation from bank for Nabinagar village CSP outlet**

| <u>Term loan</u> | | | |
|---------------------|-------------|-------------|-------------|
| Particulars | Year 1 (Rs) | Year 2 (Rs) | Year 3 (Rs) |
| Opening balance | Nil | 30000 | 90000 |
| Borrowed | 50000 | 120000 | 200000 |
| Add: Interest (10%) | 5000 | 12000 | 20000 |
| Less: Payments | 20000 | 60000 | 35000 |
| Closing balance | 30000 | 90000 | 255000 |
| Opening balance | Nil | 30000 | 50000 |
| Borrowed | 50000 | 120000 | 200000 |

The above income, expenses and profit statement of the BC organisation shows that the organisation is earning fairly a large amount of profit from operations in the Nabinagar village CSP outlet. The profit has increased over the period of 3 years. Their profits are likely to increase more as more number of savings account and also loan accounts are mobilised over the period of time.

➤ **Assessing profitability of the UBI Alinagar Branch, from BC operations in Nabinagar village :**

| Business | | | |
|--------------------|--------------------|--------------------|--------------------|
| Particulars | Year 1 (Rs) | Year 2 (Rs) | Year 3 (Rs) |
| Savings account | 1800000 | 2400000 | 3000000 |
| Loan account | 2160000 | 2880000 | 3600000 |

| Statement of Income | | | |
|----------------------------|--------------------|--------------------|--------------------|
| Particulars | Year 1 (Rs) | Year 2 (Rs) | Year 3 (Rs) |
| Interest on bank loan | 216000 | 288000 | 360000 |
| Account maintenance fees | 691200 | 921600 | 1152000 |
| Total (A) | 907200 | 1209600 | 1512000 |

| Statement of Expenses | | | |
|----------------------------------|--------------------|--------------------|--------------------|
| Particulars | Year 1 (Rs) | Year 2 (Rs) | Year 3 (Rs) |
| Operating costs for maintaining: | | | |
| Savings account | 72000 | 96000 | 120000 |
| Loan account | 43200 | 57600 | 72000 |
| Payments to BC organisation | | | |
| - trail fees | 23400 | 31200 | 39000 |
| - transaction fees | 218592 | 291456 | 364320 |
| - payment from banks | 118800 | 158400 | 198000 |
| - business facilitation fees | 43200 | 57600 | 72000 |
| Interest on savings account (4%) | 72000 | 96000 | 120000 |
| Loan loss (0.4%) | 8640 | 11520 | 14400 |
| Total (B) | 599832 | 799776 | 999720 |

| Statement of Profit and Loss | | | |
|-------------------------------------|--------------------|--------------------|--------------------|
| Particulars | Year 1 (Rs) | Year 2 (Rs) | Year 3 (Rs) |
| Total income (A) | 907200 | 1209600 | 1512000 |
| Less: Total expenses (B) | 599832 | 799776 | 999720 |
| Profit before tax (PBT) | 307368 | 409824 | 512280 |

The above analysis shows that the profits of the UBI Alinagar Branch in each year are low and that the profits are increasing at a decreasing rate. This is because the number of loan account holders is comparatively lower than the number of savings account holders. But since the business in loan account in the form of interest on loan account is slightly more than that of the business in savings account the bank has managed to gain some profits out of the operations in Nabinagar village. Loans and advances are the major assets of the bank. Greater the number of loan accounts or larger the amount of business out of the loan account, the bank would be able to maximise their profits provided the repayments are regular. The bank should also consider the creditworthiness of the customer so as to reduce the chances of loan loss before sanctioning the loan.

Here, we can see that the BC model is very much an effective model that may contribute towards earning of profit by all the parties involved in its operations through BC model. Thus the commercial banks should take the BC model as a business proposition and a commercial activity.

VII. Findings from the Survey:

The following Findings related to the survey conducted in Nabinagar Village may be listed below:

1. The UBI bank has adopted Kiosk based model for promoting financial inclusion
2. UBI has appointed experienced retired officers to supervise the workings of the BC model.
3. The BC organisation has been selected by the bank on the basis of the interview conducted and their educational qualifications.
4. The CSP is selected by the BC organisation on the basis of the interview.
5. No training has been provided by the business correspondent organisation to the CSP for carrying out the operations.
6. The cash balance limit for CSP is Rs 10,000.
7. UBI does not provide any locker for keeping essential documents or money for the ultra small branch to which CSP is associated while other banks does so.
8. Previously mobile based approach was followed to carry out the transactions. But since the system failed to operate successfully, online based transaction was launched on 31st January 2013. Hence the operational time required is also less.

9. The beneficiaries face problem many a times in depositing and withdrawing money due to technological glitches.
10. Passbook updation is not done through BCs and hence the villagers have to visit the banks for such updation.
11. The operational expenses are borne by the CSPs. Neither bank nor the BC organisation takes the responsibility of these payments.
12. Despite Awareness Programme and Financial Literacy camps, the desired level of growth has not yet been achieved with a portion of the accounts yet to commence transaction.

VIII Conclusion:

Access to finance is clearly not purely a financial sector issue and hence monetary measures cannot resolve it. Access to finance has social and other non financial dimensions. Poor and low income households suffer from multiple, often interlocking, disadvantages. Because of this, many other measures are also needed to address this issue effectively like improvements in education, rural infrastructure, primary health care and other vital services. There is a need for capacity building and governance reforms to go hand in hand with financial inclusion.

Until and unless the Government and financial sector work together, financial inclusion cannot happen because it is more of governance issue and less of financial issue. Deepening financial inclusion system and widening its reach is crucial for both accelerating growth and for equitable distribution given the stage of development of our country. The key however lies in linking access to financial services with livelihood options and leveraging the same to achieve poverty eradication program.

Financial inclusion is a collective effort and it is an agenda in which everyone has a role to play either as a user or as a partner. When we look at the recommendations of the Rangarajan Committee, they propose a paradigm shift in the way we see the financial inclusion. The committee strongly recommends the national goal of ensuring access to a deposit account for at least 90% of the household if they so desire, and to the payment system and the various schemes implemented through this system. Currently most banks are satisfied opening No-Frill accounts and promptly announce that 100% financial inclusion has been achieved. They should go one step further and make available the needed financial services i.e. credit, remittance or insurance as the case may be, to the undeserved/undeserved segments so that financial access takes place in true sense.

BC model has been able to promote financial inclusion to a great extent. Efforts are needed in order to channelize the model to its best capacity so as to achieve the desired result. Incentives and increments in the salaries of the BC are required to be made in order to encourage them to work with greater enthusiasm and zeal.

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The Issue of Non Performing Asset in Select Indian Public Sector Banks: A Study

Soumya Ganguly*

Abstract

Over the past few years, it has been observed that the amount of Non Performing Asset in few Public Sector Banks has inflated drastically in India. One of the basic reason behaving it is Bad Loans. It can be defined as loans which are in outstanding beyond an assured time limit. A "bad loan" is a term used to refer to the loans that are made to the customers with bad credit. Bad loan is one of the major issues especially in Indian Public Sector Banks with decelerate of the Indian economy. With decelerate of the Indian economy, a number of companies or projects are under pressure. As a consequence, the Indian banking system has seen augment in NPAs and rationalized financial records during the recent years. Hence, it is essential to make sure that the banking system recognizes financial distress early, takes timely steps to resolve it, and ensures fair revival for lenders and investors. This study has been carried out with the objectives of understanding the present scenario of bad loans in selected Indian Public Sector Banks. I have considered Indian Overseas Bank, UCO Bank, State Bank of India and Punjab National Bank as my sample for the study. The study reveals that Banks' board of directors should follow the existing regulation regarding lending exposure to a single client, including related borrowers. Government should ensure effective corporate governance in Public Sector Banks in India.

Key Words: NPA, Bad loans, Public Sector Banks, RBIs guidelines, Problem Asset, Shareholders' Risk.

* Faculty Member, Department of Commerce Barrackpore Rastraguru Surendranath College North 24 Parganas, West Bengal. Email: soumyaganguly2008@yahoo.com

1. Introduction

Banking system plays a fundamental role in the improvement of its sound financial system for any country and India is not the exclusion. Bankers are the distributors and custodians of the liquid capital of the country. The primary function of the banking structure is to organize the savings of the people by accommodating deposits from the public. The banker becomes the trustee of the additional balances of the community. Here-in-lies the tedious duty of the banker is in exciting the mobilization of surpluses. The job of banking is endorsing development and expansion particularly in the context of planning to break the brutal cycle of poverty and to retrieve the economy from the trap of under-development is a matter of supreme importance, predominantly when our country is on the way of development. In order to mobilize deposits, the commercial banks undertake deposit mobilization through various deposit schemes appropriated to the different segments of the people. Bankers provides more man power and spend more time in the mobilization of deposits as the expansion of the bank deposits is the key ingredient in the progress of the banking business. But in India, the banking sector face one of the most crucial problem and it is Non Performing Asset (NPA) or it can be named as Bad Loans. A "bad loan" is a phrase used to refer to loans that are made to clients by means of bad credit. People with bad credit are considered more prone on failure to pay the loan payments. Bad loan is one of the major issues that slowdown the Indian economy especially in Indian Public Sector Banks. In India the enormity of the problem of bad debts was not taken seriously. But subsequently, some steps have been taken to solve the problem of NPAs in the balance sheets of the banks by the recommendations of Narasimham committee and Verma committee. It persists to be uttered from every corner that there has hardly ever been any methodical assessment of the best way of dealing with the problem. There seems to be no agreement in the proper policies to be followed in resolving this problem. There is also no uniformity in the relevance of NPA norms, ever since these have been documented. NPA alarms of individual banks abridged as a whole and articulated as a numerical average, for the entire bank cannot express a reliable picture. The circumstances are not so simple to be universal for the industry as a whole to lay down a handy package of a general clarification for all the banks and for all times.

In September 2008, the collapse of Lehman Brothers helped elicit economic and financial crises that flounce across the globe. At the time of its collapse, Lehman

Brothers was the 4th largest U.S. investment bank with 25,000 staffs throughout the world. For any economy a healthy banking system is very much essential motivating to achieve good growth and yet stay stable in an increasingly global business environment. Poor corporate governance of Banks has increasingly been acknowledged as an important cause of the financial crisis.

Review of literature:

Numerous studies have been performed to evaluate the NPA analysis in Indian and international perspective and few important related to the research are discussed here.

In international level, Vallabh *et.al* (2007), investigates pragmatic approach for the purpose of analysis of Non-Performing Assets (NPAs) of foreign, private and public sector banks in India. In this research paper for judging the performance and financial health of the selected banks, the NPAs are considered as an important parameter. They explored in their research paper that NPAs are measured as significant factor to evaluate the financial health and performance of banks. One of the important parameter of financial growth and stability of the banking industry is the level of NPAs. It was also found that the intensity of NPAs is one of the key element of financial constancy and development of the banking sector. Bloem and Gorter (2001) in their research paper suggested that the level of non-performing loans is relatively predictable, although it may vary to some extent from year to year, and which is caused by an unavoidable number of 'erroneous economic judgments by persons and natural bad luck (unanticipated price changes for certain products, bad weather etc.). Under such situation, the possessor of loans may spread the risk by taking out insurance, or they simply may make an allowance for a normal share of non performance in the form of bad loan. At this point of time, banks' non-performing loans increase, subsequently profits decline and eventually extensive losses to capital may become obvious. Ultimately, the economy reaches a trench and revolves towards a new expansionary segment; thus the risk of future losses accomplishes a low point, even if banks may still emerge comparatively detrimental at this phase in the sequence. Another one researcher Ferguson (2007) conducted a study on the Non-Performing Assets in Russia. According to the researcher, asset securitization is an escalating drift in Russia as companies loaded by poor credit ratings looking for access to capital at lower expenditure than they would be authorised in conventional equity or debt markets. This study designates that securitization of these bad loans has not

happened in Russia at the stages one might imagine. This is because of legal and regulatory obstructions that have dispirited investors and lenders comparable in addition to a comparatively little amount of loans that under-perform. This article predicts a momentous increase in the intensity of non-performing loans, which will be rationally harmonizing with an augmented attention of Russian lenders in securitizing these assets. In the research article of Nelson M. Waweru et.al (2009), it was identified that in Kenya since 1986 many financial institutions were forced to collapse due to non performing loans. This study examined the roots of non-performing loans and also the steps that bank managers have taken to alleviate that problem. This study was conducted using a sample of 30 managers chosen from the ten largest banks of Kenya. The study found that countrywide monetary recession was supposed as one of the most significant peripheral cause. It was also found that, the failure of client to reveal imperative information during the loan application process was considered to be the relevant factor of bad loans.

In a national level, study, Kumar (2013) expressed his opinion that Non-performing Assets (NPAs) have become a trouble and annoyance for the Indian banking segment for the past some years. In the late 90s one of the key issues challenging the performance of commercial banks was negatively disturbing the accretion of enormous non-performing assets (NPAs). Singh (2013) in his paper says that the source of the dilemma of escalating NPA's lies in the organization of credit risk management by the banks. Banks need to take sufficient precautionary actions in setting up pre- sanctioning evaluation liability and an effective post-disbursement control. He also expressed his thoughts that, Banks should constantly scrutinize loans to identify accounts that have probability to turn into non- performing. In the study of Gupta (2012), it is concluded that to assess the financial capability of the borrower before credit facility each bank should have its own independent credit rating agency and credit rating agencies should frequently assess the monetary situation of the customers. Rai (2012) find out in her study that even after defaulting constantly, corporate borrowers not at all had the apprehension of banks taking action to recover their dues. Chatterjee *et.al* (2012) in their study has concluded that banks should find out the main reasons of the loan required by the borrower. Appropriate recognition of the guarantor should be ensured by the bank together with inquiry of his/her wealth. In the study of Kaur and Singh (2011) it is observed that to judge the performance and financial health of banks, NPAs are measured as an essential consideration. The

drivers of financial constancy and development of the banking sector is one of the levels of NPAs. In the study of Prasad and Veena (2011), it was narrated that NPAs have negative impact on the return on assets as NPAs fails to produce interest earnings for banks but at the same time it is obligatory to the banks for the purpose of providing provisions for NPAs from their current profits. According to Chaudhary and Sharma (2011) a proficient management information system should be developed to eradicate the problem of NPAs. The bank should implement proper training methods for the bank staff who are concerned in disbursing the loans about the proper credentials and charge of securities and forced to take measures in avoiding loans turning into NPA. In the study of Balasubramaniam (2001), it was revealed that, all the banks are having a high level of NPAs and the banks would be projected to deposit their NPA. This thing can happen only by an effective and proper internal control mechanism, a well established credit review modus operandi together with their hard works to progress asset eminence in their balance sheets.

Objectives of the Study:

This study is based on the following objectives:

To identify the Non-performing assets of Indian Overseas Bank, UCO Bank, State Bank of India and Punjab National Bank for the last five financial years starting from 2011-12 to 2015-16.

To analyse the risk of the Shareholder of the selected banks due to NPA over the study period.

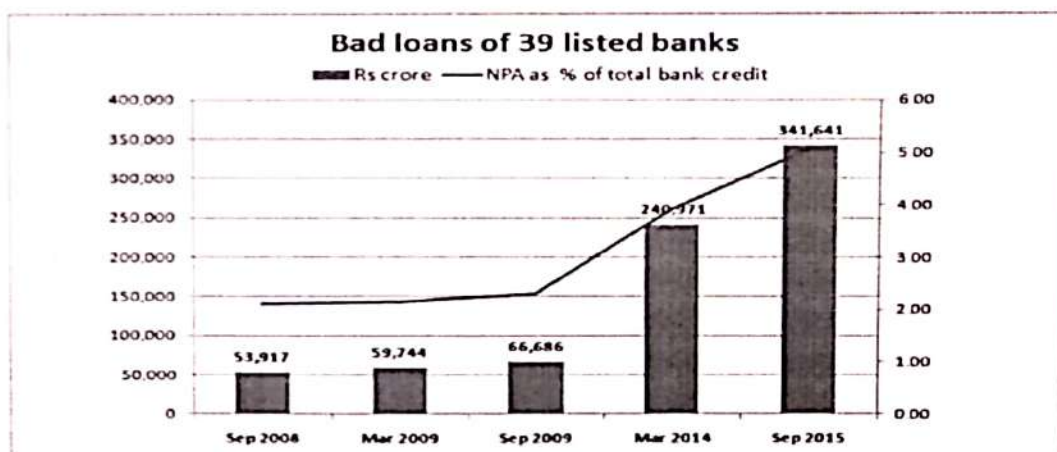
Research Methodology:

This study is purely based on secondary data. According to the Reserve Bank of India database, Indian Overseas Bank is having highest ratio of NPA to total advances followed by UCO Bank and in terms of absolute value, State Bank of India has the highest value of Gross NPA followed by Punjab National Bank. So, this study considered all of the above four public sector banks viz. Indian Overseas Bank, UCO Bank, State Bank of India and Punjab National Bank. Data related to this study were collected from the annual reports of the banks, different research articles, news papers and websites for the period of five years from 2011-12 to 2015-16. Table is used to compare total advances, gross NPA, net NPA & profits of the selected banks.

Analysis and Discussion:

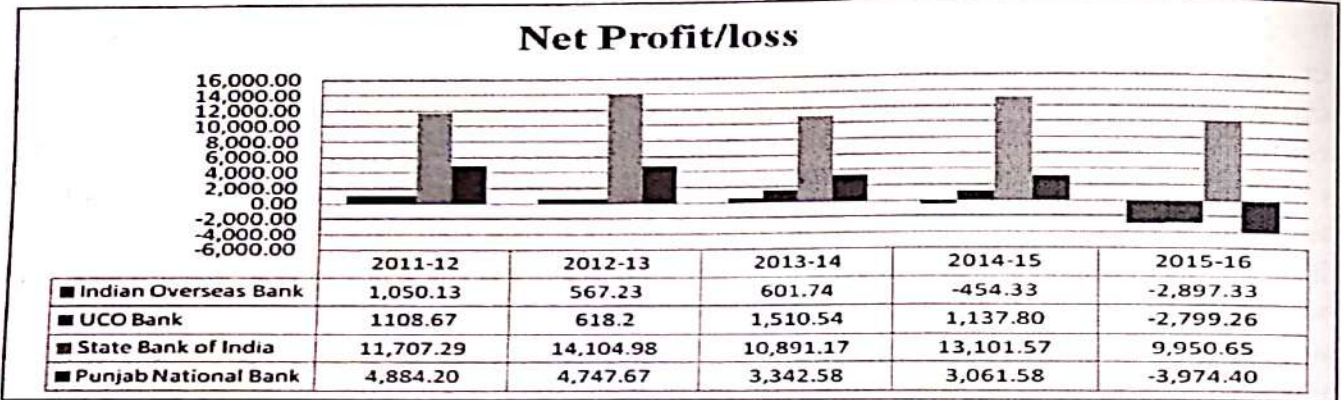
During the past, Indian lenders, particularly state-run banks, were very much busy in volume game to inflate their balance sheets and mollify their promoter i.e. the

government. That has been so from the time when steps of nationalisation of these banks ensued in two phases. There used to be struggle among public sector banks to ensign their total business volume on front-pages of print media but very modest concentration was paid to the class of assets. Governments frequently indulged these banks as their extensive arms and used them for populist instrument. Every departing chairman passed the situation to his descendant. As per the report of a leading newspaper it was observed that gross non-performing assets (GNPAs) of Indian banks in September 2008 (just before the 2008 global financial crisis broke out following the collapse of Lehman Brothers) raise from Rs 53,917 crore, due to the bad loans and it now has gone to Rs 3,41,641 crore in September 2015. In other words, the total GNPAs of banks, as a percentage of the total loans, has grown from 2.11 per cent to 5.08 percent.



Source: <http://www.firstpost.com>

Out of 10 most stressed banks, 9 of them are in the segment of government banks. The RBI has specified a target to clean up their balance sheets within March 2017 for all the banks. The former RBI governor Raghuram Rajan has specified a clear message to banks to contend with the NPA problem straight, in its place of postponing it and declining it. But, there is also vast capital allusion on these banks due to high NPAs too. Banks need to keep back money (known as provisions) to cover their bad loans. Professionals have opined that the government’s promise capital infusion in these banks is insufficient. As of June 2016, the total amount of Gross Non-Performing Assets (NPAs) for public and private sector banks is around Rs. 6 lakh crore. To analyse the situation of the selected banks regards to NPAs the following tables and charts are used –

Chart 1: Changes in Net Profit or Loss of the selected Bank (Rs. in Crore)

Source: Annual reports of the Banks

From the above figures it becomes crystal clear that, there is a declining trend in the profitability and in the last financial year (2015-16) of all the selected banks which may be the indication of effect of NPA or it can be termed as Bad Loans.

Table 1: Gross NPA Ratio of the selected Bank (in Percentage)

| Details | 2011-12 | 2012-13 | 2013-14 | 2014-15 | 2015-16 |
|----------------------|---------|---------|---------|---------|---------|
| Indian Overseas Bank | 2.79 | 4.12 | 5.13 | 8.69 | 18.68 |
| UCO Bank | 3.54 | 5.56 | 4.43 | 6.97 | 16.61 |
| State Bank of India | 4.57 | 4.90 | 5.09 | 4.36 | 6.71 |
| Punjab National Bank | 2.97 | 4.36 | 5.41 | 6.75 | 13.54 |

Source: Annual reports of the Banks

From the above table it can be said that, there is a proportionate increasing trend of Gross NPA till the last financial year (2015-16). It is a notable fact of such banks that, during the last financial year (2015-16) there is an increase of Gross NPA by more than 100% (except State Bank of India which is approximately 54%) which is very much alarming to the management authority of all the selected banks.

Table 2: Net NPA Ratio of the selected Bank (in Percentage)

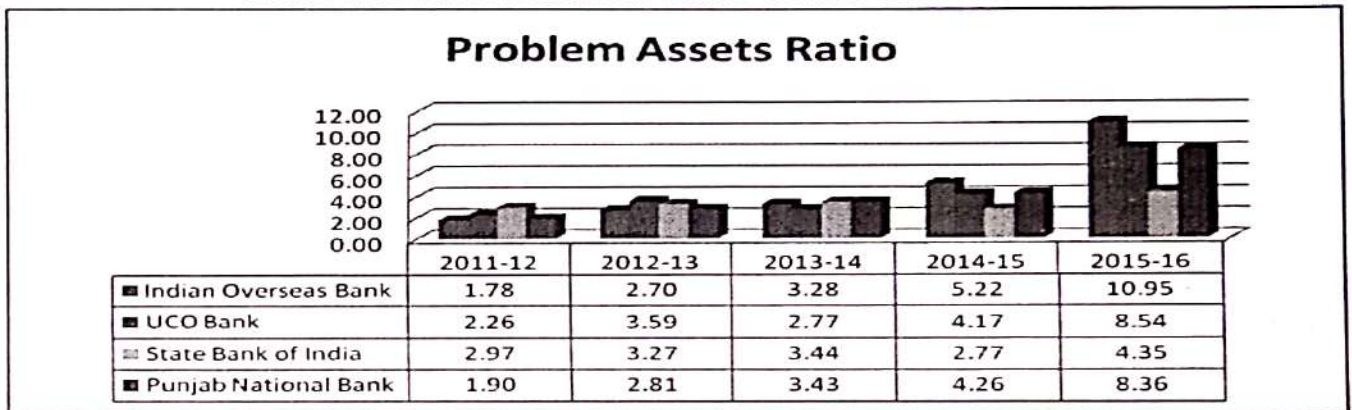
| Details | 2011-12 | 2012-13 | 2013-14 | 2014-15 | 2015-16 |
|----------------------|---------|---------|---------|---------|---------|
| Indian Overseas Bank | 1.36 | 2.51 | 3.22 | 5.71 | 11.94 |
| UCO Bank | 1.96 | 3.17 | 2.38 | 4.30 | 9.09 |
| State Bank of India | 1.82 | 2.10 | 2.57 | 2.12 | 3.81 |
| Punjab National Bank | 1.52 | 2.34 | 2.84 | 4.05 | 8.59 |

Source: Annual reports of the Banks

The Net NPA ratio of the selected Bank is also in increasing trend since the study period i.e. 2011-12 to 2015-16 keeping it pace with Gross NPA. It has been observed

that, there is an increase of Gross NPA by more than 100% (except State Bank of India which is approximately 80%) during the last financial year. So it can be said that, the selected banks fails to maintain adequate provisions against NPA. It is also an alarming to the banks that they are unable to collect the bad loans available in the market.

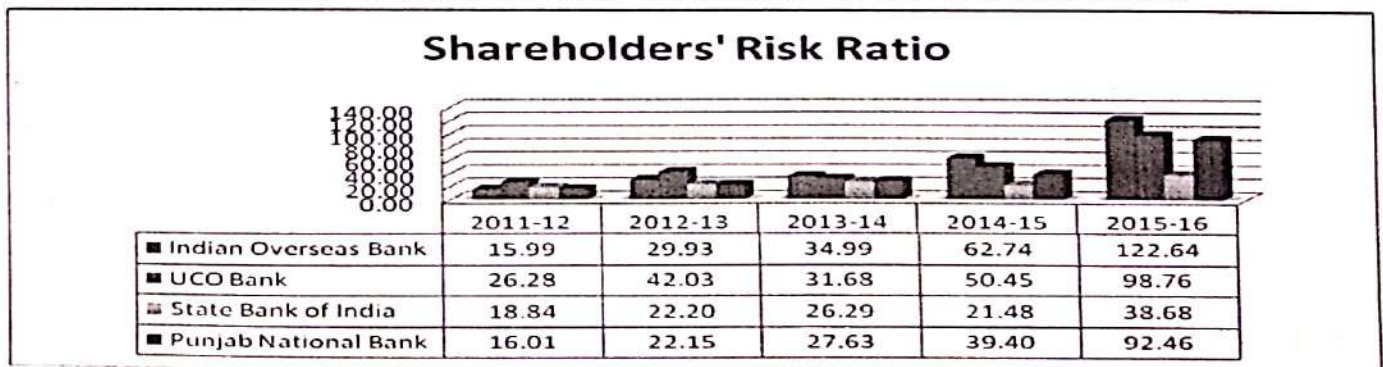
Chart 2: Problem Assets Ratio of the selected Bank



Source: Annual reports of the Banks

The Problem assets ratio illustrates the proportion of Gross NPA to total assets and the graph given above shows that the percentage of all selected banks. The percentage shown is, however not steady. It can be concluded from the above information that, during the last financial year the true picture is very must alarming as because, the situation is worst in comparison of the past four financial years. It seems that much attention has been given by the management to the proportion of Gross NPA and total assets of the bank. There is almost a steady increase in the ratio for all the selected banks during the study period.

Chart 3: Shareholders' Risk Ratio of the selected Bank



Source: Annual reports of the Banks

The shareholders are also rendered to enormous risk if the Net NPA is positive. That's why it is required to notice that the shareholder's funds are safe in view of the NPA or not. So, this ratio happens to very much imperative from the standpoint of the shareholders. This ratio is the proportion of Net NPA to total Capital & Free Reserve i.e. shareholders' fund. The shareholder may get panic-stricken after seeing the results of the selected banks. The Net NPA of Indian Overseas bank is more than the total shareholders fund during the last financial year. Only in the case of State Bank of India, it is moderate but for all other banks, the situation is very bad for the shareholders.

Conclusion:

Bad loans are a pull on bank resources for two grounds – one, they don't earn any interest income and second, they detain valuable assets in the form of NPAs. Therefore, recovery of bad loans has assumed necessity. Reserve Bank of India has taken various steps for corporate governance in the Indian Banking System. These can broadly be classified into the following three categories: a) Transparency b) Off-site surveillance c) Prompt corrective action. Transparency and disclosure standards are also important constituents of a sound corporate governance mechanism. Transparency and accounting standards in India have been enhanced to align with international best practices. Rising NPAs are not just hurting banks' profitability but are also reduce the amount of funds available for fresh lending as banks need to make higher provisioning for bad debts. Banks must also accelerate efforts to recover bad loans. After 2008, fresh NPAs every year have been more than the amount recovered from bad assets.

The situation of Indian Overseas Bank is very alarming. Undoubtedly the bank is certainly in front of an emergency condition due to its huge NPAs. The Bank is required to renovate its position and generate wealth on its own to survive in the banking sector otherwise it will be very difficult to sustain. It is also very bad news to the shareholder of the bank that, Net NPA of the bank is more than the shareholders' fund. UCO Bank is the another very bad performer among the public sector banks recording a highest increase in gross nonperforming assets (NPAs) in percentage terms against total loans in the last financial year after Indian Overseas Bank. The asset quality of the bank deteriorated in the last quarter, as its gross non-performing assets (NPAs) increased day by day. In March, 2014 A. Krishnakumar, State Bank of India Managing Director and Group Executive (National Banking) has said that State Bank of India is taking initiatives to reduce bad loans which have reached 5.73

per cent. Asset quality of Punjab National Bank deteriorated further during the last quarter of 2015-16 due to slightly higher-than-expected fresh slippages. Gross non-performing assets (NPA) increased at a huge rate (more than 100%) during the last financial year 2015-16 which is very much alarming to one of the leading public sector bank in India.

After the analysis of the data of the selected leading Public Sector Undertaking (PSU) Banks, it can be concluded that, they are not in the line with the RBI as RBI has directed banks to address asset quality on a war footing and clean up balance sheets by March 2017. The basic principle of sound Corporate Governance is transparency. Due to this reason public disclosure by the bank is desirable in the areas of Board structure, senior management structure, qualifications and experience of board members as well as managerial personnel, information regarding basic organization structure etc. The improper operation of the bank resulted due to the inadequate supervision of the board of directors, inadequate internal control and internal audit system, domination by one person and unethical practices. A bank can overcome its unsound operations and problems regarding bad loans by the implementation of Corporate Governance principles efficiently.

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Efficiency assessment of Indian commercial banks and the major determinants

Angana Deb*
&
Nitish Datta**

Abstract

In this paper, we have made an attempt to assess the trend of efficiency of the Indian commercial banks in the post liberalized regime. In this analysis, bank performance has been measured in terms of non radial Pareto-Koopmans efficiency using non parametric Data Envelopment Analysis. We found that the public sector banks are still the most efficient bank group in producing the traditional lending and non-lending banking activities in India, followed by the foreign bank group. The situation is just the reverse when off balance sheet activities of banks have been considered as a bank output to represent the non lending banking activities instead of non-interest income. The domestic private banks are found to be the least efficient banks for both the models. Logistic regression models has been estimated separately for the two different sets of efficiency scores to explain the possible factors of their variations such as ownership structure, capital strength, market concentration, profitability, asset quality etc. Bank efficiency in India has been found to be positively related to size and profitability whereas poor asset quality has negative impact on the performance of Indian banks.

Key Words: Efficiency, Banking, Data Envelopment Analysis

*Assistant Professor NabaBarrackpurPrafulla Chandra mahavidyalaya New Barrackpur, North 24 Parganas West Bengal

** Professor Department of Economics University of Kalyani WB, India

1. Introduction

In the last few decades, the world has witnessed banking and financial liberalization as a part of an overall economic reform in a large number of industrialized, developing and transition economies. The financial reform measures include liberal licensing of private domestic banks, abolition of barriers to the entry of foreign banks, privatization of public financial institutions, introduction of market based financial instruments, removal of interest rate restrictions and quantitative controls on lending etc. The primary objective of these financial reforms measures was to remove the distortions in the allocation of productive resources in the economy as efficient allocation of resources increases investments and enhance the efficiency of banks and other financial service providers.

India initiated her economic reforms process in the early '90s. The principal aim of economic reforms and financial deregulation in India was, in general, to accelerate the growth impetus of the economy. The quality and efficiency of the financial sector influences the well-being and productivity of the real sectors or the entire production process of the economy. Effective financial intermediation enables efficient allocation of economy-wide available resources to their most productive uses. Hence, an efficient financial sector is essential for optimal allocation of productive resources and enhancement of overall growth. In India, the banking sector is the most important and core part of the financial sector. Hence it attracted special attention of the policy makers during the process of economic reforms. Keeping in pace with the overall financial reforms, the banking sector was liberalized and became more market oriented. In this paper, we endeavor to evaluate the trend of efficiency of Indian banks in the deregulated regime. Moreover, we attempt to explain the possible factors influencing their variations.

Large number of studies assessed the effects of financial deregulation on the performance of banks in different countries. There is no general consensus among the academicians regarding the impact of financial deregulation on the efficiency of banking firms of a country. Some studies supported the view that financial reforms enhance banking efficiency (Bonin, Hasan and Wachtel 2005; Denizler, Dinc and Tarimcilar 2007; Zhao, Casu and Ferrari 2006). Nonetheless, some other studies exposed the opposite view (Humphrey and Pulley 1997; Wheelock and Wilson 1999; Gilbert and Wilson 1998; Kamberoglou, Liapis, Simigiannis and Tzamourani 2004).

Bhattacharyya (Bhattacharyya et al 1997) studied the efficiency of 70 Indian commercial banks of different ownership structure for the period 1986-91 using DEA. They constructed one grand frontier for the entire period by considering investments, deposits and advances as outputs and interest expense and operating expense as inputs. They found that foreign own banks in India were somewhat more efficient than privately owned domestic banks but government owned banks were more efficient than both. Ram Mohan and Ray (Ram Mohan and Ray 2004) compared the performance among three categories of 58 banks for the period 1992- 2000 using revenue maximization efficiency approach of DEA taking loans, investments, and other income as outputs; and deposits and operating cost as inputs. The findings of Ram Mohan and Ray reveal that public sector banks are significantly better than Indian private sector banks on revenue maximization efficiency but there is no difference between public sector banks and foreign banks. Some other studies find evidences of improved efficiency of Indian banks after deregulation (Ataullah, Cockerill and Le 2004; Rezvanian, Rao and Mehdian 2008). One investigation finds the opposite (Sensarma 2008).

The Indian banking industry, characterized by the coexistence of public, private and foreign owned banks, is an ideal laboratory to investigate the effect of liberalization on the performance of banks of different ownership structure. After deregulation, the range and nature of services provided by the Indian banks, both fund-based and fee-based, have been extended and diversified enormously. Banks have grown out of their narrow focus on banking services to become financial service providers. Even financial services like insurance and mutual fund services, brokerage and asset management now have been brought under the ambit of the activity of the commercial banks. Indian banks are now much more competitive, market-oriented, technologically upgraded and sophisticated in terms of communication and computing technology with modernized distribution channels such as internet or e-banking apart from traditional branch network and automated teller machines (ATMs). They have now more access to invest in the stock markets with sophisticated financial instruments enabling them to absorb more risks. The most significant achievement of financial deregulation in India is the financial stability over the decades in spite of the financial liberalization. India has successfully developed "protective wall" against major international financial crisis (e.g. Asian financial crises in 1997 and U.S. banking crisis in 2008). In the changed global scenario, the Indian banking industry is getting

greater attention as India is being treated as a new, big and prospective market. Therefore, the estimation of efficiency of the Indian banks and analysis of the factors those make them efficient has been a major concern for the researchers.

Our study departs from the previous studies in a number of ways. First, the methodology used to estimate the efficiency is somewhat different from what has been used in the previous studies. Some of these past studies adopted stochastic approach to estimate the production frontier of the banks. Even the studies employing non parametric methodology, besides being few in number, used the radial measure of technical efficiency. To the best of our knowledge, it is the first attempt to estimate efficiency of Indian banks using the non radial non-parametric Pareto- Koopmans measure. Secondly, to account for the product diversity and heterogeneity of Indian banks, we have estimated banking efficiency on the basis of two different models incorporating two different proxy variables for the non lending services of commercial banks. Thereafter, we have made an attempt of a comparative analysis of these models. Thirdly, almost all the studies on Indian banks, examined the first decade of financial reforms. So these could capture only the instantaneous effects of the first phase of reforms. Since the implementation and adoption of the reforms process in India was slow, even the gradual effects of the first phase reforms actually began to be realized only after mid 1990s. The initial deregulatory measures are expected to have some long run impact on the performance of banks which would be comprehensive only after a couple of years. Previous studies concerning Indian commercial banks were inclusive of neither the gradual effects of first generation banking reforms nor the impact of the second phase of banking reforms. Thus to fill the gap in the literature, we selected our study period to cover from 1996-97 to 2007-08, for the era that transformed the banking sector from regulated to market regime. The methodology used by us has been described in the next section. Section 3 portrays the variables and data source used in this study. Section 4 presents our empirical findings and section 5 concludes this paper.

2. Methodology

2.1 Data Envelopment Analysis

The measurement of efficiency of a firm has been discussed by a number of economists (Farrell 1957; Fare, Grosskopf and Lovell 1985; Lovell 1993). But the initial CCR model was applicable only to technologies operating under the constant returns to scale. In 1984, Banker, Charnes and Cooper (BCC) extended the CCR model to

accommodate technologies that exhibit variable returns to scale. It constructs the best production frontier solely on the basis of the observed data. However, the major limitation of this method is that it eliminates random error. Banker (Banker 1993) showed that while DEA estimator is biased for finite samples, the bias no longer exists for large samples. Therefore, DEA estimator is asymptotically consistent if the sample size is sufficiently large. Technical efficiency of a firm can be measured in two ways. One is the input oriented measure i.e. comparison of the observed level of inputs with the minimum level of input that could produce the observed level of output. On the other hand, the output oriented technical efficiency for a given firm is defined as the ratio of output vector of the firm under consideration using the same input vector to the output vector of a fully efficient firm.

In DEA, a benchmark technology is constructed from the observed input – output bundles of the ‘DMU’s (Decision Making Unit) in the sample on the basis of assumptions given below:

- i) All observed input – output combinations are feasible. An input – output bundle (x, y) is feasible when the output bundle ‘y’ can be produced from the input bundle ‘x’. If we have a sample of ‘N’ firms from an industry producing ‘m’ outputs from ‘n’ inputs, $x^j = (x_{1j}, x_{2j}, \dots, x_{nj})$ is the input bundle of firm ‘j’, $(j = 1, 2, \dots, N)$ and $y^j = (y_{1j}, y_{2j}, \dots, y_{mj})$ is the observed output bundle of firm ‘j’. Then each (x^j, y^j) is a feasible input – output bundle.
- ii) The production possibility set is convex i.e. if two feasible input – output bundles (x^A, y^A) and (x^B, y^B) are considered, the weighted average input – output bundle (x^t, y^t) , where, $x^t = \lambda x^A + (1 - \lambda)x^B$ and $y^t = \lambda y^A + (1 - \lambda)y^B$, $0 \leq \lambda \leq 1$, is also feasible.
- iii) Inputs are freely disposable i.e. if (x^0, y^0) is feasible, then for any $x \geq x^0$, (x, y^0) is also feasible.
- iv) Outputs are freely disposable i.e. if (x^0, y^0) is feasible, then for any $y \leq y^0$, (x^0, y) is also feasible.

In the CCR model, an additional assumption holds i. e. the assumption of constant returns to scale,

- v) If (x, y) is feasible, then for any $k \geq 0$, (kx, ky) is also feasible.

Under CRS, the conical hull constitutes the production possibility set; it is the smallest cone containing the free disposal convex hull of the observed input-output bundles (S).

$$S = \{(x, y) : x \geq \sum \lambda_j x^j, y \leq \sum \lambda_j y^j; \lambda_j \geq 0, (j = 1, 2, \dots, N)\}$$

2.2 Pareto-Koopmans Efficiency

All the measures of efficiency discussed above are radial in nature. One major problem with the radial measure of efficiency is that it fails to reflect all identifiable potential for increasing outputs or reducing inputs, as the case may be. The Russell measure of non-radial output-oriented technical efficiency for firm 'o' is as follows:

$$RM_y = \frac{1}{\rho_y}, \text{ where } \rho_y = \max \frac{1}{m} \sum_{r=1}^m \phi_r$$

$$\text{s. t. } \sum_{j=1}^N \lambda_j y_{rj} \geq y_{ro}; \quad r = 1, 2, \dots, m;$$

$$\sum_{j=1}^N \lambda_j x_{ij} \leq x_{io}; \quad i = 1, 2, \dots, n;$$

$$\phi_r \geq 1; \quad r = 1, 2, \dots, m;$$

$$\sum_{j=1}^N \lambda_j = 1; \quad \lambda_j \geq 0; \quad j = 1, 2, \dots, N$$

The analogous input-oriented Russell measure for non-radial technical efficiency is:

$$RM_x = \rho_x, \text{ where}$$

$$\rho_x = \min \frac{1}{n} \sum_{i=1}^n \theta_i$$

$$\text{s. t. } \sum_{j=1}^N \lambda_j y_{rj} \geq y_{ro}; \quad r = 1, 2, \dots, m$$

$$\sum_{j=1}^N \lambda_j x_{ij} \leq \theta_i x_{io}; \quad i = 1, 2, \dots, n;$$

$$\theta_i \leq 1; \quad i = 1, 2, \dots, n;$$

$$\sum_{j=1}^N \lambda_j = 1; \quad \lambda_j \geq 0; \quad j = 1, 2, \dots, N.$$

An input-output bundle is Pareto-efficient only when the Russell measures of input and output oriented technical efficiency scores are equal to unity, i.e.

$$RM_x(x^0, y^0) = RM_y(x^0, y^0) = 1$$

where (x^0, y^0) is optimal solution of the above function.

A non-radial Pareto-Koopmans measure of technical efficiency of the input-output pair (x^0, y^0) can be computed as,

$$\bar{\Gamma} = \min \left(\frac{1}{n} \sum_{i=1}^n \theta_i, \frac{1}{m} \sum_{r=1}^m \phi_r \right)$$

Subject to,

$$\sum_{j=1}^N \lambda_j y_{rj} \leq \theta_r \phi_r y_{r0}; \quad r = 1, 2, \dots, m;$$

$$\sum_{j=1}^N \lambda_j x_{ij} \leq \theta_i x_{i0}; \quad i = 1, 2, \dots, n;$$

$$\phi_r \leq 1; \quad r = 1, 2, \dots, m;$$

$$\theta_i \leq 1; \quad i = 1, 2, \dots, n;$$

$$\sum_{j=1}^N \lambda_j = 1; \quad \lambda_j \geq 0; \quad j = 1, 2, \dots, N$$

Thus, (x^0, y^0) is Pareto-Koopmans efficient if and only if $\phi_r = 1$ for each output r and $\theta_i = 1$ for each input i implying $\Gamma = 1$. The objective function of this programme is non-linear. By linearizing the objective function we get,

$$\Gamma = f(\theta, \phi) = f(\theta^0, \phi^0) + \sum (\theta_i - \theta_i^0) (\delta f / \delta \theta_i)_0 + \sum (\phi_r - \phi_r^0) (\delta f / \delta \phi_r)_0$$

where, $\delta f / \delta \theta_i = \frac{1}{n} / \left(\frac{1}{m} \sum_{r=1}^m \phi_r \right)$, and

$$\delta f / \delta \phi_r = - \frac{1}{n} \sum_{i=1}^n \theta_i / \left(\frac{1}{m} \sum_{r=1}^m \phi_r \right)^2$$

Thus, setting $\theta_i^0 = 1$ for all i and $\phi_r^0 = 1$ for all r ,

$$\Gamma \approx 1 + \frac{1}{n} \sum_{i=1}^n \theta_i - \frac{1}{m} \sum_{r=1}^m \phi_r$$

A non-radial Pareto-Koopmans measure of technical efficiency of DMU₀ can be computed by solving the LP problem:

$$\text{Min} = \text{Min } \tilde{\Gamma} = \frac{1}{n} \sum_{i=1}^n \theta_i - \frac{1}{m} \sum_{r=1}^m \phi_r$$

Subject to,

$$\sum_{j=1}^N \lambda_j y_{rj} \geq \phi_r y_{r0}; \quad r = 1, 2 \dots m;$$

$$\sum_{j=1}^N \lambda_j x_{ij} \leq \theta_i x_{i0}; \quad i = 1, 2 \dots n;$$

$$\phi_r \geq 1; \quad r=1, 2 \dots m$$

$$\theta_i \leq 1; \quad i = 1, 2 \dots n;$$

$$\sum_{j=1}^N \lambda_j = 1; \quad \lambda_j \geq 0; \quad j = 1, 2 \dots N$$

Once we obtain the optimal (θ^*, ϕ^*) from this problem, the Pareto-Koopmans efficiency is measured by,

$$\Gamma^* = \frac{1}{n} \sum_{i=1}^n \theta_i^* / \frac{1}{m} \sum_{r=1}^m \phi_r^*$$

In our study, we actually estimate this “Pareto-Koopmans” efficiency of banks².

2.3 Second-stage analysis: Logistic model

In order to understand the determinants of the performance of the banks and to approximate the magnitude of their impact, a second stage analysis is particularly useful. At this point, we construct an econometric regression model with the efficiency scores as the dependent variable. The regression model is as follows: $EFF_{it} = f(X_{it})$ where EFF_{it} is technical efficiency of i th bank at the period t , X_{it} is the i th independent variable at t th period. Since dependent variable is bounded between zero and one, it is necessary to use a non-linear specification of the functional form, rather than a linear regression model. We put up a logistic model following Maudos and Guevara (2007)³. Using the above equation in the logistic functional form, one

² Readers interested in methodology are suggested to consult (Ray 2004), *Data Envelopment Analysis: Theory and techniques for economics and operations research*, Cambridge University Press.

³ Logistic model was originally developed by a Belgian mathematician Pierre Verhulst in 1838.

can write *logistic* $EFF_{it} = \frac{e^{\sum \beta_i x_{it}}}{1 + e^{\sum \beta_i x_{it}}}$, which can be easily linearized via the log transformation as follows:

$$\ln \left[\frac{\text{Logistic}(EFF_{it})}{1 - \text{Logistic}(EFF_{it})} \right] = \sum \beta_i x_{it} + u_t$$

Here β_i is the i th unknown parameter to be estimated.

2.4 Hypotheses

On the basis of the DEA and logistic regression, we test the following hypotheses regarding the efficiency of Indian commercial banks during 1997 to 2008.

- i) On an average, technical efficiency of Indian commercial banks has increased in this period.
- ii) During the period, the efficiency gap between the efficient banks and the inefficient banks has also increased.
- iii) The average technical efficiency of the public sector banks is greater than those of the domestic private banks and foreign banks operating in India in producing lending and non lending services.
- iv) The domestic banks, i.e. the public sector and domestic private banks are, on an average, less efficient than their foreign counterpart when off balance sheet activities are chosen as one of the outputs of banks.
- v) The variations in the efficiency of the Indian banking sector largely depend upon some factors such as capital adequacy, size, asset quality, liquidity, management quality, profitability, ownership structure of the bank and market concentration.

3. Specification of Variables and Data

3.1 Inputs and Outputs

In our study, keeping in mind our objective of investigation, we have selected three inputs and three outputs those capture traditional 'lending activities' as well as 'non-lending activities' of commercial banks. To account for the product diversity of Indian commercial banks, we have built up two models. These two models - model A and model B have been constructed as follows:

The selected input and output set for model-A is: Inputs: i) number of employees, ii) equity capital (core capital + reserves & surpluses), iii) total loanable fund (deposits + borrowings); Outputs: i) advances, ii) investments, iii) non interest income.

Explanation of the three input variables is quite obvious. The first two are labour and capital inputs. As we consider commercial banks as financial intermediaries, its total loanable fund is treated as third input. As far as the outputs are concerned, the first two outputs stand for traditional lending activities of banks or two obvious outputs of bank's financial intermediation. In model-A, non interest income has been selected as a proxy for non-lending banking activities. A different proxy for bank's non lending activities may be the value of the off-balance sheet activities. Therefore, model-B includes all the variables same as in model-A, except the third output. In model-B, we take off-balance sheet activities⁴ of Indian commercial banks as the proxy variable for non-lending activities of banks. Consequently, in this study, we attempt to investigate whether the inclusion of off balance sheet items as an output for the efficiency analysis changes the performance of the banks of different ownership structure. Subsequently, we select some plausible factors those influence or determine the efficiency of banks in India. The first probable determinant of technical efficiency of a commercial bank is its capital cushion. We used CRAR or the risk adjusted capital adequacy ratio measured according to the Basel II norm which incorporates risk elements and value losses while calculating the regulatory capital base of a bank. Second, bank size has always been considered an important determinant of bank's efficiency. In this study, bank size has been measured by the log of the value of the bank's total asset. Third, asset quality of the bank is measured by the ratio of net non-performing asset to net advances of the bank. We adopted this indicator as a proxy for the bank's asset quality. Fourth, to account for the effects of profitability of the bank on its efficiency level, we rely on the ratio of operating profit⁵ to total assets of the bank. Fifth, liquidity of a bank may also be a very crucial determinant of technical efficiency. Liquidity has been defined as the ratio of total liquid assets of the bank (such as cash in hand, money at call and short-notice and non-approved securities like bonds and debentures) to total assets. Sixth, we have constructed a Herfindahl Index of total business (deposits + advances) for each year. It stands for a parameter of measuring competitiveness or market concentration in the banking industry in a particular year. Seventh, to capture the impact of the managerial quality of

⁴Forward exchange contracts, guarantees, acceptances, endorsements are the off balance sheet items of the Indian commercial banks.

⁵Operating profit is the total earnings of the bank less the total expenses excluding the provisions and contingencies

a bank, in line with the existing literature, the ratio of total operating expenditure to total asset has been used as proxy (Peria, Soledad and Schmukler 2001; Das and Ghosh 2007). Eighth, to take into account the effects the ownership structure of the bank, we have used two dummy variables – one for the public sector banks and another for foreign banks.

3.3 Data

Bank wise unbalanced panel data of all scheduled commercial banks of India during the time period 1996-97 to 2007-08 has been collected from the various publications of the Reserve Bank of India (www.rbi.org.in). The input and output variables of each year, except the number of employees were deflated by the GDP deflator of the respective year. Nonetheless, we should mention here that the data for non-interest income is available for all the years of our study period, but data for the value of off-balance sheet items is available only from 1998-99. Consequently, model-A runs for the entire study period from the year 1996-97, but model- B could be estimated for the period starting from 1998-99.

4. Empirical Findings

4.1 First – Stage Efficiency Analysis

Our study attempts to shed light into variations and trend of efficiency of the Indian commercial banking industry as a whole, in addition to banks of different ownership structure separately. Therefore, we proceed our analysis by segregating the entire Indian commercial banking sector (ALL) into three subgroups according to their ownership pattern – public sector banks (PUB), domestic private sector banks (PVT) and foreign owned banks (FRN). The overall efficiency trend during our study period has been described in this section. Table 1 and table 2 depict the results of technical efficiency scores of the entire sample set for model-A and model-B respectively.

Some important inferences can be made from table 1. First, the number of banks in the sample declines steadily throughout our study period. In the post deregulated regime some of the weak banks have been closed or merged to or acquired by some large banks.

Table 1 approximately here

Second we find no uniform pattern of mean efficiency scores. Table 1 depicts that the mean efficiency is the highest in 1998 and lowest in the year 2006. In 2002, there is a sudden rise of mean efficiency from 0.773 to 0.822. We can easily envisage that

Table 1: Summary Results of Technical Efficiency Analysis: Model A

| YEAR | No. of units | Mean | S.D. | No. of banks on frontier | %of banks on frontier | Mean TE of the inefficient banks |
|--------------|--------------|-------|-------|-----------------------------|--------------------------|-------------------------------------|
| 1997 | 94 | 0.798 | 0.218 | 43 | 45.74 | 0.628 |
| 1998 | 98 | 0.843 | 0.181 | 52 | 53.06 | 0.666 |
| 1999 | 99 | 0.813 | 0.219 | 49 | 49.49 | 0.631 |
| 2000 | 100 | 0.814 | 0.229 | 53 | 53.00 | 0.604 |
| 2001 | 97 | 0.773 | 0.236 | 42 | 43.30 | 0.599 |
| 2002 | 92 | 0.822 | 0.217 | 41 | 44.57 | 0.679 |
| 2003 | 89 | 0.811 | 0.219 | 38 | 42.70 | 0.671 |
| 2004 | 88 | 0.829 | 0.224 | 41 | 46.59 | 0.680 |
| 2005 | 84 | 0.799 | 0.262 | 42 | 50.00 | 0.597 |
| 2006 | 82 | 0.744 | 0.253 | 34 | 41.46 | 0.566 |
| 2007 | 81 | 0.757 | 0.259 | 37 | 45.67 | 0.553 |
| 2008 | 78 | 0.813 | 0.232 | 36 | 46.15 | 0.652 |
| TOTAL SAMPLE | 1082 | 0.804 | 0.229 | 508 | 46.86 | 0.626 |

Note: The number of units here refers to total number of observations in that year in our sample. Fifth column shows percentage of banks on the frontier in the respective years. The last column exhibits the mean efficiency of the banks not operating on the efficiency frontier or banks with technical efficiency less than unity. Source: Author's calculations

out of twelve years of our study technical efficiency scores are more than average in seven years. But in 2001, there is a sudden decline in the mean efficiency of all Indian commercial banks taken together to 0.773. As revealed in the RBI publication "Trend and Progress of Banking" for the year 2000-01, the setback of banking performance in year 2000-2001 was marked by higher operating expenditure of banks largely due to introduction for Voluntary Retirement Scheme. The growth in income of scheduled commercial banks in this year was 14.9 percent, while that in expenditure was 16.7 percent. In the 2002 again showed an upward shift in the mean efficiency of Indian banks. The higher mean of technical efficiency of Indian banking sector continues for the next three years. In 2002, while income of scheduled commercial banks witnessed a large growth mainly due to rise in non lending banking activities, their operating cost decreased mainly as result of decline in the wage bill. Bank credit flow was very good mainly on account of rise in housing loan (38.4 percent). Moreover, "non-priority sector personal loans" of scheduled commercial banks rose

from 4.9 percent to 10 percent during this financial year [Trend and Progress of Indian Commercial Banks, 2001-02]. 2004-05 was another year of poor efficiency of the Indian banking industry as a whole. In a rising interest rate scenario, investment by banks declined significantly. Foreign currency borrowing by Indian commercial banks increased during the period. It resulted into a rise of scheduled commercial banks' international liabilities by 15.5 percent during 2004-05 as compared to 10.1 percent in 2003-04.

In 2008, mean efficiency for all banks rises to 0.813 from 0.757 in 2007. During this time, Indian banks, encouraged by the second generation reforms, started exploring non traditional sources of income. Again operating costs of banks decreased because of the continued emphasis in technical upgradation of banking operations. Therefore, a rise in non interest income and fall in operating expenditure combined together outweighed the decline in the interest income in 2008 and may have resulted into increased efficiency.

Third, the percentage of banks lying on the frontier varies from 41 percent to 53 percent. On an average, about 50 percent of the banks are situated below the frontier. The standard deviation of their efficiency scores is a good estimator of the variation of performance of the banks or dispersion existing in the efficiency of the banking sector. Another indicator is the mean efficiency scores of the inefficient banks. If this score falls, we may infer that the performance difference between the efficient banks and the inefficient banks increased or the inefficient banks are situated far from the efficiency frontier. To strengthen our argument, both the indicators imply the same conclusion. Upto 2007, the difference between efficient banks and inefficient banks showed a sign of going up both in terms of standard deviation and mean efficiency scores of the inefficient bank, with a few exceptions. In 2007, standard deviation is the highest and mean efficiency of banks lying below the efficiency frontier is the lowest. Only very recently, variations in performance in the Indian banking industry has reduced.

Table 2 approximately here

From table 2, some inferences can be made. Average efficiency of banks is lower in model B as compared to model A, for every year of the study period as well as for the entire sample set. It implies that inclusion of the off-balance sheet items in the output list of the Indian commercial banks reduces their efficiency scores. In 2003 and 2004, there is slight increase in efficiency. In 2005 and 2006, it again falls. In

Table 2: Summary Results of Technical Efficiency Analysis: Model B

| Year | No. of Units | Mean | Std Dev. | No. of banks on the frontier | % of banks on the frontier | Mean Efficiency of inefficient banks |
|------|--------------|-------|----------|------------------------------|----------------------------|--------------------------------------|
| 1999 | 93 | 0.636 | 0.389 | 44 | 47.31 | 0.310 |
| 2000 | 98 | 0.618 | 0.393 | 44 | 44.9 | 0.306 |
| 2001 | 92 | 0.599 | 0.396 | 39 | 42.39 | 0.317 |
| 2002 | 91 | 0.503 | 0.403 | 31 | 34.07 | 0.259 |
| 2003 | 71 | 0.579 | 0.409 | 30 | 42.25 | 0.271 |
| 2004 | 76 | 0.595 | 0.394 | 32 | 42.11 | 0.301 |
| 2005 | 82 | 0.547 | 0.435 | 36 | 43.9 | 0.192 |
| 2006 | 82 | 0.486 | 0.435 | 32 | 39.02 | 0.158 |
| 2007 | 81 | 0.499 | 0.447 | 33 | 40.74 | 0.156 |
| 2008 | 78 | 0.482 | 0.438 | 29 | 37.18 | 0.193 |

Note: The number of units here refers to total number of observations in that year in our sample. Fifth column shows percentage of banks on the frontier in the respective years. The last column exhibits the mean efficiency of the banks not operating on the efficiency frontier or banks with technical efficiency less than unity.

Source: Author's calculations.

2008, mean efficiency falls to 0.482, which is the lowest. Mean efficiency is the highest at 0.636 in 1999. Third, the dispersion in the efficiency level of banks measured by the standard deviation of the technical efficiency scores has risen from its adjacent previous year throughout the study period, except in 2004 and 2008. Dispersion was lower in initial three years of study period. It can also be noted that few banks were efficient in raising OBS. The efficiency gap between the efficient and the inefficient banks is large in case of model B than model A (as shown in table 1) indicating greater variations in performance among Indian commercial banks in producing OBS items. The similar finding can be drawn from the mean efficiency of the banks below the frontier. With few exceptions, the number of banks situating on the efficient frontier also declined drastically over the years. It again implies that the difference between the efficient banks and banks lying below the frontier increased in this period.

In table 3 we present the bank group-wise mean efficiency scores using model A to illustrate the association between ownership structure of Indian banks and their efficiency level. Figure 1 is the graphical presentation of table 3.

Table 3 approximately here

Figure 1 approximately here

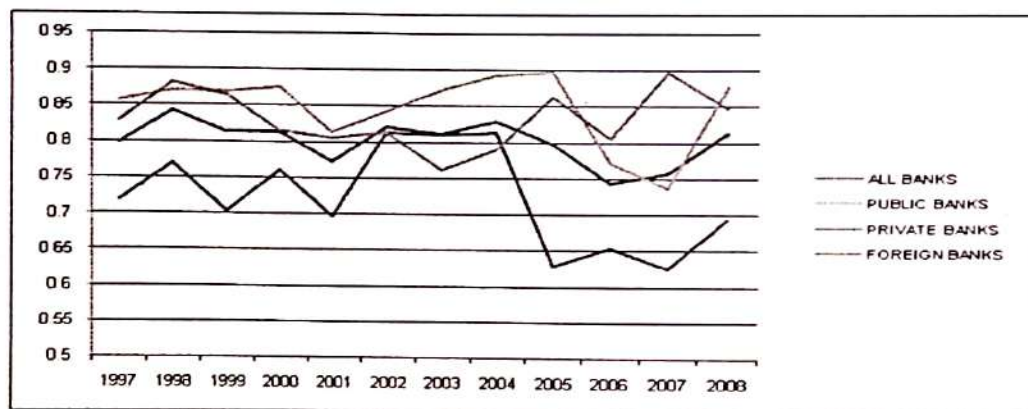
Table 3: Bank Group wise Mean Technical Efficiency and Standard Deviation: Model A

| Year | ALL | | PUB | | PVT | | FRN | |
|------|-------|---------|-------|---------|-------|---------|-------|---------|
| | Mean | Std Dev | Mean | Std Dev | Mean | Std Dev | Mean | Std Dev |
| 1997 | 0.798 | 0.218 | 0.856 | 0.168 | 0.720 | 0.203 | 0.829 | 0.260 |
| 1998 | 0.843 | 0.181 | 0.870 | 0.165 | 0.771 | 0.183 | 0.881 | 0.254 |
| 1999 | 0.813 | 0.219 | 0.869 | 0.173 | 0.703 | 0.222 | 0.865 | 0.180 |
| 2000 | 0.814 | 0.229 | 0.875 | 0.159 | 0.761 | 0.207 | 0.815 | 0.214 |
| 2001 | 0.773 | 0.236 | 0.813 | 0.175 | 0.697 | 0.237 | 0.805 | 0.276 |
| 2002 | 0.822 | 0.217 | 0.843 | 0.166 | 0.814 | 0.196 | 0.813 | 0.262 |
| 2003 | 0.811 | 0.219 | 0.872 | 0.141 | 0.811 | 0.206 | 0.763 | 0.267 |
| 2004 | 0.829 | 0.224 | 0.892 | 0.127 | 0.813 | 0.193 | 0.791 | 0.271 |
| 2005 | 0.799 | 0.262 | 0.897 | 0.132 | 0.628 | 0.264 | 0.863 | 0.300 |
| 2006 | 0.744 | 0.253 | 0.772 | 0.220 | 0.653 | 0.236 | 0.806 | 0.284 |
| 2007 | 0.757 | 0.259 | 0.737 | 0.190 | 0.625 | 0.285 | 0.897 | 0.230 |
| 2008 | 0.813 | 0.232 | 0.877 | 0.133 | 0.694 | 0.223 | 0.848 | 0.273 |

Note: ALL: all Indian scheduled commercial banks, PUB: Public banks, PVT: domestic private banks, FRN: foreign banks.

Source: Author's calculations.

Figure 1: Year wise and Bank Group wise Mean Technical Efficiency: Model A



Our findings in table 3 reveal that, if the value of traditional non lending banking activities are measured in terms of non interest income, as in model A, in 1997, the public sector bank group was the most efficient bank group with mean efficiency score 0.856 followed by the foreign bank group with mean efficiency score 0.829. The domestic private sector bank group was the worst performing bank group with mean efficiency score 0.720 in 1997. In the next year 1998, the foreign banks performed better than the public sector banks and attained higher mean efficiency score. However, after 1998, the efficiency score of the foreign banks were less than efficiency scores of public sector banks except the years 2006 and 2007. The domestic private sector banks witnessed best performance in 2002, 2003 and 2004 when the mean efficiency scores of this bank group were higher than that of the foreign bank group but less than public sector banks. Table 3 shows that standard deviation of efficiency scores is higher for foreign banks followed by private sector banks and public sector banks save 1999 and 2007. It clearly reveals that variance of efficiency scores is lowest for public sector banks. Our analysis revealed that the public sector commercial banks of India are more efficient compared to domestic private counterparts. Moreover, most of the time, with few exceptions, public banks showed better performance than the foreign owned banks as well.

Now let us take the results of model B as shown in table 4. The picture is a bit different from model-A. Table 4 and figure 2 clearly reveal that foreign banks of India are the most efficient in producing non traditional sophisticated non lending services measured in terms of off balance sheet exposure of banks. Public sector banks, in spite of being the second efficient bank group for model B, have much lower mean efficiency scores than that of the foreign bank group. This finding is opposite to the results obtained from model A. However, the variance of efficiency score of public sector banks was more or less stable and the variance of efficiency scores of public sector undertakings is least compared to the variances of other two groups.

Table 4 approximately here

Figure 2 approximately here

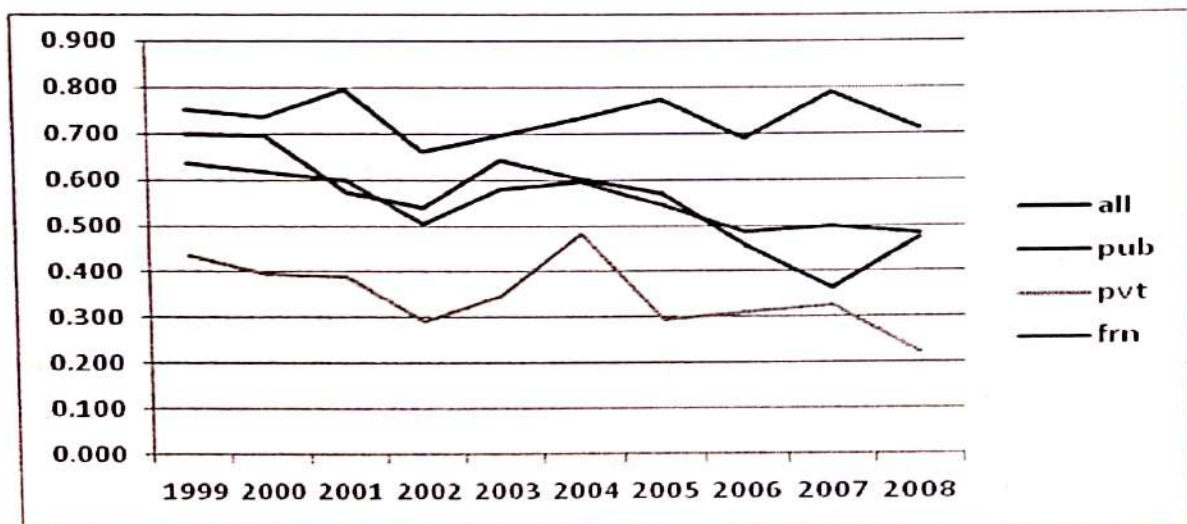
However, the domestic private banks represents the least efficient bank group for both the models. The major difference seen in figure 1 and figure 2 is that, for model A, domestic private sector bank group showed a downturn in 2007 and then an

Table 4: Bank Group wise Mean Technical Efficiency and Standard Deviation: Model B

| Year | ALL | | PUB | | PVT | | FRN | |
|------|-------|---------|-------|---------|-------|---------|-------|---------|
| | Mean | Std Dev | Mean | Std Dev | Mean | Std Dev | Mean | Std Dev |
| 1999 | 0.636 | 0.389 | 0.699 | 0.339 | 0.437 | 0.413 | 0.754 | 0.344 |
| 2000 | 0.618 | 0.393 | 0.695 | 0.343 | 0.396 | 0.398 | 0.736 | 0.355 |
| 2001 | 0.599 | 0.396 | 0.574 | 0.389 | 0.391 | 0.392 | 0.796 | 0.306 |
| 2002 | 0.503 | 0.403 | 0.538 | 0.380 | 0.292 | 0.352 | 0.662 | 0.390 |
| 2003 | 0.579 | 0.409 | 0.644 | 0.350 | 0.350 | 0.394 | 0.697 | 0.420 |
| 2004 | 0.595 | 0.394 | 0.602 | 0.348 | 0.485 | 0.418 | 0.734 | 0.390 |
| 2005 | 0.547 | 0.435 | 0.570 | 0.399 | 0.296 | 0.406 | 0.773 | 0.375 |
| 2006 | 0.486 | 0.435 | 0.460 | 0.392 | 0.312 | 0.413 | 0.689 | 0.429 |
| 2007 | 0.499 | 0.447 | 0.364 | 0.376 | 0.327 | 0.438 | 0.789 | 0.382 |
| 2008 | 0.482 | 0.438 | 0.474 | 0.381 | 0.223 | 0.372 | 0.713 | 0.432 |

Note: ALL: all Indian scheduled commercial banks, PUB: Public banks, PVT: domestic private banks, FRN: foreign banks.

Source: Author's calculations.

Figure 2: Bank Group wise Mean Technical Efficiency and Standard Deviation: Model B

upward trend in the last year of the study period. Surprisingly, figure 3 depicts just the opposite. Mean technical efficiency scores for the public sector bank group in model B rises in 2008, while those of the other two groups are showing downward

trend in the recent past. This finding may lead to an inference that in the recent years, public banks are emphasizing more on to manage the off-balance sheet activities than the past years.

We observed that change in only one output variable invariably changed the results enormously. From the above tables and inferences it is clear that inclusion of off-balance sheet items as an output of banks invariably and significantly changes the efficiency scores of the banks. This observation necessitates further research regarding the specification of bank inputs and outputs of commercial banks. Further research should be conducted to find out whether off-balance sheet items should be incorporated as outputs of banks or not.

4.2 Second –Stage Logistic Model Analysis

The logistic regression model in this study has been estimated by taking the technical efficiency scores as the dependent variable and the explanatory variables proposed in section 3.2, as the independent determinants. Separate logistic models have been estimated for model-A and model-B and the results have been presented in table 5 and table 6 below.

Logistic Model Analysis: Model A

The findings of our multivariate analysis has been presented in table 5.

Table 5 approximately here

It is important to note that both bank size and bank profitability have highly significant positive impact on the bank's efficiency level. It means larger and more profitable banks seem to be technically more efficient. Management quality variable i.e. ratio of operating expenses to total assets has significant positive coefficient. This proxy variable is expected to vary negatively with efficiency of the bank. A possible explanation may be that due to some exogenous events or external adversities, the bank management with higher efficiency level had to allocate additional expenditure. As a result, even if the bank management is efficient in producing banking services, its operational costs is quite high. Perhaps this is an indication of the existence of the rent seeking behaviour on the part of management of technically efficient banks. The proxy for quality of asset, that is NPA has a negative effect on the efficiency of banks, as is expected, though not significant. It suggests that banks with higher level of non performing assets are supposed to have low quality assets and therefore result into lower technical efficiency. Management of the banks with high NPAs

Table 5: Estimation Results of Logistic Model: Model A (Sample Size = 1076)

| | coefficient | std. error | t-ratio | |
|------|-------------|------------|---------|-----|
| SIZE | 0.297 | 0.075 | 3.920 | *** |
| MGMT | 0.430 | 0.105 | 4.105 | *** |
| CAP | 0.001 | 0.005 | 0.232 | |
| NPA | -0.024 | 0.024 | -1.000 | |
| HFI | -0.302 | 0.178 | -1.699 | * |
| LQD | 0.030 | 0.020 | 1.528 | |
| PRFT | 0.527 | 0.087 | 6.093 | *** |
| PUB | 1.109 | 0.444 | 2.501 | *** |
| FRN | 2.751 | 0.433 | 6.373 | *** |

Adjusted R Square 0.581

*Note: SIZE: Log of the total asset; MGMT: Ratio of operating expenditure to total assets; CAP: Risk Adjusted Capital adequacy ratio; NPA: Ratio of net non performing assets to net advances; PRFT: Ratio of operating profit to total assets; HFI: Herfindahl Index of total business of the bank for the specific year; LQD: Ratio of liquid assets to total assets; PUB, FRN: Dummy variables for public and foreign ownership respectively. *** Significant at 1%, ** Significant at 5% and * Significant at 10%.*

Source: Author's own calculations.

have to incur additional costs, human resources and managerial effort to recover bad loans. This affect the bank's regular activities and may affect its efficiency negatively. Negative coefficient of HFI, with statistical significance, implies that with increased competition and decreased concentration of business in the banking industry of India after financial reforms, efficeincy of banks has improved. Both PUB and FRN dummies have significant positive impact leading to the conclusion that both public control and foreign control on banking firm raises its efficiency compared to the domestic private ownership.

Logistic Model Analysis: Model B

We further estimated Logistic model with the same of explanatory variables as independent variables and efficiency scores obtained from model B as dependent variable. The results have been shown in table 6.

Table 6 approximately here

Table 6: Estimation Results of Logistic Model: Model B (Sample Size = 843)

| | coefficient | std. error | t-ratio | |
|------|-------------|------------|---------|-----|
| SIZE | 0.138 | 0.087 | 1.585 | |
| MGMT | 0.108 | 0.117 | 0.924 | |
| CAP | -0.012 | 0.008 | -1.544 | |
| NPA | -0.055 | 0.027 | -2.033 | ** |
| HFI | -0.279 | 0.210 | -1.323 | |
| LQD | 0.048 | 0.023 | 2.070 | ** |
| PRFT | 0.197 | 0.102 | 1.921 | * |
| PUB | 1.809 | 0.493 | 3.667 | *** |
| FRN | 5.429 | 0.502 | 9.011 | *** |

Adjusted R Square 0.312

Note: SIZE: Log of the total asset; MGMT: Ratio of operating expenditure to total assets; CAP: Risk Adjusted Capital adequacy ratio; NPA: Ratio of net non performing assets to net advances; PRFT: Ratio of operating profit to total assets; HFI: Herfindahl Index of total business of the bank for the specific year; LQD: Ratio of liquid assets to total assets; PUB, FRN: Dummy variables for public and foreign ownership respectively. *** Significant at 1%, ** Significant at 5% and * Significant at 10%.

Source: Author's own calculations.

The result indicates that technical efficiency scores of model B are positively related to the size of the banks, though not significant. The efficiency of banks is negatively related to the level of non performing assets of the bank and the coefficient is statistically significant. Like model A, the coefficients of the dummy variables for public and foreign ownership have positive impact on the efficiency of banks and these relationships are statistically significant. We find significant positive impact of profitability and liquidity of bank. As banks become profitable, it can reinvest its profit to improve its working conditions, operational process etc. All these obviously help to raise the bank's efficiency. Although not statistically significant, the positive relationship between the management quality variable and efficiency as well as the negative impact of market concentration on the technical efficiency of banks.

5. Concluding Remarks

This paper endeavors to find out the long term or gradual effects of the first generation financial reforms and instantaneous impact of the second generation reforms on the performance of Indian banks measured in terms of their efficiency using a non radial DEA approach. Further attempts have been made to find out the major determinants of efficiency and to gauge the magnitude of their effects on variations in efficiency across banks. Taking into account the vast diversity in the banking business in India and the differences in organizational structure, policies, objectives, priorities and services among Indian banks, we estimated two slightly different models and found some interesting results indeed.

During the phase of financial reforms, several bank mergers, acquisitions and bank closures took place. We found a sign of significant improvement in the overall performance of the banks measured in terms of their technical efficiency in producing traditional lending and non lending banking services. The conventional wisdom holds that private sector is more efficient and more productive compared to public sector but this is not appropriate for Indian private sector banks for most of the period of investigation. However, average efficiency score of the Indian commercial banks is very low when the off-balance sheet activities are treated as a bank output. It implies that even after two decades of financial liberalization, Indian commercial banks, especially the public sector and domestic private sector banks are relatively less equipped in managing the off-balance sheet activities. With some minor exceptions, most of the time public banks secure the position of the most efficient bank group immediately followed by the foreign banks if model A is considered.

The result is just the opposite for model B where off-balance sheet items are considered as a proxy for non lending banking services. Accordingly, foreign banks are the most efficient banks in this model, followed by the public sector banks. Moreover, there is a massive gap between the mean efficiency of foreign banks and that of the public banks in model B. Indian domestic private sector banks are the least efficient banks in both the models considered according to our study.

The multivariate analysis based on two models depicts the impact of some exogenous factors on bank performance. Again, evidences suggest that higher efficiency of Indian commercial banks is associated with the public ownership of Indian banks rather than domestic private ownership. We witnessed that inclusion of off-balance sheet in the output list of the Indian commercial banks has changed the efficiency

scores. This observation necessitates further research regarding the specification of bank inputs and outputs of commercial banks. Results indicate that even after a significant period of time, the business on off-balance sheet activities are still confined to the foreign owned banks in India. Public banks have a long way to go in this area of business. Indian domestic private banks (with few exceptions) have not yet acquired specialized skill in these activities. Further research should be conducted to find out whether off-balance sheet items should be incorporated as outputs of banks or not. Multivariate results of both the models exhibit more or less the same outcomes. Indian banks' efficiency increases with their size, profitability, liquidity, asset quality and market competition.

Consequently, we can infer that, in spite of a major share of the total business of the Indian banking sector controlled by public ownership, there is evidence of polarisation of the Indian banking business into two directions. In one hand, there are public banks with extensive branch network in rural and remote areas, working in the path of "financial inclusion", extending loans to priority and needy sectors with some national goals in addition to their business goals. The performance of the public banks is better in case of traditional lending and non-lending banking business. But the public sector banks have to go a long way in order to achieve significant efficiency in producing modern and sophisticated banking activities like off balance sheet items. To improve the performance of the public sector banks in the off-balance sheet items some policies like proper training programme for the bank employees, appointment of well equipped bank management, installation of sophisticated technology for banking operation is required.

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Wealth Related Health Inequalities in India

*Dr. Debapasad Sarkar**

Abstract

This article utilizes the National Family Health Survey-3 data and presents an empirical assessment of wealth-related inequality in health outcome and health resource use in India. It undertakes a state-level analysis of inequities by employing the widely accepted measures of health concentration curves and health concentration indices. It finds that the poorer sections of the population suffer very much in respect of ill health outcome and in case of risky behavior or life style diseases, the richer sections of the population are in disadvantageous position. In the context of inequality of resource use, wealthier sections of the population are more inequitable than poorer where the emergency services are related to huge out-of-pocket expenditure. The analysis reveals that the degree of health outcome inequalities escalates with the rising wealth levels of the population. Again the degree of inequalities in health resource use of basic services escalates with the rising wealth levels of the population. The poorer sections have different needs and therefore, planning and intervention necessitates an understanding of the sources of inequality and recognition of the vulnerable groups to arrive at efficient resource allocation and policy decisions.

JEL Classification: I14, , I15,R11

Keywords: Health Inequality, Wealthy-Less wealthy, health outcome, health resource.

1. Introduction

In India, with the rapid socio-economic progress, the widening socio-economic disparities are posing challenges to health sectors. These challenges are related to the issues of growth with equity¹ in health status and healthcare. In any country the

* Assistant Professor, Department of Economics, Barrackpore R. S. N. College, Kolkata-700120, email: s19debaprasad@gmail.com. Contact no. 9231613402.

state of health is measured in terms of life expectancy, mortality rates, fertility rates and many more, depending on the factors like income, nutrition, sanitation, safe drinking water, social infrastructure, medical care facilities, employment status, poverty, etc. It is revealed (MoHFW, 2012-13) that there is slight improvement in sex ratio (933 per 1000 persons in 2001 to 940 in 2010) in comparison to fall in child sex ratio from 927 per 1000 boys in 2001 to 914 in 2010. Haryana (830), Punjab (846) and J&K (859) are at the lowest bottom of the child sex ratio in the country. The differences in life expectancy at birth may be due to the variation in socio-economic conditions, 63.5 years in 2006, highest in Kerala -74 and lowest in 56 years in Madhya Pradesh; this difference of 18 years is higher than the provincial differences in life expectancy in China (Burd-Sharps, S.2008), or the interstate differences in the USA (WHO,2008). Life expectancy at birth is 63 years for boys and 66 years for girls, and the mortality rate for children younger than 5 years is 69 per 1000 live births in India—higher than the average for South East Asia (63 per 1000 live births, WHO, 2008). A fifth of maternal deaths and a quarter of child deaths in the world occur in India. There is a slight improvement in maternal health as well as infant mortality rates from the previous years but the rural areas (14.9) are lagging behind the urban areas may be due to the lower literacy rate, poverty, inadequate health facilities, desire for male child etc.

In India, individuals with the greatest need for health care have the greatest difficulty in accessing health services and are least likely to have their health needs met (Gaudin S, Yazbeck, AS. 2006). We conceptualize access as the ability to receive a specific number of services, of specified quality, subject to a specified constraint of inconvenience and cost, with use of selected health services as a proxy for access. To show the persisting inequities in health care in India, we focus on access to maternal and child health services since the disease burden relating to communicable, maternal, and prenatal disorders can be partly addressed by access to these services. Use of preventive services such as antenatal care and immunizations remains sub-optimum, with much variation in their use by gender, socioeconomic status, and location (Y Balarajan, S Selvaraj, S V Subramanian, 2011). In 2005–06 (NFHS-III), national immunization 3 coverage was 44%. Immunization coverage varies by household wealth and education, with absolute and relative inequalities² generally showing reduction with time (figure 4). Inequalities exist by caste—eg, in 2005–06, immunization coverage among scheduled tribes and scheduled castes was 31.3%

and 39.7%, respectively, compared with 53.8% among other castes, and absolute inequalities between these castes increased with time. Coverage remains higher in urban areas (58%) than in rural areas (39%), although absolute and relative urban-rural differences have decreased with time. The absolute gender gap has increased from 2.6% in 1992–93 to 3.8% in 2005–06.

Similar patterns in inequalities have been noted for antenatal care coverage. In 2005–06, 77% of Indian women received some form of antenatal care during their pregnancies in the 5 years before the survey, although only 52% had three or more visits. Overall, coverage of antenatal care has improved with time. Inequalities by wealth, education, and urban or rural residence, persist, however, even though absolute and relative inequalities have decreased with time. Differences between states are substantial in both the number of antenatal visits and the type of services provided during these visits.

Inadequate access to appropriate maternal health services remains an important determinant of maternal mortality. Although the proportion of deliveries in institutions has increased with time, only 38.7% of women in India report giving birth in a health facility for their most recent birth in 2005–06. Women in the richest quintile were six times more likely to deliver in an institution than were those in the poorest quintile. Although this relative difference in inequality has decreased with time, the absolute difference in the proportion of delivery in an institution between the poorest and richest quintiles has increased from 65% in 1992–93 to 70% in 2005–06. Among scheduled tribes, delivery in an institution was 17.1% in 1998–99 and only 17.7% in 2005–06. Rates of admission to hospital also vary by gender, wealth, and urban or rural residence. Some of this variation might be due to differences in actual and perceived need and health-seeking behavior; indeed, evidence suggests that gender inequalities exist in untreated morbidity, and illness is probably under-reported among women.

Although poor individuals are more likely to seek care in the public sector than in the private sector, rich people use a greater share of public services, and are more likely to use tertiary care and hospital-based services. Rich individuals are also more likely to be admitted to hospital than are poor people and have longer inpatient stays in hospitals in the public sector. Analysis of the 52nd round (1995–96) of the National Sample Survey of health services in the public sector showed a more equitable distribution of services for preventive care (immunization and antenatal visits) than did most of those for curative care.

These data, however, mask the substantial variation in health within India. Although health outcomes have improved with time, they continue to be strongly determined by factors such as gender, caste, wealth, education, and geography. Many of the inequities in health result from a wide range of social, economic, and political circumstances or factors that differentially affect the distribution of health within a population. Since some of these inequities in health result from the unfair distribution of the primary social goods, power, and resources, the social determinants of health need to be addressed. In studies of the US, wealth inequality was used to predict health (measured by several indicators such as mortality and prevalence of diseases) at the state level (Kawachi & Kennedy, 1997; Kennedy, Kawachi, & Prothrow-Stith, 1996). Over half of the variation in age-adjusted total mortality was explained by wealth inequality. Furthermore, one study using multi-level analysis found that between-state variation in self-rated health was different for various wealth groups (Subramania, Kawachi, & Kennedy, 2008). In addition to its aggregate effect on health in the population, wealth inequality at the state level was found to have an independent effect on individuals' health, controlling for individual level characteristics, and the independent effects of wealth inequality were more evident at higher levels of aggregation (Soobader & LeClere, 1999).

Although diminishing health inequality is one of the policy priorities in different government through the world in recent years, our understanding of health inequality is rather limited due to its unobservability and a very marginal no. of study worldwide and in India have examined state-level health outcomes that take into account the level and distribution of health simultaneously. Furthermore, micro-data analyses using individuals as the unit of observation cannot provide sufficient macro-level information for state governments' policy assessment. Although several studies used multi-level analyses to include macro-level information, only wealth-related variables such as median wealth and poverty level were included (Kahn, Wise, Kennedy, & Kawachi, 2000; Kennedy, Kawachi, Glass, & Prothrow-Stith, 1998; Soobader & LeClere, 1999; Subramania et al., 2008; 2006).

Researchers and policy makers always argue in favor of curving inequalities in health for healthier workforce for a country in its growth pathways. Unavoidable inequalities in health 5 outcomes results due to differences in socioeconomic status (e.g., wealth, education, age, caste and gender) of an individual and of course due to the differences in existing health resource use. However, the measurement of such inequality and

underpinning reasons behind are not suggestive of a clear picture. India offers excellent opportunities for this type of research because of the wide inter-state variations of political, cultural, economic, and epidemiologic histories and because good amount of household level data (ex. NFHS-I,II,III; DLHS-I,II,III etc.) on health outcomes and health resource use are available. Comparisons across states in India and across different socio-economic groups in a state can help to identify opportunities for the reduction of inequalities in health. We compared the magnitude of wealth related inequalities in self-assessed health outcomes like, child mortality, adult chronic health problems, child and adult anthropometric health, child and adult anemia and wealth related inequalities in health resource use, like child vaccination and AWC service use, use of health institution and health workforce use, use of contraceptive use etc. in India and among its 29 states in all parts of India except united territories based on the individual level data from NFHS- III; 2005-06.

II Objective:

Inequalities in health outcomes and health services use among various socioeconomic subsections constitute one of the main challenges for public health. Because inter-state comparative studies can help to identify opportunities for reducing inequalities in health, we conducted the present study with the aim to assess variations in wealth based inequalities in health outcomes and health resource use across 29 states, including UTs in India and identify some of the immediate low wealth-high inequality and/or high wealth- low inequality classifications for the policy urgent.

III Data, Variables and Methodology:

Data on health outcomes (child mortality; adult chronic health problems, adult anthropometric health etc.) and health resource use (child vaccination and AWC service use, use of health institution and health workforce use, use of contraceptive use etc) are collected for different wealth quintiles⁴ from NFHS-III (2005-06) based household survey.

Table 1(a): Definitions of Child Health Indicators Used

| | Output Indicator |
|-------------|---|
| USMR | The number of deaths to children under five years of age per 1,000 live births. Figures are based on births during the five years preceding the survey. |

| | |
|-----------------------------------|---|
| Stunting (H/A) | Children whose height-for age is below minus two standard deviations (-2 SD) from the median of the reference population, are considered short for their age, or stunted. Includes children who are below (-3 SD) from the International Reference Population median. |
| Prevalence of Anaemia(ANE) | Children between six months and 59 months are classified as anaemic if the haemoglobin concentration in them is found to be lower than 11.0 g/dl. |
| | Resource Use indicator |
| Observed Birth | No of live births in the five years preceding the survey, delivered with assistance of doctor, auxiliary nurse midwife, nurse, midwife, lady health visitor, or other health personnel. |
| AWC Services | Children age 0-71 months who received any from an <i>anganwadi</i> centre (AWC) services for children include distribution of supplementary food, growth monitoring, immunizations, health check-ups, and preschool education. |
| Vaccinations | A child (12-23 months) if received all basic vaccinations as BCG, measles, and three doses each of DPT and polio vaccine (excluding polio vaccine given at birth). |

Table 1(b): Definitions of Adult Health Indicators Used

| | Output Indicator |
|-----------------|--|
| Thinness | Women and men age 15-49 with specific body mass index (BMI) levels are found to be lower than 18.5 kg/m ² |

| | |
|----------------------------------|---|
| Obesity | Women and men age 15-49 with specific body mass index (BMI) levels are found to be more than and equal to 25.0kg/m ² |
| Anaemia | Women and men age 15-49 are classified as anaemic if the haemoglobin concentration in them is found to be lower than 12.0 g/dl for women and be lower than 13.0 g/dl for men. |
| Health problem | Any modern method includes female and male sterilization, the pill, the IUD, injectables, male condoms, female condoms, emergency contraception |
| | Health Resource Use |
| Contraceptive Use | Any modern method includes female and male sterilization, the pill, the IUD, injectables, male condoms, female condoms, emergency contraception |
| ANC | Women who had a live birth in the five years preceding the survey and received antenatal care (ANC) during pregnancy from doctor and nurse including Auxiliary nurse midwife(ANM); Nurse; Midwife; = Lady health visitor(LHV) |
| PNC | Women who had a live birth in the five years preceding the survey and received a postnatal check-up on the woman's health within 42 days of the birth. |
| Use of Health Institution | The source of health care from Public or Private Health Institution that household members generally use when they get sick. |
| Medical Insurance | Households with at least one usual member covered by health insurance or a health scheme that have different types of health coverage. |

Source: Definitions are according to NFHS-III, report 2005-'06.

Data were classified according to five wealth quintiles separately for male, female and child, including all common self-assessed information from rural and urban parts of India. For each state and India itself, the wealth related inequalities in health outcomes and health resource use are measured by the Health Concentration Index (HCI). The concentration index is an extension of the traditional Gini-coefficient used as a measure of inequality of wealth distribution in a society. The concentration curve (CC) is a tool to visualize the degree of socioeconomic inequality in health for the whole distribution. It plots the cumulative share of the population, ranked by a living standard variable on the horizontal axis, against the corresponding cumulative share of health measure on the vertical axis. The bench mark is the 45-line, which represents the state where health is not systematically related to socioeconomic characteristics. If the CC curve coincides with the diagonal, everyone in the society, irrespective of living standard variable, enjoys the same level of ill-health. The ill-health is more concentrated among the lower social classes if the CC lies above the line of equality. The further CC lies from the diagonal, the greater the degree of inequality in ill health between the poorer and the better-off. Again if CC of country (X) is everywhere closer to the diagonal than that of country (Y), then country X 's concentration curve is said to *dominate* that of country Y . It seems reasonable in such cases to conclude that there is unambiguously less inequality in ill health in country X than in country Y .

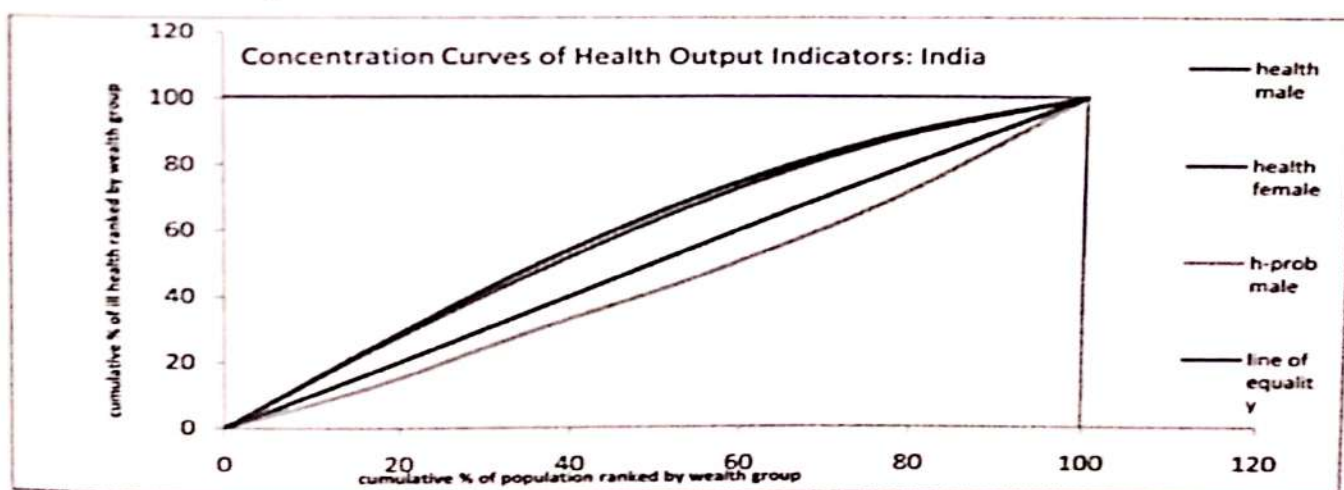


Fig. 1a. Health Output Concentration Curves (Computed by authors using NFHS 3 (2005-06) report).

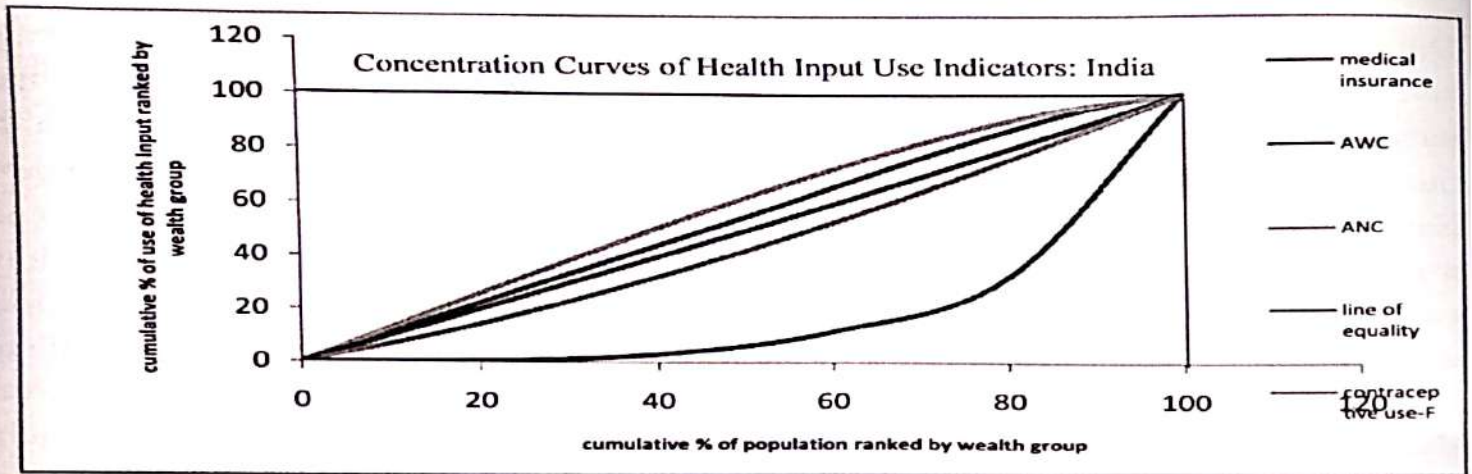


Fig. 1b. Health Input Use Concentration Curves (Computed by authors using NFHS 3 (2005-06) report.

Converting the visual representation into a single indicator is defined (Wagstaff, Pierella, & van Doorslaer, 1991; Wagstaff & van Doorslaer, 2000) as twice the area between the CC and the line of equality as Concentration Index (CI) and the diagonal and is bounded by - 1 and 1. Formally

$$CI_h = 1 - 2 \int_0^1 CC(r) dr$$

Where respondent i 's fractional rank in the wealth distribution is expressed by r , with $r \in [0,1]$. For grouped data, the concentration index for $t=1, \dots, T$ groups is easily computed in a spread sheet program using the following formula (Fuller and Lury 1977):

$$C = (p_1L_2 - p_2L_1) + (p_2L_3 - p_3L_2) + \dots + (p_{T-1}L_T - p_TL_{T-1})$$

where p_t is the cumulative percentage of the sample ranked by economic status in group t , and L_t is the corresponding concentration curve ordinate. The sign of the concentration index indicates the direction of any relationship between the health variable and position in the living standards distribution, and its magnitude reflects both the strength of the relationship and the degree of variability in the health variable. The CI takes the value zero in the case of no SES-related health inequality and the higher the absolute value of CI implies higher the degree of inequality. It has negative values if ill-health is more concentrated among the poor and positive for the rich (O. O'Donnell et al, 2007)

By following the Household Population and Housing Characteristics of NFHS-III, report 2005-'06 ((Table 2.17: Percent distribution of the population by wealth

quintiles), we separated the states of India into higher and lower wealth state categories (table- 2). In this categorization of the population we follow more than the average percent of residence by state are either into two lower wealth quintiles or into two higher wealth quintiles.

Table -2:

| Poorer States | Richer States |
|---|--|
| Arunachal Pradesh, Assam, Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh, Orissa, Rajasthan, Tripura, Uttar Pradesh, West Bengal. | Andhra Pradesh, Delhi, Goa, Gujarat, Haryana, Himachal Pradesh, Jammu and Kashmir, Karnataka, Kerala, Manipur, Meghalaya, Mizoram, Maharashtra, Tamil Nadu, Nagaland, Punjab, Sikkim, Uttaranchal. |

Source: Household Population and Housing Characteristics of NFHS-III, report 2005-'06 (Table 2.17).

In analyzing the nature and the extent of wealth association of inequality indices (CI) both for health outcome and health resources use, and percent distribution of the population by Wealth Quintiles in different states and all India we have categorized the states into four broad sections lower wealth – lower inequality , lower wealth – higher inequality , higher wealth – lower inequality and higher wealth – higher inequality . The classification is done depending on their respective inequality (CI) values exceed or fall short of the cut-off level⁵.

IV Analysis of Results:

The analysis starts with expectation that the coexistence of higher average wealth level and higher inequality in ill-health or health resource use are not desirable than the coexistence of lower average wealth level and more equal distribution of ill-health and health resource use at least. The extent of wealth based Health Concentration Index (HCI) for ill-health are substantially higher in the states with higher concentration of population in the lower wealth quintiles, but the magnitude of the inequalities between higher and lower wealth quintiles are much larger in some states than others. Inequalities in child mortality and child anemia are small in higher wealth quintiles in most of the states of the country. Inequalities in adult chronic disease prevalence and health risk related to over-weight or obesity are higher corresponding to higher wealth quintiles and inequalities in adult thinness (underweight male and female) and anemia are lower in lower wealth quintiles in most of the states (Table-3).

Table-3 HCI of Health Output by wealth quintiles across the states in India in 2005-06 (from NFHS-III)

| States | USMR | Rank CH-ANE | Rank F-ANE | Rank M-ANE | Rank F-HPRO | Rank M-HPRO | Rank F-UW | Rank M-UW | Rank F-OW | Rank M-OW | Rank | | | | | | | | | | | |
|------------------|--------|-------------|------------|------------|-------------|-------------|-----------|-----------|-----------|-----------|-------|----|-------|----|-------|----|--------|----|-------|----|-------|----|
| Arunachal | -0.034 | 3 | -0.061 | 18 | -0.11 | 13 | 0.016 | 1 | -0.095 | 8 | 0.028 | 19 | 0.201 | 2 | -0.08 | 2 | -0.074 | 4 | 0.416 | 4 | 0.441 | 13 |
| Bihar | -0.087 | 6 | -0.041 | 17 | -0.09 | 5 | -0.03 | 8 | -0.107 | 9 | 0.063 | 17 | -0.19 | 27 | -0.13 | 12 | -0.104 | 8 | 0.646 | 6 | 0.621 | 4 |
| Delhi | -0.178 | 19 | -0.067 | 22 | -0.13 | 18 | -0.04 | 16 | -0.161 | 18 | 0.12 | 11 | 0.173 | 6 | -0.15 | 17 | -0.178 | 26 | 0.133 | 29 | 0.177 | 25 |
| Gujrat | -0.207 | 24 | -0.067 | 22 | -0.11 | 11 | -0.05 | 24 | -0.138 | 14 | 4E-04 | 23 | 0.009 | 18 | -0.21 | 27 | -0.146 | 17 | 0.362 | 18 | 0.353 | 19 |
| Himachal Pradesh | -0.07 | 4 | -0.024 | 5 | -0.11 | 9 | -0.01 | 6 | -0.043 | 6 | 0.217 | 3 | -0.23 | 28 | -0.08 | 3 | -0.093 | 6 | 0.278 | 24 | 0.322 | 20 |
| Jarkhand | -0.136 | 14 | -0.069 | 21 | -0.08 | 6 | -0.05 | 23 | -0.155 | 22 | -0.05 | 27 | 0.142 | 8 | -0.12 | 10 | -0.118 | 12 | 0.666 | 2 | 0.627 | 3 |
| Kerala | -0.122 | 11 | -0.033 | 9 | -0.16 | 22 | -0.04 | 18 | -0.108 | 11 | -0.05 | 28 | 0.078 | 16 | -0.19 | 22 | -0.186 | 26 | 0.16 | 27 | 0.247 | 24 |
| Maharashtra | -0.208 | 25 | -0.04 | 16 | -0.14 | 19 | -0.05 | 20 | -0.128 | 13 | 0 | 24 | 0.082 | 14 | -0.18 | 21 | -0.163 | 20 | 0.366 | 17 | 0.365 | 17 |
| Meghalaya | -0.182 | 20 | -0.063 | 19 | -0.03 | 1 | -0.07 | 27 | -0.153 | 20 | 0.208 | 4 | 0.194 | 3 | -0.09 | 4 | 0.074 | 1 | 0.301 | 21 | 0.086 | 29 |
| Nagaland | -0.186 | 22 | | | | | | | | | | | | | | | | | | | | |
| Panjab | -0.016 | 2 | -0.029 | 8 | -0.21 | 28 | -0.04 | 14 | -0.096 | 7 | 0.136 | 9 | -0.08 | 22 | -0.12 | 8 | -0.107 | 9 | 0.174 | 26 | 0.264 | 22 |
| Sikkim | -0.011 | 1 | -0.006 | 2 | -0.05 | 2 | -0.02 | 7 | -0.001 | 3 | -0.16 | 24 | -0.14 | 26 | -0.11 | 7 | -0.003 | 2 | 0.143 | 28 | 0.236 | 26 |
| Tripura | -0.196 | 23 | -0.036 | 12 | -0.11 | 12 | -0.03 | 9 | -0.108 | 10 | 0 | 26 | 0.143 | 7 | -0.13 | 14 | -0.17 | 22 | 0.497 | 8 | 0.176 | 27 |
| Uttarpradesh | -0.109 | 8 | -0.027 | 7 | -0.09 | 7 | -0.03 | 10 | -0.152 | 19 | 0.102 | 14 | -0.06 | 21 | -0.16 | 16 | -0.162 | 18 | 0.442 | 9 | 0.516 | 6 |
| West Bengal | -0.108 | 7 | -0.092 | 27 | -0.17 | 26 | -0.04 | 16 | -0.14 | 16 | 0.098 | 16 | -0.11 | 26 | -0.22 | 28 | -0.193 | 28 | 0.63 | 6 | 0.69 | 2 |

Source: Computed by authors using NFHS 3 (2005-06) group level records.

Wealth Related Health Inequalities in India

Table-4

HCI of existing health resource use by wealth quintiles across the states in India in 2005-06 (from NFHS-III)

| States | Yael | Rank | AMC | Rank | HP- Birth | Rank | F- Contra | Rank | M- contra | Rank | AMC- Doc | Rank | AMC- Nurse | Rank | PNC | Rank | Govt- Serv | Rank | Pvt- Ser | Rank | MI-1 | Rank | |
|------------------|--------|------|-------|------|--------------|------|--------------|------|--------------|------|-------------|------|---------------|------|-------|------|---------------|------|-------------|------|-------|------|-------|
| Andhra Pradesh | 0.3075 | 2 | -0.1 | 18 | 0.4141 | 3 | 0.113 | 8 | 0.1676 | 5 | 0.2139 | 13 | 0.01243 | 6 | 0.438 | 3 | -0.0422 | 12 | 0.2417 | 4 | 0.581 | 12 | |
| Bihar | 0.2749 | 3 | -0.07 | 13 | 0.2833 | 11 | 0.203 | 4 | 0.2224 | 4 | 0.27573 | 6 | 0.07486 | 4 | 0.276 | 9 | 0.05913 | 2 | -0.005 | 28 | 0.712 | 4 | |
| Delhi | 0.1804 | 16 | -0.1 | 17 | 0.1961 | 21 | 0.046 | 15 | 0.0952 | 12 | 0.09449 | 23 | -0.1295 | 16 | 0.128 | 22 | -0.0344 | 10 | 0.0165 | 24 | 0.194 | 29 | |
| Gujarat | 0.1897 | 11 | -0.1 | 20 | 0.1983 | 20 | 0.028 | 19 | 0.0877 | 15 | 0.21104 | 14 | -0.2844 | 25 | 0.144 | 21 | -0.2417 | 29 | 0.0984 | 15 | 0.485 | 17 | |
| Himachal Pradesh | 0.0271 | 28 | -0.06 | 11 | 0.2048 | 19 | -0.004 | 24 | -0.027 | 29 | 0.1114 | 21 | -0.2056 | 20 | 0.153 | 20 | -0.0115 | 5 | 0.0493 | 20 | 0.312 | 26 | |
| Jharkhand | 0.2236 | 8 | -0.12 | 23 | 0.3818 | 5 | 0.236 | 3 | 0.3305 | 2 | 0.3302 | 2 | -0.0571 | 10 | 0.414 | 5 | 0.06133 | 1 | -0.020 | 29 | 0.714 | 3 | |
| Kerala | 0.0994 | 24 | -0.17 | 28 | 0.0029 | 29 | -0.057 | 28 | 0.0163 | 24 | 0.03493 | 29 | -0.2956 | 27 | 0.028 | 29 | -0.2295 | 28 | 0.2334 | 5 | 0.258 | 27 | |
| Maharashtra | 0.1269 | 20 | -0.18 | 29 | 0.1855 | 22 | 0.004 | 22 | -0.072 | 28 | 0.1469 | 18 | -0.4071 | 29 | 0.126 | 23 | -0.2205 | 27 | 0.0934 | 16 | 0.513 | 15 | |
| Meghalaya | 0.2036 | 10 | 0.04 | 2 | 0.4591 | 1 | 0.354 | 1 | 0.3475 | 1 | 0.20094 | 15 | -0.0466 | 8 | 0.362 | 6 | -0.1358 | 22 | 0.3017 | 3 | 0.59 | 11 | |
| Nagaland | 0.4202 | 1 | 0.067 | 1 | 0.4512 | 2 | 0.28 | 2 | 0.2598 | 3 | 0.23986 | 9 | 0.14768 | 3 | 0.501 | 1 | -0.0913 | 18 | 0.1057 | 14 | 0.45 | 20 | |
| Punjab | 0.1721 | 14 | -0.15 | 26 | 0.1303 | 25 | -0.012 | 27 | 0.042 | 20 | 0.185 | 17 | -0.1197 | 14 | 0.119 | 24 | -0.019 | 7 | 0.0033 | 25 | 0.366 | 25 | |
| Sikkim | 0.0178 | 25 | -0.14 | 25 | 0.2451 | 14 | 0.017 | 20 | 0.0823 | 16 | 0.11593 | 20 | -0.1602 | 19 | 0.193 | 16 | -0.0364 | 11 | 0.4074 | 1 | 0.517 | 14 | |
| Tripura | 0.0493 | 27 | -0.11 | 22 | 0.307 | 9 | 0.007 | 21 | 0.0511 | 18 | 0.13846 | 19 | 0.19047 | 1 | 0.164 | 18 | -0.0749 | 16 | 0.3034 | 2 | 0.581 | 13 | |
| Uttarpradesh | 0.2525 | 5 | -0.09 | 16 | 0.3399 | 7 | 0.188 | 5 | 0.1661 | 6 | 0.36816 | 1 | -0.0167 | 7 | 0.452 | 2 | 0.01768 | 3 | -0.004 | 27 | 0.702 | 5 | |
| All India | 0.2059 | | -0.08 | | 0.285 | | 0.095 | | 0.0936 | | 0.25106 | | -0.16 | | 0.272 | | -0.2133 | | 0.0447 | | | | 0.607 |

The inequality in health resource use arises due to lot of factors like, distance from health institutions, growing health expenditures, optimal organization of health manpower, availability of information about modern health behaviors etc. In case of the availability and receiving any service of AWC⁶, source of health care that receive by people from govt. health institutes and at the sick time and ANC⁶ services, poorer sections or the populations in the lower wealth quintiles suffered a lot in most of the states in India with a variations in inequality. On the other hand a large extent of inequality in the wealthier sections of the populations with respect to the use of services related to all types of basic child vaccination, birth attenuated by health personnel⁶, ANC services by doctors, modern contraceptive use etc., across almost all Indian states (Table-4).

Section-IV.1 Classification of Inequality Index:

The sign of the concentration index indicates the direction of relationship between the health variable and position in the living standards (wealth) distribution. The negative CI values for ill-health and resource use indicators are confirming that the dominance of inequalities among the poorer with a greater concentration and on contrary positive CI implying dominance of inequalities among the rich. Here in the table 5, we have listed the sign of the state specific CI corresponding to each ill-health indicators and health resources use. In most of the cases the concentration of the poorer or the richer sections of people are justified accordingly

Table - 5

| CI of Health Output Indicators | States with +ve or -ve Values | CI of Resource Use Indicators | States with +ve or -ve Values |
|--------------------------------|--|-------------------------------|--|
| U5MR | All Negative. | Observed Birth | All Positive. |
| Child Anemia | All Negative. | Child Vaccination | All Positive. |
| Stunting | All Negative. | AWC Service | All Negative (except Assam, Meghalaya, Nagaland). |
| Female Anemia | All Negative (except Arunachal). | ANC-Doctor | All Positive. |
| Male Anemia | All Negative. | ANC Nurse | All Negative (except Arunachal, Bihar, Goa, J&K, Tripura). |
| Female Health Problem | All Positive (except Assam; Jharkhand, Gujarat, Kerala, Maharashtra, Sikkim, Tripura). | Female modern Contraceptive | All Positive (except Goa, H P, Karnataka, Kerala, T N, Punjab, W B). |
| Male Health Problem | All Positive (except Bihar, H P, M P, Nagaland). | Male modern Contraceptive | All Positive (except Goa, H P, Karnataka, Maharashtra, T N, Punjab, W B).. |
| Female Thinness | All Negative. | PNC | All Positive. |
| Male Thinness | All Negative (except Meghalaya). | Medical Insurance | All Positive. |
| Female Obesity | All Positive. | Govt. health setup use | All Negative (except Jharkhand, Bihar, UP, Haryana). |
| Male Obesity | All Positive. | Pvt. Health setup use | All Positive (except Jharkhand, Bihar, UP, Haryana). |

Source: Computed by authors using NFHS 3 (2005-06) unit level records.

Section-IV.2 Inter-state Variations:

We have found a huge inter-state variation in terms of state specific values of inequalities (CI) across the wealth groups for both health output indicators and health resource use. The state with highest absolute CI values implies highest rate of inequality across the wealth groups in a state. The most remarkable and may be surprising observation is that the states with higher percentage of population in the higher wealth groups, affected with higher tempo of inequality in both ill-health indicators (except Chhattisgarh) and health resource use (except Madhya Pradesh, Uttar 13

Pradesh) (Table -2 & 6). The higher inequality in ill-health output may be explained by the fact that there is huge socio-economic gap between poor and wealthy population. The cause behind the higher positive inequality in health resource in wealthy states use may be that the disadvantaged group of population is not taking part of existing public run facilities.

Table 6

| | Inequality in Output Indicators | | | Inequality in Resource Use Indicators | |
|-----------------------|---------------------------------|----------------------|------------------------------------|---------------------------------------|----------------------|
| | Lowest CI values | Highest CI values | | Lowest CI values | Highest CI values |
| U5MR | Sikkim (-0.011) | Goa (-0.965) | Observed Birth | Kerala (0.00294) | Meghalaya (0.4591) |
| Child Anemia | Sikkim (-0.006) | Mizoram (-0.14) | Child Vaccination | Tamilnadu (0.0042) | Nagaland (0.4202) |
| Stunting | Meghalaya (-0.0319) | Goa (-0.2855769) | AWC Service | M P (-0.0002) | Maharashtra (-0.179) |
| Female Anemia | J&K (-0.00539) | Mizoram (-0.15368) | ANC-Doctor | Kerala (0.00493) | U P (0.36816) |
| Male Anemia | J&K (-0.00922) | Mizoram (-0.41785) | ANC Nurse | Arunachal (0.01243) | Maharashtra (-0.407) |
| Female Health Problem | Rajasthan (0.007) | Uttaranchal (0.313) | Female modern Contraceptive | Maharashtra (0.00357) | Meghalaya (0.3594) |
| Male Health Problem | Gujarat (0.0091) | Chhattisgarh (0.317) | Male modern Contraceptive | Goa (-0.003) | Meghalaya (0.3475) |
| Female Thinness | Nagaland (-0.00557) | Tamilnadu (-0.2298) | PNC | Kerala (0.028) | Nagaland (0.501) |
| Male Thinness | Sikkim (-0.003) | Karnataka (-0.1944) | Medical Insurance | Delhi (0.194) | M P (0.759) |
| Female Obesity | Delhi (0.13283) | Chhattisgarh (0.743) | Govt. health setup use | Haryana (0.00274) | Gujarat (-0.2417) |
| Male Obesity | Meghalaya (0.0848) | Orissa (0.60524) | Pvt. Health setup use | Haryana (-0.0011) | Sikkim (0.4074) |

Source: Computed by authors using NFHS 3 (2005-06) unit level records. Values in parentheses is state specific CI values.

The variations of ill-health inequality (CI) across the states are depicted by ranking among 29 states of India corresponding to each specific indicator (table-3). Comparing the values of inequalities in ill-health outcome in the three sub-sections

namely child, female and male health inequality across the different Indian states observed the followings.

i) Child health output inequalities are more pronounced in the case of the under-five mortalities. While the CI value for under-five mortality at the national level is computed to be (-0.17868), it presents a reasonably wide range across various states with the minimum of (-0.01129) in Sikkim and maximum of (-0.9648) in Goa. Among the other major states, Goa, Gujarat, Karnataka, Manipur, Maharashtra, Meghalaya, Nagaland, Tamil Nadu, UP and Tripura experience greater wealth-related inequalities in under-five mortality as against the states like Punjab, Arunachal Pradesh, Himachal Pradesh, Bihar and Rajasthan. In case of child anemia, we observed that inequalities are ranging between (-0.0063) in Sikkim and (-0.1404) in Mizoram with all-India CI value of (-0.05196) which is not vary significantly across the major states. However, the states of Assam, Jharkhand, Orissa, West Bengal, Delhi, Goa, Gujarat, Haryana, and Meghalaya are found to be more inequitable. Similarly, inequality in stunting shows inequalities at the all-India (-0.05196) level ranging between (-0.03185) in Meghalaya and (-0.2856) in Goa.

ii) Adult health indicators are classified into adult anthropometric indicator (BMI), prevalence of adult anemia and the prevalence of major health problems or category of chronic lifestyle disease. The CI values for adult anemia (CI-F-ANE & CI-M-ANE) and thinness (BMI <18.5 kg/m² or less) for both female and male are negative (except Arunachal in CI-F-ANE and Meghalaya in thinness), confirming that the adult ill-health inequalities are concentrated primarily among the poorer sections of the population. On comparison of these two inequalities in all India level, adult anemia (female -0.08796 and male -0.0641) are less pronounced than that of inequalities in female and male thinness (-0.6839 & -0.1898) in the poor. The variation in inequalities between female- male for adult anemia and thinness in all India level show that the worst situation of females. The state level variation of inequality in female anemia is ranging from (-0.1537) in Mizoram and (-0.0054) in J&K and for male anemia is ranging from (-0.4179) in Mizoram and (-0.0092) in J&K. Even the highest and lowest rank holder states are same, the inequality of female anemia distinctly dominates the male anemia both by magnitude and rank of variations among the states like Tamil Nadu, Punjab, Meghalaya, M.P., Karnataka and Chhattisgarh, whereas the opposite direction of distinct domination follows female to male in the states like West Bengal, Uttarakhand, Hariyana, Goa, Bihar, Assam and Arunachal.

The range of variation of inequality is (-0.2297) in TN and (-0.0056) in Nagaland for female and for male is (-0.194) in Karnataka and (-0.003) in Sikkim. Mostly in all the states female thinness distinctly dominates the male thinness both by magnitude except the states like Assam, Delhi, Karnataka and Tripura.

The inequality in obesity (BMI >25.0 kg/m² or more) of both female and male for the country as a whole are positive values as expected (CI-F-OB = 0.4744 and CI-M-OB = 0.4495) and females are slightly in worst position compare to male, but both are confirming the prevalence of adult ill-health inequalities in terms of obesity and health risks are concentrated primarily among the richer sections of the population. On comparison of these two in the state level, the range of variation for female is (0.7433) to (0.1328) in Delhi whereas for male the range is (0.6052) in Orissa to (0.0848) in Meghalaya. The inequality in obesity for female in the state Tripura and M.P. dominate over male and the opposite picture is in Rajasthan and J&K.

The inequality in adult ill-health related to lifestyle diseases (for India as a whole both female (CI-F-HP = 0.0228) and male (CI-M-HP = 0.12)) are positive, explaining the fact that inequalities in adult health problems in terms of diabetes, asthma, and / or any types of thyroid disorder are concentrated primarily among the richer sections of the population. Here males are more inequitably distributed. In form of magnitude, sign and rank of the concentration index of adult health problems, there is a mix inequality picture across the states in India. The state Sikkim is the only odd man out where CI of both female (CI-F-HP = -0.15423) and male (CI-M-HP = -0.1397) are negative. On contrary 13 states out of 29 states of the country like A.P., Arunachal, Chhattisgarh, Delhi, Goa, Gujarat, Hariyana, Kerala etc. have positive concentration index like all India. Other than the above mentioned states, each state has either one of CI-F-HP or CI-M-HP is negative.

Now, in terms of inequalities in health resource use separately for child and (table: 4) across all the 29 Indian states, we have observed the followings.

i) Inequality in Observed Birth (birth in presence of trained health personnel) is marked at high value at the national level (0.285), with a reasonably wide range across various states from (0.0029) in Kerala to (0.459) in Meghalaya. The population of relatively higher wealth group among the other major poor states, Arunachal Pradesh, Assam, Jharkhand, Madhya Pradesh, Tripura, Rajasthan, Uttar Pradesh and rich states, Meghalaya, Nagaland, Uttaranchal experience greater wealth-related inequalities in observed birth as against the remaining states. In case of child

vaccination, it is observed that extent of inequalities ranging between (0.0042) in TN and (0.4202) in Nagaland with national level (0.2069) which are pretty lower than observed birth and vary significantly across the major states. However, the poor states, Arunachal Pradesh, Assam, Bihar, Jharkhand, Madhya Pradesh, Rajasthan, Uttar Pradesh and two rich states Manipur, Nagaland are found to be more inequitable. Similarly, the use of basic AWC service shows inequality at the national (-0.08) level ranging between (-0.0002) in MP and (-0.179) in Maharashtra.

ii) The institutional and manpower setup show a wide range of variations among the population in the relatively higher wealth group. The CI values for ANC (doctor), PNC service for women and physical private health setup use for the country as a whole are positive (except poor states Bihar, Jharkhand, UP and rich state Haryana in pvt. physical setup), indicating the fact that inequalities are concentrated among the wealthier sections of the population. The opposite picture is for ANC- nurse (-0.16, national level) and physical Govt. health setup (-0.213, national level) use. At all India level, private physical setup use (0.0447) is less prominent than that of use of ANC-doctor (0.251) and PNC service (0.272) in the people in the higher wealth group. At the state level as regards to the PNC service the range of variation is (0.028) in Kerala and (0.501) in Nagaland. The variation of inequality is ranging from ANC-doctor is (0.368) in UP and (0.0049) in Kerala. Between ANC- nurse (lowest 0.0124 in Arunachal & highest -0.407 in Maharashtra) and physical Govt. health setup (lowest 0.0027 in Haryana & highest -0.2417 in Gujarat) use, the state level variation show a clear dominance by the first over the later.

iii) The orientation and the applicability of modern information and technique have unique contribution in minimizing health risks and uncertainty. The CI values for Medical Insurance (MI), use of modern contraception by male and female for the country as a whole (MI 0.607, F-cont = 0.095 and M- cont = 0.0936) are positive values as expected and females are slightly in worst position compare to male, but both are confirming that inequalities in preventive measures are concentrated primarily among the richest sections of the population. In the state level, the variation of inequality is from (0.354) in Meghalaya to (0.0035) in Maharashtra for female whereas for male the range of inequality is (0.348) in Meghalaya to (-0.003) in Goa and inequalities in male contraceptive use dominates female use mostly in all states. One specific observation with respect to use of Medical Insurance (ranging from 0.194 in Delhi to 0.759 in MP) is mainly concentrated in the wealthier sections of the population.

Section IV.3 Classification States by Wealth based Inequality:

The distribution of the population across wealth quintiles shows large variations across states, with Delhi (70 percent) and Goa (55 percent) having over one-half of their populations in the highest quintile and Chhattisgarh, Orissa, Bihar, and Tripura, having only about one-tenth or less of their populations in the highest quintile. In Jharkhand, half of the population falls into the lowest wealth quintile. By contrast, in about half of the states, less than 10 percent of households are in the lowest wealth quintile. By employing table-2 for classification of states by wealth and the cut-off levels of all category of ill-health inequality (tables 3a-3j) & health resource use inequality (tables 4a-4j), we are able to obtain vital insights into the relationship between the magnitudes of inequalities in ill-health and the state's wealth profiles. The identification and clustering of states with low wealth-high inequality and /or high wealth- low inequality is desirable to justify the effectiveness of public run health facilities.

Classification according to Wealth Levels and Ill-health Inequality:

Table 3a: Prevalence of Under-five Mortality (U5MR cut off value = -0.179):

| | Lower Inequality | Higher Inequality |
|----------------------|--|---|
| Lower Wealth | Assam, Arunachal Pradesh, Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh, Rajasthan , Orissa, West Bengal | Tripura, Uttar Pradesh, |
| Higher Wealth | Andhra Pradesh, Delhi , Himachal Pradesh, Haryana, Kerala, Jammu and Kashmir, Mizoram, Punjab, Sikkim, Uttaranchal | Goa, Gujarat, Karnataka, Manipur, Maharashtra, Meghalaya, Nagaland, Tamil Nadu, |

States like Delhi ,Goa, Gujarat, Karnataka, Manipur, Maharashtra, Meghalaya, Nagaland and Tamil Nadu demonstrate the coexistence of higher levels of wealth along with higher levels of inequalities in under-five mortalities and states such as Assam, Jharkhand, Chhattisgarh, etc. have lower wealth levels are also found to have lower levels of inequalities in under-five mortalities. These states suggest that there is a straightforward positive relationship between wealth levels and ill-health inequality. Andhra Pradesh, Delhi, Himachal Pradesh, Haryana, Kerala, Jammu and Kashmir, Mizoram show the coexistence of higher levels of wealth along with the lower levels of inequalities in under-five mortalities. This implies the fact that higher level wealth can effectively reduce child mortality which is desirable (table 3a).

Table 3b: Prevalence of Child Anemia (cut off value = -0.052):

| | Lower Inequality | Higher Inequality |
|----------------------|--|---|
| Lower Wealth | Arunachal Pradesh, Bihar, Chhattisgarh, Madhya Pradesh, Tripura, Rajasthan, Uttar Pradesh. | Assam, Jharkhand, Orissa, West Bengal. |
| Higher Wealth | Andhra Pradesh, Himachal Pradesh, Jammu and Kashmir, Karnataka, Kerala, Maharashtra, Manipur, Mizoram, Punjab, Sikkim, Tamil Nadu. | Delhi, Goa, Gujarat, Haryana, Meghalaya, Uttaranchal. |

There is a straightforward positive relationship between wealth levels and inequality in Child Anemia in the states like Delhi, Goa, Gujarat, Haryana etc. (coexistence of higher levels of wealth along with higher levels of inequalities) and in the states Arunachal Pradesh, Bihar, Orissa etc. (lower wealth levels with lower levels of inequalities). But states like Andhra Pradesh, Himachal Pradesh, J&K, Karnataka, Kerala, Manipur, Punjab, Sikkim and Tamil Nadu fulfill the desire of coexistence of higher levels of wealth along with the lower levels of inequalities in Child Anemia (table 3b).

Table 3c: Prevalence of Stunting (cut off value = -0.12589):

| | Lower Inequality | Higher Inequality |
|----------------------|---|---|
| Lower Wealth | Arunachal Pradesh, Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh, Rajasthan, Tripura, Uttar Pradesh. | Assam, Orissa, West Bengal. |
| Higher Wealth | Gujarat, Himachal Pradesh, Meghalaya, Manipur, Nagaland, Sikkim. | Andhra Pradesh, Delhi, Goa, Haryana, Jammu and Kashmir, Karnataka, Kerala, Maharashtra, Mizoram, Punjab, Tamil Nadu, Uttaranchal. |

In case of stunting, most of the states like Andhra Pradesh, Delhi, Goa, Jammu and Kashmir, Karnataka, Kerala, Punjab and Tamil Nadu (the coexistence of higher levels of wealth along with higher levels of inequalities) Arunachal Pradesh, Bihar, and Jharkhand etc. (lower wealth levels with lower levels of inequalities) in explaining a positive relationship between wealth levels and child ill-health inequality. But states like Gujarat, Himachal Pradesh, Meghalaya, Manipur, Nagaland and Sikkim have fulfilled the desire (table 3c).

Table 3d: Prevalence of Adult Anemia Female (cut off value = -0.0187):

| | Lower Inequality | Higher Inequality |
|----------------------|--|---|
| Lower Wealth | Arunachal Pradesh, Assam. | Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh, Orissa, Rajasthan, Tripura, Uttar Pradesh, West Bengal. |
| Higher Wealth | Himachal Pradesh, Jammu and Kashmir, Manipur, Mizoram, Sikkim. | Andhra Pradesh, Delhi, Goa, Gujarat, Haryana, Karnataka, Kerala, Maharashtra, Meghalaya, Punjab, Tamil Nadu, Uttaranchal. |

Table 3e: Prevalence of Adult Anemia Male (cut off value = -0.064):

| | Lower Inequality | Higher Inequality |
|----------------------|--|--|
| Lower Wealth | Assam | Arunachal Pradesh, Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh, Orissa, Rajasthan, Tripura, Uttar Pradesh, West Bengal. |
| Higher Wealth | Himachal Pradesh, Jammu and Kashmir, Sikkim. | Andhra Pradesh, Delhi, Goa, Gujarat, Hariyana, Karnataka, Kerala, Manipur, Maharashtra, Meghalaya, Mizoram, Punjab, Tamil Nadu, Uttaranchal, |

In case of the Prevalence of Female Anemia, states like Delhi, Goa, Hariyana, Manipur, Punjab etc. demonstrate the coexistence of higher levels of wealth along with higher levels of inequalities, where as in Sikkim it is the coexistence of lower wealth- lower levels of inequalities explaining the straightforward positive relationship. But states like Bihar, Rajasthan, Tripura, Uttar Pradesh, West Bengal and Jammu and Kashmir, Himachal Pradesh have the exceptions. In case of Prevalence of Male Anemia, we got more or less same results (table 3d & 3e).

Table 3f: Prevalence of Health Problems Female (cut off value = 0.023):

| | Lower Inequality | Higher Inequality |
|---------------------|---------------------|---|
| Lower Wealth | Rajasthan, Tripura. | Arunachal Pradesh, Assam, Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh, Orissa, Uttar Pradesh, West Bengal. |

| | | |
|----------------------|--|---|
| Higher Wealth | Gujarat, Manipur, Maharashtra, Nagaland. | Andhra Pradesh, Delhi, Goa, Haryana, Himachal Pradesh, Jammu and Kashmir, Karnataka, Kerala, Meghalaya, Mizoram, Punjab, Sikkim, Tamil Nadu, Uttaranchal, |
|----------------------|--|---|

Table 3g: Prevalence of Health Problems Male (cut off value = 0.12):

| | Lower Inequality | Higher Inequality |
|----------------------|--|---|
| Lower Wealth | Madhya Pradesh, Rajasthan, Uttar Pradesh, West Bengal. | Arunachal Pradesh, Assam, Bihar, Chhattisgarh, Jharkhand, Orissa, Tripura. |
| Higher Wealth | Andhra Pradesh, Gujarat, Haryana, Jammu and Kashmir, Kerala, Manipur, Maharashtra, Mizoram, Punjab, Uttaranchal, | Delhi, Goa, Himachal Pradesh, Karnataka, Meghalaya, Nagaland, Sikkim, Tamil Nadu, |

Most of the states show higher levels of pro poor inequality irrespective of wealth level for female lifestyle health problems but there is no clear picture in between the level of wealth and level of inequality in case of male (table 3f & 3g).

Table 3h: Prevalence of Thinness Female (cut off value = -0.168):

| | Lower Inequality | Higher Inequality |
|----------------------|--|---|
| Lower Wealth | Arunachal Pradesh, Assam, Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh, Rajasthan, Tripura, Uttar Pradesh. | Orissa, West Bengal. |
| Higher Wealth | Delhi, Himachal Pradesh, Jammu and Kashmir, Manipur, Meghalaya, Mizoram, Nagaland, Punjab, Sikkim, | Andhra Pradesh, Goa, Gujarat, Haryana, Karnataka, Kerala, Maharashtra, Tamil Nadu, Uttaranchal. |

Table 3i: Prevalence of Thinness Male (cut off value = -0.1898):

| | Lower Inequality | Higher Inequality |
|---------------------|--|--------------------------|
| Lower Wealth | Arunachal Pradesh, Assam, Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh, Orissa, Rajasthan, Tripura, Uttar Pradesh. | West Bengal. |

| | | |
|----------------------|--|-----------------|
| Higher Wealth | Andhra Pradesh, Delhi, Gujarat, Haryana, Himachal Pradesh, Jammu and Kashmir, Kerala, Manipur, Maharashtra, Meghalaya, Mizoram, Nagaland, Punjab, Sikkim, Tamil Nadu, Uttaranchal. | Goa, Karnataka. |
|----------------------|--|-----------------|

There is a straightforward positive relationship between wealth levels and health inequality in Female Thinness in most of the states the states. But Delhi, Himachal Pradesh, Jammu and Kashmir, Manipur, Meghalaya, Mizoram, Nagaland, Punjab, Sikkim like Goa, Karnataka etc. 20

have the desirable coexistence of higher levels of wealth along with the lower levels of inequalities. Most of the states show lower levels of pro-rich inequality irrespective of wealth level for Male Thinness (Table 3h & 3i).

Table 3j: Prevalence of Obesity (Female cut off value = 0.47442):

| | Lower Inequality | Higher Inequality |
|----------------------|--|--|
| Lower Wealth | Arunachal Pradesh, Rajasthan, Uttar Pradesh. | Assam, Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh, Orissa, Tripura, West Bengal. |
| Higher Wealth | Andhra Pradesh, Delhi, Goa, Gujarat, Haryana, Himachal Pradesh, Jammu and Kashmir, Karnataka, Kerala, Manipur, Maharashtra, Meghalaya, Mizoram, Nagaland, Punjab, Sikkim, Tamil Nadu, Uttaranchal, | Goa, Karnataka. |

Table 3k: Prevalence of Obesity (male cut off value = 0.44952):

| | Lower Inequality | Higher Inequality |
|----------------------|---|---|
| Lower Wealth | Arunachal Pradesh, Tripura. | Assam, Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh, Orissa, Rajasthan, Uttar Pradesh, West Bengal. |
| Higher Wealth | Andhra Pradesh, Delhi, Goa, Gujarat, Haryana, Himachal Pradesh, Kerala, Manipur, Maharashtra, Meghalaya, Mizoram, Nagaland, Punjab, Sikkim, Tamil Nadu. | Jammu and Kashmir, Karnataka, Uttaranchal. |

In case of inequality in obesity for both male and female show a straightforward negative relationship with the coexistence of higher wealth –lower inequality and lower wealth –higher inequality in most of the states (table 3j&3k).

Classification according to Wealth Levels and Inequality in Health Resources Use:

Table 4a: Use of Child Vaccination (cut off value = 0.2069):

| | Lower Inequality | Higher Inequality |
|----------------------|--|--|
| Lower Wealth | Chhattisgarh, Orissa , Tripura, West Bengal | Arunachal Pradesh, Assam, Bihar, Jharkhand, Madhya Pradesh, Rajasthan , Uttar Pradesh, |
| Higher Wealth | Andhra Pradesh, Delhi ,Goa, Gujarat, Haryana, Himachal Pradesh, Jammu and Kashmir, Karnataka, Kerala, Mizoram, Maharashtra, Meghalaya, Punjab, Sikkim, Tamil Nadu, Uttaranchal | Nagaland, Manipur, |

In case of inequality in Child Vaccination show a straightforward desirable negative relationship with the coexistence of higher wealth –lower inequality and lower wealth –higher inequality in most of the states except Chhattisgarh, Orissa, Tripura, West Bengal, Nagaland, Manipur etc. This explains the fact that increase in wealth level can lead to reduction of inequality via the improvement of accessibility of child vaccination.

Table 4b: Use of AWC Services (cut off value = -0.08):

| | Lower Inequality | Higher Inequality |
|----------------------|--|--|
| Lower Wealth | Assam, Bihar, Chhattisgarh, Madhya Pradesh, Orissa, Rajasthan, West Bengal. | Arunachal Pradesh, Jharkhand, Tripura, Uttar Pradesh, |
| Higher Wealth | Hariyana, Himachal Pradesh, Jammu and Kashmir, Meghalaya, Mizoram, Manipur, Nagaland, Uttaranchal, | Andhra Pradesh, Delhi, Goa, Gujarat, Karnataka, Kerala, Maharashtra, Punjab, Sikkim, Tamil Nadu, |

There is no clear relationship between wealth levels and inequality in use of AWC services in the states (table 4b) but in use of health personnel for child birth a straightforward desirable negative relationship with the coexistence of higher wealth –lower

inequality and lower wealth –higher inequality in most of the states except in Bihar, Chhattisgarh, West Bengal, Meghalaya, Nagaland, Uttaranchal etc. (table 4c).

Table 4c: Use of health personnel for child birth (cut off value = 0.285):

| | Lower Inequality | Higher Inequality |
|---------------|---|---|
| Lower Wealth | Bihar, Chhattisgarh, Orissa, West Bengal. | Arunachal Pradesh, Assam, Jharkhand, Madhya Pradesh, Tripura, Rajasthan, Uttar Pradesh, |
| Higher Wealth | Andhra Pradesh, Delhi, Goa, Gujarat, Himachal Pradesh, Jammu and Kashmir, Karnataka, Kerala, Manipur, Punjab, Sikkim, Tamil Nadu, Hariyana, Maharashtra, Mizoram, | Meghalaya, Nagaland, Uttaranchal, |

Table 4d: Contraceptive use by Female (cut off value = -0.09522):

| | Lower Inequality | Higher Inequality |
|---------------|--|--|
| Lower Wealth | Madhya Pradesh, Orissa, Tripura, West Bengal | Arunachal Pradesh, Assam, Bihar, Chhattisgarh, Jharkhand, Rajasthan, Uttar Pradesh |
| Higher Wealth | Andhra Pradesh, Delhi, Goa, Gujarat, Hariyana, Himachal Pradesh, Karnataka, Kerala, Maharashtra, Manipur, Punjab, Sikkim, Tamil Nadu, Uttaranchal, | Jammu and Kashmir, Meghalaya, Mizoram, |

Table 4e: Contraceptive use by Male (cut off value = 0.09361):

| | Lower Inequality | Higher Inequality |
|---------------|---|---|
| Lower Wealth | Chhattisgarh, Madhya Pradesh, Tripura, West Bengal, | Arunachal Pradesh, Assam, Bihar, Jharkhand, Orissa, Rajasthan, Uttar Pradesh, |
| Higher Wealth | A P, Goa, Gujarat, Haryana, Himachal Pradesh, Karnataka, Kerala, Maharashtra, Manipur, Punjab, Sikkim, Tamil Nadu, Uttaranchal, | Delhi, Jammu and Kashmir, Meghalaya, Mizoram, Nagaland, |

In case of the Contraceptive use by Female and Male, major states like Jammu and Kashmir, Meghalaya, and Mizoram etc. demonstrate the coexistence of higher levels of wealth along with higher levels of inequalities, where as in Madhya Pradesh, Tripura, West Bengal it is the coexistence of lower wealth- lower levels of inequalities explaining the straightforward positive

relationship. But states like Arunachal Pradesh, Assam, Bihar, Chhattisgarh, Jharkhand, Rajasthan, Uttar Pradesh and Jammu and A P, Goa, Gujarat, Haryana, Himachal Pradesh, Karnataka, Kerala, Maharashtra, Manipur, Punjab, Sikkim, Tamil Nadu, Uttaranchal have the exceptions (table 4d & 4e).

Table 4f: Use Doctors for ANC Services (cut off value = -0.25106):

| | Lower Inequality | Higher Inequality |
|----------------------|--|---|
| Lower Wealth | Arunachal Pradesh, Assam, Orissa, Tripura, West Bengal | Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh, Rajasthan, Uttar Pradesh. |
| Higher Wealth | Andhra Pradesh, Delhi, Goa, Gujarat, Haryana, Himachal Pradesh, Jammu and Kashmir, Karnataka, Kerala, Manipur, Maharashtra, Meghalaya, Nagaland, Punjab, Tamil Nadu, Sikkim, | Mizoram, Uttaranchal, |

Table 4g: Use Nurse for ANC Services (cut off value = -0.16):

| | Lower Inequality | Higher Inequality |
|----------------------|---|--|
| Lower Wealth | Arunachal Pradesh, Assam, Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh, Rajasthan, Uttar Pradesh, | Orissa, Tripura, West Bengal |
| Higher Wealth | Delhi, Haryana, Jammu and Kashmir, Meghalaya, Mizoram, Nagaland, Punjab, Uttaranchal, | Andhra Pradesh, Himachal Pradesh, Gujarat, Goa, Kerala, Maharashtra, Manipur, Karnataka, Sikkim, Tamil Nadu, |

In case of the use of ANC services by doctors, most of the states follow desirable negative relationship with the coexistence of higher wealth –lower inequality and lower wealth –higher inequality (table 4f) but there is no clear relationship between wealth levels and inequality in use of ANC services by nurse in the states (table 4g).

Table 4h: Use of PNC Services (cut off value = 0.2719):

| | Lower Inequality | Higher Inequality |
|----------------------|--|---|
| Lower Wealth | Chhattisgarh, Orissa, Tripura, West Bengal | Arunachal Pradesh, Assam, Bihar, Jharkhand, Madhya Pradesh, Rajasthan, Uttar Pradesh, |
| Higher Wealth | Andhra Pradesh, Delhi, Goa, Gujarat, Haryana, Himachal Pradesh, Jammu and Kashmir, Karnataka, Kerala, Mizoram, Maharashtra, Manipur, Punjab, Sikkim, Tamil Nadu, | Meghalaya, Nagaland, Uttaranchal, |

In case of inequality in PNC services use and in coverage of Medical Insurance show a straightforward desirable negative relationship with the coexistence of higher wealth –lower inequality and lower wealth –higher inequality in most of the states except Chhattisgarh, Orissa, Tripura, West Bengal, Meghalaya, Nagaland, Uttaranchal in case of PNC services and in state like Arunachal Pradesh, Assam, Tripura, Andhra Pradesh, Tamil Nadu in case of coverage of Medical Insurance (table 4h & 4i).

Table 4i: Coverage of Medical Insurance (cut off value = -0.607):

| | Lower Inequality | Higher Inequality |
|----------------------|--|---|
| Lower Wealth | Arunachal Pradesh, Assam, Tripura, | Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh, Orissa, Rajasthan, Uttar Pradesh, West Bengal |
| Higher Wealth | Delhi, Goa, Gujarat, Haryana, Himachal Pradesh, Jammu and Kashmir, Karnataka, Kerala, Manipur, Maharashtra, Meghalaya, Mizoram, Nagaland, Punjab, Sikkim, Uttaranchal, | Andhra Pradesh, Tamil Nadu, |

Table 4j: Use of Govt. institutional Services at Sick time (cut off value = -0.2133):

| | Lower Inequality | Higher Inequality |
|---------------------|-------------------------|--|
| Lower Wealth | | Arunachal Pradesh, Assam, Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh, Orissa, Rajasthan, Tripura, Uttar Pradesh, West Bengal |

| | | |
|----------------------|--|---|
| Higher Wealth | Delhi, Goa, Gujarat, Haryana, Jammu and Kashmir, Maharashtra, Tamil Nadu, Himachal Pradesh, Kerala, Manipur, Meghalaya, Mizoram, Punjab, Sikkim, | Andhra Pradesh, Karnataka, Nagaland, Uttaranchal, |
|----------------------|--|---|

Table 4k: Use of Pvt. institutional Services at Sick time (cut off value = 0.0447):

| | Lower Inequality | Higher Inequality |
|----------------------|---|---|
| Lower Wealth | Tripura | Arunachal Pradesh, Assam, Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh, Orissa, Rajasthan, Uttar Pradesh, West Bengal |
| Higher Wealth | Delhi, Goa, Gujarat, Haryana, Himachal Pradesh, Kerala, Manipur, Meghalaya, Mizoram, Maharashtra, Tamil Nadu, Nagaland, Punjab, Sikkim, | Andhra Pradesh, Jammu and Kashmir, Karnataka, Uttaranchal, |

In case of inequality in use of both Govt. and private run institutional services at sick time show a straightforward negative relationship with the coexistence of higher wealth –lower inequality and lower wealth –higher inequality in most of the states which is desirable but surprising as poorer section has not been benefited as much by public run health related institutional facilities (table 4j &4k).

Correlation coefficients for Health Outcome Inequality and Resource Use Inequality

The correlation coefficients for total sample (wealthy and less wealthy group) show that inequality in ill health and inequality in publicly provided health resources are not correlated at all in most of the cases. Thus the correlation analysis is reasonably done separately for wealthy and less wealthy group. The correlation coefficients show that inequality in ill health raises 24

mostly with increasing inequality in publicly provided health resources use except inequality in use of ANC-doctors, AWC services by the wealthy sections (table-5a). In case of increase in inequality in vaccination and child birth in presence of health personnel, inequality in U5MR and child malnutrition increases. Inequality in use of ANC-doctors, AWC services and inequality in child health go in opposite direction for wealthy section due to the fact that people in the wealthy sections are heavily depends on private health service.

Table 5a: Child

| Less wealthy | Vaci | AWC | HP-Birth | ANC-Doc | ANC-Nurse | PNC | Govt-Serv | Pvt-Ser | M-I |
|----------------|--------|---------|----------|---------|-----------|--------|-----------|---------|------|
| USMR | 0.66** | | 0.56* | | .60** | .74** | .59** | | |
| Stunting | | | .57* | .56* | | | .54* | | |
| Anemia | | .69** | | | .61** | | .64** | | |
| Wealthy | | | | | | | | | |
| USMR | 0.46* | | 0.44* | -0.47* | | 0.84** | | | |
| Stunting | | -0.50** | | -0.51** | | 0.75** | | .56** | .45* |
| Anemia | | | 0.65* | | | | | | |

**;.5% and *;.10% level of significance.

The similar pattern of correlation between inequality in adult ill health and inequality in health resources use are shown in table-5b. In less wealthy section inequality in publicly provided basic services are more important to reduce the inequality in adult health indicators whereas wealthy section depends both on public and private services. This ambiguity will be clarified if the analysis for wealthy section can be parted into rural and urban distribution of wealthy people separately viz-a-viz rural and urban distribution of public and private health services.

Table 5b: Adult

| Less Wealthy | F-Contra | M-contra | ANC-Doc | ANC-Nurse | PNC | Govt-Serv | Pvt-Ser | M-I |
|----------------|----------|----------|---------|-----------|--------|-----------|---------|-------|
| F-ANE | 0.49* | | | | | | 0.5* | |
| M-ANE | | | | | | | | |
| F-HPRO | | -0.51* | | 0.57** | 0.58** | 0.48* | | |
| M-HPRO | | | | | | | | 0.55* |
| F-U/W | | 0.57* | 0.63** | 0.72** | | | | |
| M-U/W | | | | | | | | |
| F-O/W | 0.65* | | | | 0.52* | | | |
| M-O/W | | | | | | | -0.66** | |
| Wealthy | | | | | | | | |
| F-HPRO | | | | | | 0.47* | 0.59** | 0.42* |
| M-HPRO | 0.53** | 0.50** | | | | 0.42* | 0.62** | 0.46* |
| F-U/W | 0.65** | 0.64** | -0.44* | | | | | |

**;.5% and *;.10% level of significance.

Hence, due to low awareness, low capability and heavy dependence on public services the disadvantage section of the population are made the main difference in inequality in health outcome between wealthy and less-wealthy sections. Moreover, there may be the endogeneity between the distribution of health outcome and health resource use both for wealthy and less-wealthy sections but it is beyond the scope for the present analysis.

V. Conclusions:

A huge variation in sign and magnitude of inequality indices across states of India in health outcome and health resource use, are basically associated with variation in wealth level. It finds that the poorer sections of the population suffer very much in respect of ill health especially in child health or adult health outcome. In case of

risky behavior or life style diseases, the richer sections of the population are in disadvantageous position. In the context of inequality of resource use, wealthier sections of the population are more inequitable than poorer where the services are related to huge out-of-pocket expenditure. The analysis reveals that the degree of health outcome inequalities escalates with the rising wealth levels of the population in most of the states where as it is desirable that inequality should reduce with increase in wealth level. Again the degree of inequalities in health resource use of basic services escalates with the rising wealth levels of the population, may be due to the fact that wealthier are not trying to avail those public run services facilities. In a nutshell, with the wide inter-state variety of political, cultural, geographical, economic, and epidemiologic histories it is very hard to conclude about the nature and direction of wealth based health inequality as a whole in the country like India. These inequalities might be reduced by improving educational opportunities, wealth redistribution, health-related behavior, or access to health care.

Notes:

1. Equity as defined by the International Society for Equity in Health is: The absence of potentially remediable, systematic differences in one or more aspects of health across socially, economically, demographically, or geographically defined population groups or subgroups .
2. Recently, the World Bank, in cooperation with the Dutch and Swedish governments, has sponsored a set of reports providing basic information about health inequalities within countries. As a result of this collective initiative, the basic information (for 1992/93 and 1998/99) about health, nutrition and population inequalities is published in the report on India [Gwatkin et al 2007].
3. Wagstaff and van Doorslaer (2000) conducted a literature review of individual level studies on the impact of income inequality on health. In their review of six major studies, they found that the literature reveals strong support for the absolute income hypothesis and little or no support for the relative income hypothesis. Also see Macinko et al (2003).
4. The NFHS-3 wealth index is based on the following 33 assets and housing characteristics: household electrification; type of windows; drinking water source; type of toilet facility; type of flooring; material of exterior walls; type of roofing; cooking fuel; house ownership; number of household members per sleeping room; ownership of a bank or post-office account; and ownership of a mattress, a pressure cooker, a chair, a cot/bed, a table, an electric fan, a radio/transistor, a black and white

television, a color television, a sewing machine, a mobile telephone, any other telephone, a computer, a refrigerator, a watch or clock, a bicycle, a motorcycle or scooter, an animal-drawn cart, a car, a water pump, a thresher, and a tractor. The wealth index has been developed and tested in relation to inequalities in household wealth, use of health services and health outcomes (Rutstein et al., 2000). Each household asset is assigned a weight (factor score) generated through principal components analysis, and the resulting asset scores are standardized in relation to normal distribution with a mean of zero and standard deviation of one (Gawtkin et al., 2000). Each household is then assigned a score for each asset, and the scores were summed for each household; individuals are ranked according to the score of the household in which they reside. The sample is then divided into quintiles i.e., five groups with an equal number of individuals in each.

5. The cut-off levels for wealth category is defined on the basis of Table 2.17: of Household Population and Housing Characteristics of NFHS-III, report 2005-'06, (>33% of population fall in either lowest two wealth group or in highest two wealth group). The cut-off levels for health inequality are derived on the basis of the values of CI all India level for each and every CI of health outcomes and resource use indicators.
6. AWC service includes supplementary food, growth monitoring, immunizations, health check-up, and pre-school education, and ANC services includes ANM = Auxiliary nurse midwife; LHV = Lady health visitor; TBA = Traditional birth attendant; ICDS = Integrated Child Development Services, health personnel includes Doctor, auxiliary nurse midwife, nurse, midwife, lady health visitor, or other health personnel.

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