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MEASURING MOTIVATING POTENTIAL OF JOBS IN A CORPORATE HOSPITAL

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Abstract: From time immemorial, when people started understanding as to what makes them work in personal or professional lives, attempts to understand the concept of motivation have been pursued consistently. Consequently, the popular press is replete with management literature on the employee motivation as an important behavioral dimension. Managers often state "I wish I had a highly motivated staff working for me", often ignoring the fact that the answer is very much within themselves. Contrarily, the best way of answering it is by examining the motivation potential of the jobs created by the managers which is also their job responsibility. Thus, the present work attempts to explore the nuances of employee motivation in a 500 bedded large corporate hospital. To that effect, Job Characteristics Theory (JCT) (Hackman and Oldham, 1976) is chosen to be one of the most suitable theories to be tested, of course, partly. 208 employees representing 18 jobs responded to a standardized questionnaire which included a standardized scale that assesses the motivating potential score of the job occupied by the employees. Curiously, the employees representing various jobs did vary significantly on all the job characteristics, besides the motivating potential score according to their job specializations. Surprisingly, some medical specializations and some non-medical specializations were found to be having more motivating potential than others. Implications are drawn for managing motivation of the employees in corporate hospitals.

INTRODUCTION

Ever since the evolution of the societies, work predominated as centrality of lives of the people across all the cultures. In any society, the advanced and the non-advanced, work determines the ways of life, a pattern of interactions and a necessity for living. As it seems rewarding, it serves as a means of nurturing positive feelings and provides motivation to continue working. Work provides a major bond, through which man is united with his fellow beings, an axis along which his pattern of life is organized in the community.

Consequently, there emerged ample theories of work motivation. What motivates employees has been a continuous and perplexing question addressed by all these theories. As

these theories are evolved, two approaches were identified to group them. They are content theories and the process theories.

Content theories attempt to explain what exactly motivates people in general. In other words, all those theories which intend to explain the needs, motives, wants, desires that drive people towards their realization were categorized as content theories. On the other hand, the process of motivation or how exactly the motivation takes place in workplace has been the pursuit of the second line of theories called the process theories of motivation. After all of these, there is one commonality or the crux of motivation that is "work itself". Therefore, in the year 1975, *Hackman and Oldham*, developed a theory called job characteristics theory of motivation. A cursory view of this theory is presented later in this paper.

MOTIVATION AMONG HOSPITAL EMPLOYEES

As regards the motivation of employees, at least in a healthcare setting like hospitals, it is not very clear as to what motivates them to stay in such workplaces. By and large, the hospital jobs are not very well-paid jobs, besides being extremely stressful as a result of handling patients who are battling between life and death every minute.

Some believe that hospital staff are either motivated or they are not, and that appealing to an employee's need for material gain will not make any difference to their inherent motivation level. Monetary inducement will simply cause instrumental behaviour designed to get the reward. In health services a strong argument exists that staff are motivated to deliver the standards of care they have been trained to provide. As *Handy (1994)* puts it 'the wealth creation of a business is as worth doing and as valuable as the health creation of a hospital'.

Others think that 'pay' plays a large part in the employee's reason for being at work and that performance will improve if a monetary reward lies at the end. A point exists to working harder if individual employees know they will gain cash or other benefits. Contrary to such contentions, this study addresses the issue that work itself is the greatest motivator, since work occupies the central part of one's life. Therefore, the purpose of this study is threefold. Firstly, it measures the characteristics of hospital jobs. Secondly, it assesses the motivating potential of select jobs in the hospital. Thirdly, it draws implications for hospital administration.

JOB CHARACTERISTICS THEORY

Hackman and Oldham's (1975, 1976, 1980) Job Characteristics Model (JCM) is one of the most impacting theories ever accepted and adopted in the field management of behaviours in organizations. This theory also worked as a basis for scores of studies and job redesign interventions over the past two decades, and research on this model has been extensively

reviewed (Fried & Ferris 1987; Loher, Noe, Moeller & Fitzgerald, 1985; Taber & Taylor, 1990). The majority of research has supported the validity of the JCM, although critiques and modifications have been offered (Roberts & Glick, 1981; Salancik & Pfeffer, 1978).

According to the theory propounded by Hackman & Oldham (1979), any job can be described in terms of five core job dimensions, viz, skill variety, task identity, task significance, autonomy and feedback. What are these conceptually?

Skill variety is the degree to which the job requires a variety of different activities so the worker can use a number of different skills and talents. *Task identity* is the degree to which the job requires completion of a whole and identifiable piece of work. *Task significance* is the degree to which the job has a substantial impact on the lives or work of other people. *Autonomy* is the degree to which the job provides substantial freedom, independence, and discretion to the individual in scheduling the work and in determining the procedures to be used in carrying it out. Lastly, *feedback* is the degree to which carrying out the work activities required by the job results in the individual obtaining direct and clear information about the effectiveness of his or her performance. It is said that if the first three exist in jobs, employees feel that their jobs are meaningful, important, valuable and worthwhile. Autonomy gives them a feeling of personal responsibility for the results and if job provides feedback, the employees will know how effectively they are performing.

All these five job characteristics are expected to produce three critical psychological states. The first one is the *experienced meaningfulness* – the belief that one's work is worthwhile or important. The second state is *experienced responsibility* – feeling of personal accountability for the outcomes of efforts. The third psychological state is *knowledge of results* – employees seek information about the consequences of their work effort. All these critical psychological states determine the outcomes namely work motivation, growth satisfaction, general satisfaction and work effectiveness (McShane et.al, 2006). Loher, Noe, Moeller & Fitzgerald (1985) found that employees who have a high need for growth and who see their jobs as being high on the five core job characteristics have the most positive work outcome.

Measurement of the motivating potential of the jobs in organizations is the most important element of all in this theory. In this study an attempt is made only to measure job characteristics and the motivating potential score of all the jobs in the hospital defined by their job descriptions. In order to measure the motivating potential score (MPS) of each job, the following computation suggested by Hackman and Oldham (1976) is utilized in this study.

$$MPS = \frac{\text{Skill variety} \times \text{Task identity} \times \text{Task Significance}}{3} \times \text{Autonomy} \times \text{Feedback}$$

SOME RESEARCH STUDIES

In the early days of measurement of motivation, focus was on the listing of jobs. One such study was conducted by *Turner and Lawrence (1965)*. They focused on job characteristic from 47 types of jobs for systematic research on a large scale. The study aimed at evaluating the influence of various types of jobs on employees' job satisfaction and truancy. *Turner and Lawrence (1965)* observe that employees prefer jobs with high complexity and challenges. They summarize requisite task attributes, including variety, autonomy, required interaction, optional interaction, knowledge and responsibility, as part of complex and challenging jobs.

Hackman and Lawler (1971) found from their research on job characteristics and job satisfaction that employees scoring higher on four items (*skill variety, task identity, autonomy and feedback*) can also score higher on motivation and job satisfaction. The employees scoring high on the four items above were also shown to have lower task results for the five dependent variables explored.

Steers (1977) found job characteristics to be antecedents of organizational commitment. *Glisson and Durick (1988)* focused on manpower service workers and found job characteristics to be closely correlated with organizational commitment, among these job characteristics, skill variety and task identity showed the most significant influence. *Hunt et.al (1985)* found that autonomy, variety, task identity and feedback influence the level of an employee's organizational commitment. Similarly, *Ramaswami et.al (1993)* provided support for the direct influence of autonomy, variety and feedback on organizational commitment.

Bhuian et.al (1996) found task significance, autonomy and feedback to directly influence job satisfaction. From the research of *Reiner and Zhao (1999)*, *Bhuian et.al (1996)* found skill variety and task significance to have significant effects on job satisfaction. By and large, research on job characteristics very consistently supports the prediction that worker satisfaction, motivation and performance are higher among individuals who see their jobs as high in the five core job characteristics (*Fried & Ferris, 1986*).

By and large, all of these characteristics are understood to be applicable in the hospital jobs, their extent or degree differs according to the jobs designed and performed by their incumbents. Thus, it is hypothesized that the hospital employees do not differ in their job characteristics and motivation potential score according to their specialization.

METHOD

This study is carried out in a private multi-specialty, 500 bedded, *ISO 9000-2001* certified hospital involving a sample of 208 employees performing 18 jobs. A stratified, disproportionate, random sampling technique was adopted to select the respondents of the study. *Naughton's*

(1988) scale to measure the job characteristics of the hospital staff is adopted. The response pattern ranged from "strongly agree" to "strongly disagree" (where strongly agree =5 and strongly disagree=1). Employees gave their ratings to the scale items tapping essence of the job characteristics. Items on each sub-scale meant for the five characteristics were averaged to obtain a summary score for each of the five job characteristics. Item details are presented in table 1. The five job characteristic measures were then summed to form an *Additive Motivating Potential Score (AMPS)* for each subject (Dunham, 1976; Oldham et al., 1986) according to the MPS formula.

Details about the job characteristics, number of items, scale reliabilities are reported in Table 1. Alpha coefficients reveal that the scales items used to measure job characteristics are highly reliable and internally consistent.

Table 1
Details about the Scales and the Items

Sl. No.	Job Characteristics	Conceptualization	Items	Alpha Co-efficients
1	Skill variety	Degree to which the employees have the scope of using different skills and talents to complete a variety of work activities	6	.66
2	Task identity	Degree to which a job requires completion of a whole or identifiable piece of work, such as doing something from beginning to end.	3	.60
3	Task significance	Degree to which the job has a substantial impact on the organization.	3	.45
4	Autonomy	Degree of employees has freedom in scheduling the work, determining the procedures and the methods of work.	6	.56
5	Feedback	Degree to which employees can tell how well they are doing based on direct reports from the work itself.	2	.42

RESULTS AND DISCUSSION

It was hypothesized that the hospital employees do not differ in their job characteristics and motivation potential score according to their specialization. Results with regard to the testing of this hypothesis are presented in the following sections.

Table 2 shows the distribution of mean scores and motivating potential score of 18 jobs of the incumbents on skill variety, task identity, task significance, autonomy, feedback. With regard to skill variety, it is clear that hospital engineers scored higher mean score (22.33) followed by technicians and physicians (21.50), assistants (20.64) and executives (20.16). The waiters have scored the least on skill variety (11.00). Interestingly, the f-value shows that the respondents significantly differ in their score on skill variety scale. Thus, it could be said that the jobs of these people require a variety of different activities to be performed.

Table 2
Mean Scores and F-values of the job characteristics and MPS

Sl. No.	Incumbents	Skill Variety	Task Identity	Task Significance	Autonomy	Feedback	MPS
		Mean	Mean	Mean	Mean	Mean	Mean
1	Drivers	12.7	11.0	9.5	14.0	6.2	302.5
2	Supervisors	18.0	10.0	13.0	20.0	7.0	634.6
3	Waiters	11.0	10.0	6.0	15.0	6.0	201.0
4	Housekeepers	15.6	9.2	9.6	15.0	7.0	363.6
5	Dieticians	18.0	11.0	14.5	20.0	8.0	802.3
6	Stenos	20.0	10.0	13.7	24.2	8.2	944.5
7	Cooks	12.3	11.6	6.6	16.3	9.0	344.0
8	Cashiers	18.5	9.0	10.7	23.5	7.0	615.5
9	Assistants	20.6	10.2	11.8	23.0	8.1	788.0
10	Executives	20.1	8.1	11.6	20.8	7.3	618.3

MEASURING MOTIVATING POTENTIAL OF JOBS IN A CORPORATE HOSPITAL

11	Nurses	17.5	9.4	11.1	17.0	7.1	482.6
12	Doctors	19.3	9.3	12.7	22.4	7.6	789.4
13	Data Entry Operators	21.5	9.0	13.0	19.5	6.5	593.8
14	Physiotherapists	21.5	9.5	13.0	23.5	8.0	845.6
15	Front office Assistants	17.8	10.2	10.8	14.6	6.0	358.2
16	Maintenance Operators	16.3	10.0	11.3	16.3	8.6	557.8
17	Engineers	22.3	8.0	12.3	22.0	7.0	700.2
18	Technicians	21.5	9.2	13.2	22.2	7.2	754.6
19	F _{value} d.f (16,190)	6.57**	.77	5.33**	5.38**	2.08*	5.06**

N=190, P=**.0000, * .01.

On task identity, cooks scored the highest mean score (11.66) followed by dieticians and ambulance drivers (11.00), front officers and assistants (10.20). Interestingly, the engineers scored the least (8.00). This means, the total jobs of these people need to be completed by themselves only, whereas it is not so in the case of engineers' jobs. However, the f-value shows that the respondents do not differ significantly in their score on task identity scale which is evident from the f-value. One can easily understand the nature of job of cooks in a hospital. They experience a fair amount of sense of identity with the jobs they do on a day-to-day basis as they feed a large number of people several times a day. Therefore, every time they prepare a meal, they feel a sense of completion and fulfillment in their completed work. They are followed by dieticians who also experience a sense of identity with what they do in their jobs. They too feel that their work is complete unlike others in the hospital. Therefore, the other staff is relatively less on task identity since everybody contributes his/her mite towards the recovery of the patients.

With regard to task significance, dieticians scored the highest mean score of 14.50 followed by stenos (13.72), supervisors and data entry operators and physicians with a mean score of 13.00. Interestingly, the f-value shows that the respondents significantly differ in their score on task significance scale.

On autonomy dimension, stenos scored the highest mean (24.25) followed by physicians and cashiers (23.50), assistants (23.00) and technicians (22.25). Surprisingly, front officers and ambulance drivers scored the least. Interestingly, the f-value shows that the respondents significantly differ in their score on autonomy scale.

On feedback, maintenance staff scored highest mean of 8.66 followed by stenos (8.25), assistants (8.10), physicians (8.00) and dieticians (8.00). Waiters and front officers scored the least. Interestingly, the f-value shows that the respondents significantly differ in their score on feedback scale.

Lastly, with regard to motivating potential of the jobs, it is interesting to note that the top five jobs of doctors, nurses, technicians, assistants, and executives, jobs have greater motivating potential. The last five with least motivating potential are waiters, cooks, data entry operators, drivers and dieticians, which is evident from the scores presented in table 2. Interestingly, the f-value also reveals that such differences in their MPS are statistically significant.

In conclusion, it could be stated that all the hospital staff have significantly varied scores on all the characteristics of the job except on task identity. This is very interesting. What does it convey from the hospital context and from the perspective of each individual's contribution towards the recovery process of the patients therein. This issues needs to be discussed in the light of the meaning of the 'task identity'. It was conceptualized as "degree to which a job requires completion of a whole or identifiable piece of work, such as doing something from beginning to end." In a hospital every staff member does job which is only a single portion of a whole job. The recovery of an ailing patient is not contributed by the doctors and the nurses alone; it is the unified efforts of eighteen staff members which is a minimum. By and large, the objective of patient recovery and ensuring better quality of life for a patient is not the job of either one or two staff members, but of more than 25 people in a full fledged hospital with requisite number of staff and the technologies employed.

IMPLICATIONS FOR HOSPITAL ADMINISTRATORS

Specific guidelines could be offered to redesign jobs. Such easily implementable guidelines make the job design area popular and practical for more effective human resource management. Some of the following guidelines for practice could be followed.

Skill variety can be ensured by providing training and re-training to the employees in cross functional areas, though such attempts may be acceptable from the perspective of hospital functional protocols. In many clinical and medical specializations, such attempts are not valid, but in some para-medical and non-medical area of work, such attempts may be tried. Another issue is that jobs that expand duties require more skills on the part of employees. Thus, training

in functional areas is a pre-requisite for ensuring skill variety. Task Identity could be promoted by giving projects to the employees or specially form work modules for each of them. However, it is suggested that the trend of staff members responding to this dimension is invariant. In other words, it means that they realize that they do not state that they do the job complete from the beginning to the end, owing to the peculiar nature of the business process in a hospital context. The process of patient recovery is driven by a unitary effort of all staff members rather than individual specific. Therefore, this trend implies that there is a better scope for building teamwork systems as opposed to the individual focused or centered work systems which occurs in non-service organizations. As regards task significance, it could be made possible when the importance of the job is communicated to the employees and, further, by taking steps to enhance the image of the organization. Further, in case of autonomy to be ensured, employees need to be empowered to make decisions in their work areas instead of waiting for the supervisors to come to their rescue. Moreover, by being given more responsibility and accountability, employees may not misuse their autonomy. Feedback is very important; it could be ensured by implementing information systems. On the other hand, supervisors give objective and immediate information to the employees on their performance. This way the employees' tasks in the hospital can be meaningful, enjoyable and potentially motivating for all the job occupants.

CONCLUSION

Assessment of motivating potential of the jobs in hospital is a pre-requisite for re-designing the work systems that promise greater productivity in the hospitals. This study reported that on skill variety, hospital engineers scored higher mean score, whereas on task identity, cooks scored highest mean score. With regard to task significance, dieticians scored the highest mean score. On autonomy, stenographers scored the highest mean, whereas on feedback, maintenance staff scored highest mean.

Except on task identity, on all the other job characteristics, the hospital employees significantly differed in their perception. Thus, the hypothesis that "hospital employees may differ in their job characteristics and MPS according to their specialization" has received strong support in this study.

Lastly, with regard to motivating potential of the jobs, it is interesting to note that the top five jobs of doctors, nurses, technicians, assistants and executives have greater motivating potential. Implications are drawn for hospital administrators.

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AN INSIGHT INTO THE INDEPENDENCE OF INDEPENDENT DIRECTORS

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Abstract

Independent directors are playing a very crucial role in good corporate governance system especially in the Indian context where one third of the publicly listed companies are promoted, controlled and managed by families. But there are theoretical debates on how independent the independent directors are. Besides this, dilemma prevails on who should monitor the Board structure - Securities Exchange Board of India (SEBI) or Department of Company Affairs (DCA)? Both of them come up with different recommendations and guidelines for corporate governance. As a result, there is confusion regarding the number of independent directors in the Board. In this backdrop, this article has made a serious attempt to look into the above mentioned crucial aspects of corporate governance as a guide for precautions from scams, scandals and flagrant violations under the veil of corporate impenetrability. Finally, some recommendations towards achieving good corporate governance through implementing independence in real sense have been suggested to enable the corporate leaders to build and restore trust among stakeholders.

INTRODUCTION

In the Indian context where one third of the publicly listed companies are promoted, controlled and managed by families, independent directors are probably playing a vital role to ensure transparency in corporate reporting. But, there are contradictions in legal requirement regarding the number of independent directors to be present on the Board. According to *Clause 49 (SEBI)*, at least 50% of the Board should consist of independent directors when the chairman is executive and one-third in case of a non-executive chairman. Contrary to this, as per the recommendation of the *Irani Committee*, the number of the independent director should be one-third of the total size of the Board. The Committee suggests that one-third of total directors as independent directors should be adequate for a company having significant public interest, irrespective of whether the chairman is executive or non-executive, independent or not. To avoid conflict with *Clause 49*, the Committee has recommended that the directors of other regulators for companies

within their domain may prevail, if they are at variance with its recommendations on the subject (*Kumar, N., p. 36*).

Basically the conflict is regarding identifying the fine line of regulatory power between *SEBI* and *DCA*. *SEBI* is mainly focusing on the practices and processes of governance while the structure for governance shall be vested with *DCA*. As all incorporation regulations are monitored and controlled by *DCA*, issues like structure, formation or composition of the Board should be looked after by *DCA*. *SEBI* has nothing to do in this respect. So any recommendation or guideline relating to the structure of the Board should come under the territory of *DCA*. But sometimes fulfilling legal requirements on these aspects may become fulfillment of mere 'form' rather than the underlying 'substance' of the law. As a result, good corporate governance system may cease to exist in reality. In this backdrop, it is time to look into the matter seriously, whether independent directors are independent in the real sense or not.

The remainder of this paper is structured as follows: Section 2 has discussed different practical problems to achieve independence in true sense by the independent directors. Section 3 has made some recommendations to overcome the problems. In Section 4, concluding remarks are presented.

PRACTICAL PROBLEMS TO ACHIEVE INDEPENDENCE IN TRUE SENSE:

As per the scheme of the company law, directors are elected by shareholders at the annual general meeting to manage the affairs of the company. They are the agents of the company and have a fiduciary duty to act in the best interest of the company (*Kumar, N., p. 33*).

The J.J. Irani Committee has recommended that the expression 'Independent Director' shall mean a non-executive director of the company who:

- a) apart from receiving director's remuneration, does not have, and none of his relatives or firms/companies controlled by him have, any material pecuniary relationship or transactions with the company, its promoters, its directors, its senior management or its holding company, its subsidiaries and associate companies which may affect independence of the director;
- b) is not, and none of his relatives is related to promoters or persons occupying management positions at the Board level or at one level below the Board;
- c) is not affiliated to any non-profit organization that receives significant funding from the company, its promoters, its directors, its senior management or its holding or subsidiary company;
- d) has not been, and none of his relatives has been, employees of the company in the immediately preceding years;
- e) is not, and none of his relatives is, a partner or part of senior management (or has

not been a partner or part of senior management) during the preceding one year of any of the following:

- The statutory audit firm or the internal audit firm that is associated with the company, its holding and subsidiary companies;
- The legal firm(s) and consulting firm(s) that have a material association with the company, its holding and subsidiary companies;

f) is not, and none of his relatives is, a material supplier, service provider or customer or a lessor or lessee of the company which may affect independence of the director;

g) is not, and none of his relatives is, a substantial shareholder of the company i.e. owning two per cent or more of voting power.

Explanation:

For the above purposes:

- "Affiliate" should mean a promoter, director or employee of the non-profit organization.
- "Relative" should mean the husband, the wife, brother or sister or one immediate lineal ascendant and all lineal descendants of that individual whether by blood, marriage or adoption.
- "Senior management", should mean personnel of the company who are members of its core management team excluding Board of Directors. Normally, this would comprise all members of management one level below the executive directors, including all functional heads.
- "Significant funding" should mean 25% or more of funding of the non-profit organization.

The heart of governance is the independence of directors (*Raghavan, R.S., p.27*). The basic tenet of good corporate governance is that independent, non-executive directors are appointed to provide checks and balances against the possibility of misusing the power by the Executive Board and the promoters. Besides this, it is expected that independent directors should bring in independent thinking and sound experience in their respective field. They should act independently in the general interest of the company to benefit all stakeholders, including minority and small shareholders. In order to do this, they should be capable of striving against the influence and pressures of the company or of the particular group of the shareholder who appointed them. They should independently perform all of their activities like decision-making, implementing strategy including key appointments and standards of conduct and also should ensure that proper monitoring mechanism is prevailing in the system. In fact, truly respected and valued independent directors are those who are competent, committed and have an independent 'state of mind' to challenge and ask the right/uncomfortable questions (*Kumar, N., p.33*). So the importance of independent directors to implement a healthy governance system in any corporate cannot be undermined. But due to different measures (which are indispensable to keep the standard of corporate governance) that have been taken by government, obtaining right quality directors becomes an issue. The *SEBI* code of corporate governance stipulates that an individual

cannot join Boards of more than ten companies so that they can spend reasonable time in each company in which they are directors. But in order to implement this provision, at least 3600 individuals are needed for listed companies if each company is required to have six independent directors on the Board. The basic purpose behind the appointment of independent directors is to win shareholders' confidence by issuing signals to the market that the company has an internal mechanism to monitor the decisions of owner-managers. Therefore, it is only the reputation due to the professional attainment that can fulfill the purpose of signaling the capital market. Companies always attract persons having the right public image. As the number of such person is insufficient, only companies having a good track record of corporate governance can attract them. Besides this, *Companies Act 1956* stipulates a ceiling on the remuneration of outside directors. In most of the cases, remuneration that is linked with profit is insufficient to attract the best talent as independent directors. In this respect, a new concept introduced by *J.J. Irani Committee Report* regarding freeing the managerial remuneration limits is very significant. The Committee has recommended removal of all ceilings on payment of directors' remuneration (*Managerial remuneration in India has so far been restricted to certain limits in the case of public companies and private companies which are subsidiaries of public companies with the overall limit being 11% of the net profits of the company during the financial year*). Shareholders of companies have been empowered to decide as to how to compensate their directors. However, this process is to be transparent and based on principles that ensure fairness, reasonableness and accountability. It is important that there should be a clear relationship between responsibility and performance vis-à-vis remuneration, and that the policy underlying directors' remuneration be articulated, disclosed and understood by investors/stakeholders. To ensure transparency, it is recommended that directors' remuneration report should form part of the annual report of the company and should contain details of remuneration package of directors including company's policy on directors' remuneration, the performance graph of the company and the remuneration of directors' vis-à-vis the performance of the company. Another important feature of the recommendations relating to managerial remuneration is the removal of all government approvals. The Committee felt that in the current competitive environment, where Indian companies have to compete for specialized manpower globally, it might not be feasible or appropriate for the government to interfere. Instead of the restrictive regime based on 'government approvals' the 'shareholder approval' regime can be adopted. Decision on how to remunerate directors should be left to the company. However, this should be transparent and based on principles that ensure fairness, reasonableness and accountability. It has been recommended that shareholders should be empowered to decide the remuneration of non-executive directors including independent directors with no government interference. The criteria for remuneration/compensation of non-executive / independent directors should be based on their attendance and contribution and performance of the company. This may be in the form of sitting fees for Board and Committee meetings attended physically or participated in electronically and/or profit related commissions. Further in order to ensure accountability, the *Companies Act 1956* stipulates that directors are individually responsible for the non-compliance of corporate and other laws and for frauds perpetrated by the company (*Bhattacharyya, A.K., p.399*). *J.J. Irani*

Committee also recommended that if the independent director does not initiate any action upon knowledge of any wrong, such directors should be held liable. This implies that, if they do not act pro actively and protect the interest of the company even after coming to know of irregularities, they should be held responsible. All these discourage qualified persons from joining the Board. Besides this, most Indian companies do have independent directors on the Board, comprising men of distinction like bureaucrats, academicians etc, purposely put together to discuss, analyze and not accept blindly the views of the management. But most of such directors either don't have sufficient knowledge of business matter or they are reluctant to look after the business matter due to lack of time or intent or both (*Chakraborty, K., p.14*). Moreover, there are theoretical debates on how independent are the independent directors. In fact, there are enough evidences in Indian corporations where 'independence' itself is questionable. Just one case of *Tata Motors*, belonging to the Tata group will clear the concept of real independence. Till sometime back *Ratan Tata* was the executive chairman of the company. He relinquished the post at sixty-five, and became the non-executive chairman. According to *Clause 49*, the independent component will be based on whether the chairman is the executive or the non-executive chairman. But the power equation within the company due to *Ratan Tata's* giving up the post of executive chairman and becoming non-executive chairman, may still remain unchanged – which may not satisfy the interest of all *stakeholders*. (The *Tatas* have done neither that nor will do that in future. We have used the hypothetical example to highlight how the law's intent can be avoided and misinterpreted if promoters want to do so.) If independent directors are not independent in true sense, then the base of corporate governance will become weak.

SOME RECOMMENDATIONS TO OVERCOME THE PROBLEMS:

Independence of thought:

In case of public limited company the promoters should act as trustees on behalf of all shareholders and should concentrate on the good of the company and not just on their own interest. What has to be kept in mind is that independence should be independence of thought and practice, and not merely structural independence. In this respect, *Infosys'* corporate governance philosophy that the company will try to 'satisfy the spirit of the law and not just the letter of the law' is notable. Big business groups should also keep in mind their group structure before nominating independent directors to maintain independence in the true sense. Presently, the regulation prescribes that independent directors shall not hold more than two per cent because regulators feel that their independence will be lost, as they (independent directors) may indulge in the interest of shareholders if they are allowed to hold more than two per cent. But what is the guarantee that independent directors will not align more with shareholders even if they are allowed to hold two per cent? So it is better that independent directors do not hold any share in the company. On the other hand, independent directors should be paid well. In fact, a decent compensation will prevent them from developing vested interests and restrict their number of directorships. *The Company's Amendment Act 2000* has reduced the number of independent directorship from twenty to fifteen companies, and *Confederation of Indian Industry*

(CII) in its code on corporate governance published in 1997 recommended that maximum limit of directorships that an independent director can hold is ten. However, implementing a law may result in shortage of talents to hold the position of independent directors. The possible solution to this problem is a decent payment, which will prevent independent directors from taking more directorships and will make them more involved in the present job. Real independence that is indispensable for good governance system is difficult to achieve. Sometimes, a long tenure makes them emotionally attached to the management, preventing them from being independent in true sense. In this respect, *Lord Nolan's principles of public life* (showed below) may help these directors to be independent in the true sense.

Lord Nolan's principles of public life	
•	Selflessness: Holders of public office should serve the public interest, not seek gains for themselves or their friends.
•	Integrity: They should not place themselves under financial obligation to outsiders who might influence their duties.
•	Objectivity: They must award public appointments on merit.
•	Accountability: They should submit themselves to appropriate scrutiny.
•	Openness: They should give reasons for their decisions.
•	Honesty: They should declare conflicts of interest.
•	Leadership: They should support these principles by personal example. They should have the courage to say "no", which might sometimes mean sacrifices in the form of not-so-small financial losses.

Recruitment process for independent directors:

Recruitment of independent directors is a most serious job as it introduces fresh talents and skills to the organization. Legislation has been developed with the growing demand for transparent and independent board with the compliance of those (legislation) matters. Besides this, directors should have an insight into the unique nature of the company including its people, products, philosophy and strategy. Before recruiting the independent directors, there should be a thorough systematic assessment of needs in accordance with the company's strategic plan. An elaborate and scientific recruitment process should be followed in order to nominate them. Companies may also advertise for these positions. After recruitment, they should undergo an induction program under senior independent directors to enrich themselves with the knowledge that is necessary. A formal comprehensive induction should always be provided to ensure early contribution of these directors on their boards (*Prasanna,P.K., p. 64*). At present, *SEBI* has prescribed a non-mandatory requirement that independent directors shall not serve for more than a continuous period of nine years on the board of a company. It is also recommended that each term of appointment should not exceed three years (*Prasanna,P.K., p. 63*). This is also helpful to maintain independence in the true sense (discussed earlier). *SEBI* should also prepare and keep a

list of suitable people who can be approached for appointment of independent directors. In fact, if they could be appointed by some (external in respect to the company) professional body, then in one sense, it will help to preserve board's independence also. In this respect, companies may contact professional consultants as they (professional consultants) can carry out a professional process to recruit independent directors. Generally professional consultants adhere to the following steps before recruiting them:

The process will include:	
*	a full-fledged profile of the candidate
*	thorough reference checking and evaluation
*	a rigorous and transparent process, which the board and appointments committee can refer to
Source: www.alexanderhughes.com	

CONCLUSION:

Though in India company failure due to corporate governance is negligible and there exist a number of outstanding examples of companies with enlightened leadership, the current scenario has a lot of scope for improvement like convergence with international accounting and audit standards, better protection of minority investors' rights and stronger enforcement of existing laws and regulations. These areas require more attention in the near future (Sur, D., & Chakraborty, K., p. 27). In fact, till now stakeholders were either ignorant or uninterested about the importance of good governance. We should not forget that some management gurus also used to rate Enron very high when it was in its full bloom. Therefore, we should be determined not to commit the same mistake by ignoring the importance of independence of independent directors in its true sense.

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MANAGEMENT OF HIGHER EDUCATION: A CONCEPTUAL ANALYSIS

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Abstract:

Higher education is in a quandary all over the world and it occupies a prestigious place even in the modern context of contemporary society. India is still lagging behind in higher education as compared to the advanced countries and many of the developing countries in the world. Higher education system in India is faced with diversity, ambiguity and complexity.

The Government of India is projected to spend 6 per cent of the G.D.P. on education, half of this on primary and secondary education alone. To fund this ambitious project the Government imposed education cess on all central taxes. But this avenue was not available to states to meet their incremental requirements, and therein lies the crux of the debate whether education should be treated as an industry and be opened to Foreign Direct Investment.

INTRODUCTION:

Higher education has undergone enormous changes in recent times. Since the formation of universities, around 1500 years ago, it has seen many transformations. However, the last decade of the 20th century brought into picture several challenges that were not anticipated either by the people in the business of higher education or by the society. The main reasons for these new challenges are the revolutions that have taken place in the field of education in the last two decades, mainly because of advancement in the technologies, namely information, broadcasting and communication.

We have witnessed interesting relationship between Education-Knowledge-Health-Economy of a nation. Therefore, education has become the prime agenda for both developed and developing nations. There are two dimensions of education that have emerged at a global level.

The first dimension is that of "*Academics*", which is concerned with ethical and moral values. These are linked with the training of minds, which in turn is linked with education. Therefore, education becomes an entity to be looked as a non-profitable activity. The other dimension is that of "*Trade in Education*", which has emerged in recent times. It is linked with economy. Thus, people and nations consider education as a "*Service Industry*" and it is included in the *General Agreement on Trade in Services (GATS)*.

In India private and Government academic institutions are actively engaged in providing educational programmes. Higher education has always had an international dimension, with more than million students studying overseas and with many collaborative arrangements among universities. This multinational thrust is a new development. There is a huge market for offshore academic programmes, since in many countries the demand for post-secondary education is much higher than the supply. The export of higher education depends on the ability to deliver programmes worldwide through offshore campuses, collaboration with overseas institutions, or via distance education. These initiatives are needed in the context of expansion.

The universal agreements need to provide useful and effective educational programmes through new technologies and international collaborations. We must understand all the implications of these innovations if they are to serve the interests of students and teachers and not simply become a vehicle for profit making corporations. We are in the midst of a revolution in the delivery of academic programmes of all kinds internationally. So far, the educationalists have focused largely on the positive aspects of the revolution. Increased access, lower costs, and the advent of a truly global market for higher education are all cited as favorable trends especially when governments are cutting back on higher education's spending.

There has been a very rapid expansion of higher education in India. The expansion, according to critics is not effectively planned, as the major objective was access to higher education. The motive for establishing multinational higher education enterprises is almost always to make money. This of course is the aim of the growing number of profit institutions, but it is also the case with most traditional non-profit universities. British and Australian Institutions have been especially active internationally as a way of making up for budget cuts at home.

The multinational and distance movement does not really contribute to the internationalization of higher education, worldwide, because they operate in a largely unregulated environment. Accreditation systems are trying to catch up with new developments, and government agencies, both in the sponsoring and in the receiving countries are concerned. The rationale for interest in export of higher education emerged in the Indian context very forcefully in view of India's need for multinational education approach that specifically focuses on concepts of anti-bias education, prejudice reduction and social reconstruction.

EXPOSURE TO GLOBAL EDUCATIONAL SYSTEM:

For centuries, from the time of *Nalanda and Taxasila*, foreign scholars used to come to *India* for higher education. Even today students from neighboring *Asian and African Countries* seek higher education in India. India's leadership in university education enhanced its image and influence abroad. This requires to be strengthened and developed further. It will help the country to earn a considerable amount of foreign exchange.

In this era of information technology, every alternate institution wants to register its presence in the cyber space by launching one or the other programme through the worldwide web. In many cases, it has been reported that the same matter is pasted on the server without bothering much about the institutional commitments; infrastructure, instructional design, interactivity and usability related issues. Their absence has contributed to the deterioration of academic and support services.

The following are some of the arguments favoring globalization of higher education:

- Search for new centers of revenue in global markets.
- Empowerment of learners who can now choose courses from a range of institutions previously closed to them.
- Benefits to students participating in a course with colleagues drawn from across the world.
- The provision of access to quality education wherever a student lives.
- Availability of scarce top quality expertise to students anywhere in the world.
- Provision of access to curricular activities that embraces a broader spectrum of knowledge than any one institution might accomplish.

The approach to the development of a global educational pursuit is based on franchising arrangements. In a franchise arrangement the course content remains the same but the material is adopted by translating it in the local language incorporating local case studies and by customising the length or degree of difficulty of material, which would demonstrate the quality. But globalization raises some crucial issues in the light of which the higher educationists have to review and modify their practices to fit to the new frame. Thus conditions may vary from location to location across the borders. This allows full mobility to the students and gives them maximum benefit of specialized programmes run by different institutions globally. International agencies like the *UNESCO* can help to a great extent in internationalization of education and forming a mechanism to globally recognizing the programmes of different institutions and evolving a viable mechanism of credit transfer for the benefit of international students.

QUALITY ASSESSMENT AND ACCREDITATION OF ACADEMIC PROGRAMMES:

Another important aspect of today's education is quality assurance by the educational providers. With the accreditation for quality becoming a national and international norm, the higher education institutions in India must gear towards quality in order to attract students from overseas; otherwise, we may be left behind in the competition. With the opening up of the low cost global opportunities, students have become more cost-conscious and expect quality from the providers of education.

In India the *NAAC (National Assessment and Accreditation Council)* and *NBA (National Board of Accreditation)* are playing a crucial role in assessing and accreditation educational institutions so that they can meet global competition. Apart from this, it is also necessary to have accreditation by external agencies in order to assess the performance of the educational institutions with regard to the quality of teaching, infrastructure and placement. In recent times, the distance education institutions have been playing a pioneering role developing and implementing schemes of instructional partnership and collaboration.

The process of internationalization of higher education raises the following crucial issues among others, which need to be resolved before an institution enters the global fray;

- Improving quality of teaching-learning and making it available to culturally, educationally, geographically and linguistically diverse student body.
- Becoming sensitive to local issues while being globally competitive and preventing commercialization and westernization in the name of globalization.
- Need to understand the range of requirement of old and new clients to concretize the same with academic understanding for developing of a curriculum, which recognizes globalization and universal interdependence.
- Preventing commodification of education to protect the dwindling status of educational institutions to that of business houses.
- Increasing and maintaining acceptability and desirability of cross-border education.
- Helping teachers in updating their knowledge to adopt to new role by adding new competencies to their existing scientific and pedagogical backgrounds.
- In global framework, service management is a gray area, which hampers the smooth functioning of the system and requires utmost serious attention. The institutions in developing countries like India are not able to improve the deteriorating student support services in their own land.
- Establishing, maintaining and monitoring the student support services network since the development of *Information and Communication Technology (ICT)* is not uniform across the world and providing quality services alike in all parts of the world will be very difficult.

STATE WISE COMPARISON OF ATTAINMENT IN PRIMARY EDUCATION

As per information provided to the *Rajya Sabha* in the winter session of 2007, an *Educational Development Index (EDI)* has been developed by the *National University of Educational Planning and Administration (NUEPA)* to assess progress of States & Union Territories towards the goal of *Universalisation of Elementary Education*. The EDI takes into account four broad parameters of access, infrastructure, and teacher related indicators and elementary education outcomes.

Ranking of states on a composite index for primary and upper primary levels of education based on 2005-06 data

Rank	State	EDI Value	Rank	State	EDI Value
1	Kerala	0.708	19	Rajasthan	0.583
2	Delhi	0.707	20	A&N Islands	0.566
3	Tamil Nadu	0.701	21	Manipur	0.564
4	Puducherry	0.7	22	Chattisgarh	0.559
5	Chandigarh	0.69	23	Haryana	0.556
6	Karnataka	0.674	24	D&N Haveli	0.538
7	Himachal	0.668	25	Tripura	0.535
8	Andhra Pradesh	0.654	26	Meghalaya	0.534
9	Mizoram	0.65	27	Nagaland	0.533
10	Lakshadweep	0.65	28	Orissa	0.512
11	Sikkim	0.635	29	Madhya Pradesh	0.512
12	Maharashtra	0.635	30	Assam	0.49
13	Gujarat	0.63	31	Uttar Pradesh	0.482
14	Punjab	0.608	32	West Bengal	0.467
15	Uttarakhand	0.605	33	Arunachal	0.458
16	J&K	0.597	34	Jharkhand	0.435
17	Daman&Diu	0.592	35	Bihar	0.327
18	Goa	0.586	Source: Rajya Sabha Unstarred Question #654		

BUDGETARY ALLOCATION FOR EDUCATION:

Now, it is proposed to analyze the budgetary allocation for education according to state-wise expenditure on education and budgetary share of education in state's total expenditure. The relevant data of state-wise expenditure on education and state's share in total expenditure on education is presented in Table-I & II.

The data reveals that the total expenditure on education in the country increased by 75 percent to Rs. 1,05,618.8 crore during the year 2007-08 from Rs.60,267.30 crore in 2000-01. The actual allocation for education in *Maharashtra* has declined marginally by 2.1 percent from Rs. 12,653.34 crore in 2006-07 to Rs.12,391.9 crore in 2007-08. *Arunachal Pradesh, Mizoram, Manipur and Goa* are four other states, which too have witnessed a decline in actual allocation under this head during this period, whereas, the budgetary allocation for education in *Meghalaya* has abnormally increased by 31.6 per cent from Rs.390.86 crores in 2006-07 to Rs.514.48 crore in 2007-08. *National Capital Territory, Delhi* has increased by 24.3 percent from Rs. 1997.25 Crores in 2006-07 to Rs.2,482.5 crores in 2007-08. Similarly, *Haryana, Uttaranchal, Tamilnadu and Karnataka* are four other states, which have witnessed a sharp increase in actual allocation for education during the period under review. The states still have their responsibilities to improve the general living standard by improving the standards of higher education.

In order to analyze the budgetary share of education in state's total expenditure, the relevant data of state-wise budgetary share of education in state's total expenditure is presented in Table-III. The data reveals that the twenty-nine major states together have allocated just about 13.86 percent of their aggregate budgetary expenses on education in 2007-08. This was 3.54 percent points lower than what they allocated seven years ago in 2000-01. In 2007-08 the allocation under education increased by 9.9 per cent over the previous year compared to 22 percent rise in 2006-07, which was for the country as a whole. At the individual level, many states did even worse. For example, In *Madhya Pradesh* it has accounted for a paltry 3.87 percent in total budgetary expenses of the state in 2007-08. The share was 8.4 per cent in *Arunachal Pradesh* and 8.61 percent in *Sikkim* during the same period — substantially lower than the national average. In fact, the share of education in total budgetary allocation was lower than the national average in as many as 14 of the 29 states in 2007-08. Worse, most of these states have, witnessed a decline in the share of education in their total budgetary allocation during the last seven years. Among the major states, *Maharashtra* has witnessed the sharpest decline of 15.0 percent from 22.3 per cent in 2000-01 to 7.3 percent in 2007-08. At 7.3 percent the share of education in total budgetary allocation in *Maharashtra* was lower than that of the national average. This is surprising considering the state's record in literacy drive.

Assam has witnessed the second biggest decline—the share of education in the state's total budgetary allocation has declined by a massive 18.68 percent percentage from 25.5 percent in 2000-01 to 6.82 percent in 2007-08. Education's share in total budgetary allocation has fallen by 6.76 percent in Bihar, 4.75 percent in *Uttaranchal* and 4.62 percent in *Tripura*.

NEED FOR PRIVATE PARTICIPATION IN HIGHER EDUCATION:

Despite the role education plays in the growth of an economy, *India's* spending on education at a percentage of *GDP* is very low at 3.2 percent compared to *Sweden's* 8.0 percent, *USA's* 5.4

percent and UK's 5.3 percent. Presently, the *Government of India* proposes to spend 6 percent of the GDP on education, half of this on primary and secondary education alone. To fund this ambitious project the government imposed *education cess* on all central taxes. The collection from *education cess* has met part of the additional funds requirements of the Union Government. But this avenue was not available to states to meet their incremental requirements and therein lies the crux of the debate whether education should be treated as an industry and be open to *Foreign Direct Investment*. As such, the fund-starved states have been actively encouraging private participation in technical education of late, as they were unable to increase allocation under this head to meet the growing needs.

Education is like a cradle to international competitiveness and we have to invest in education on an unprecedented scale to achieve global leadership. Therefore, most economically developed countries have invested heavily in education and this is one of the key factors that has accounted for their success. In India, the education sector needs huge funds to achieve its target and to modernise higher education. Thus, the *Government of India* is planning to change the domestic regulations to attract foreign investment in the education sector. New state regulations are required to be framed in the light of Supreme Court Judgement and in view of the entry of foreign universities. Such regulations should restrict profiteering in education for betterment of promoting higher education.

CONCLUSION:

When an individual falls sick, only he and his family are affected. However, when educational institutions fall sick, the economic prosperity of the entire nation is affected. Consequently, the need of the hour is a meaningful coordination between educational goals and economic progress. Economically developed countries have invested heavily in education which has accounted for their success. In India, the education sector needs funds to achieve its target and to modernize higher education. Therefore, the *Government of India* is planning to change the domestic regulations to attract foreign investments in the education sector.

TABLE-I
STATE-WISE EXPENDITURE ON EDUCATION

State	State-Wise Expenditure on Education (Revenue+ Capital)											Percent Change over the previous year										
	Rs. In Crores																					
	2007-08	2006-07	2005-06	2004-05	2003-04	2002-03	2001-02	2000-01	2007-08	2006-07	2005-06	2004-05	2003-04	2002-03	2001-02							
Andhra Pradesh	8158.28	7091.82	5370.49	5384.45	4667.84	4027.18	3871.04	3740.3	15.0	32.1	-0.3	15.4	15.9	4.0	3.5							
Arunachal Pradesh	226.58	310.71	240.41	219.76	198.66	165.58	183.2	77.24	-27.1	29.2	9.4	10.6	20.0	-9.6	137.2							
Assam	3716.11	3852.11	2518.82	3198.35	2363.78	1998.02	1872.49	1943.52	-3.5	52.9	-21.2	35.3	18.3	6.7	-3.7							
Bihar	5465.79	5406.24	4423.1	4143.86	3607.36	3259.98	3076.22	4012.27	1.1	22.2	6.7	14.9	10.7	6.0	-23.3							
Chhattisgarh	2131.41	1821.79	1301.33	1304.46	969.45	750.47	696.59	250.32	17.0	40.0	-0.2	34.6	29.2	7.7	178.3							
Goa	423.86	454.47	349.56	362.36	292.34	286.32	247.25	233.13	-6.7	30.0	-3.5	24.0	2.1	15.8	6.1							
Gujarat	5109.31	4741.56	4309.29	4093.72	3692.64	3634.36	3263.55	3684.77	7.8	10.0	5.3	10.9	1.6	11.4	-11.4							
Haryana	2951.54	2388.2	1992.77	1793.49	1540.68	1455.01	1479.66	1334.47	23.6	19.8	11.1	16.4	5.9	-1.7	10.9							
Himachal Pradesh	1592.11	1366.08	1213.53	1072.2	1005.61	957.34	918.72	904.52	16.5	12.6	13.2	6.6	5.0	4.2	1.6							
Jammu & Kashmir	1466.3	1387.99	1256.5	1080.67	977.5	955.59	936.7	866.84	5.6	10.5	16.3	10.6	2.3	2.0	8.1							
Jharkhand	2614.25	2394.1	2115.33	1739.23	1379.37	1859.34	1283.06	0	9.2	13.2	21.6	26.1	-25.8	44.9	0.0							
Karnataka	7109.94	5968.7	4890.07	4505.33	3771.34	3570.72	3505.88	3488.75	19.1	22.1	8.5	19.5	5.6	1.8	0.5							
Kerala	5557.31	4754.54	3497.57	3645.83	3094.8	2986.22	2489.81	2635.52	16.9	35.9	-4.1	17.8	3.6	19.9	-5.5							
Madhya Pradesh	455.38	488.14	375.11	2720.61	2375.77	2312.14	2125.86	2762.53	-6.7	30.1	-86.2	14.5	2.8	8.8	-23.0							
Maharashtra	12391.9	12653.34	10774.13	10238.58	9440.98	8941.4	9387.91	9420.25	-2.1	17.4	5.2	8.4	5.6	-4.8	-0.3							
Manipur	390.48	421.92	422.31	415.39	304.94	286.25	290.6	279.51	-7.5	-0.1	1.7	36.2	6.5	-1.5	4.0							
Meghalaya	514.48	390.86	311.77	346.73	269.06	242.3	250.08	236.86	31.6	25.4	-10.1	28.9	11.0	-3.1	5.8							
Mizoram	293.7	331.88	291.46	257.91	218.36	204.26	213.89	189.86	-11.5	13.9	13.0	18.1	6.9	-4.5	12.7							
Nagaland	390.83	389.08	324.8	284.3	256.41	210.05	223.01	237.68	0.4	19.8	14.2	10.9	22.1	-5.9	-6.2							
Orissa	3033.79	2563.01	2131.86	1967.84	1899.52	1902.44	1755.64	1760.48	18.4	20.2	8.3	3.6	-0.2	8.4	-0.3							
Punjab	3227.73	2790.07	2307.76	2493.02	2080.81	2092.76	1832.93	1859.24	15.7	20.9	-7.4	19.8	-0.6	14.2	-1.4							
Rajasthan	5316.34	4943.39	4694.41	4093.33	3655.09	3329.86	3455.52	3286.28	7.5	5.3	14.7	12.0	9.8	-3.6	5.1							
Sikkim	264.09	261.38	222.95	210.23	174.15	161.19	152.44	134.09	1.0	17.2	6.1	20.7	8.0	5.7	13.7							
Tamil Nadu	8432.94	7045.56	5273.07	4642.74	4254.13	4158.902	4299.8	4409.67	19.7	33.6	13.6	9.1	2.3	-3.3	-2.5							
Tripura	652.88	629.63	506.21	553.57	504.47	485.23	459.25	411.4	3.7	24.4	-8.6	9.7	4.0	5.7	11.6							
Uttaranchal	1830.1	1522.63	1318.87	1329.99	1094.04	969.31	696.92	238.63	20.2	15.4	-0.8	21.6	12.9	39.1	192.1							
Uttar Pradesh	12538.88	11175.06	9112.02	7679.18	6315.77	6137.29	6088.1	6172.52	12.2	22.6	18.7	21.6	2.9	0.8	-1.4							
West Bengal	6879.98	6583.4	5563.21	5246.41	4522.6	4405.72	4552.45	4581.63	4.5	18.3	6.0	16.0	2.7	-3.2	-0.6							
National Capital Territory, Delhi	2482.5	1997.25	1661.54	1766.93	1271.74	1237.53	1184.53	1115.02	24.3	20.2	-6.0	38.9	2.8	4.5	6.2							
All States	105618.6	96124.91	78770.25	76790.47	66191.21	62982.78	60793.1	60267.3	9.9	22.0	2.6	16.0	5.1	3.6	0.9							

Source : State Finances - A Study of Budgets (Various Issues) - RBI
Note : Data pertaining to 2007-08 are Budget estimates.

TABLE-II
STATE'S SHARE IN TOTAL EXPENDITURE ON EDUCATION

(Percentage)

State	2007-08	2006-07	2005-06	2004-05	2003-04	2002-03	2001-02	2000-01
Andhra Pradesh	7.7	7.4	6.8	7.0	7.1	6.4	6.4	6.2
Arunachal Pradesh	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.1
Assam	3.5	4.0	3.2	4.2	3.6	3.2	3.1	3.2
Bihar	5.2	5.6	5.6	5.4	5.4	5.2	5.1	6.7
Chattisgarh	2.0	1.9	1.7	1.7	1.5	1.2	1.1	0.4
Goa	0.4	0.5	0.4	0.5	0.4	0.5	0.4	0.4
Gujarat	4.8	4.9	5.5	5.3	5.6	5.8	5.4	6.1
Haryana	2.8	2.5	2.5	2.3	2.3	2.3	2.4	2.2
Himachal Pradesh	1.5	1.4	1.5	1.4	1.5	1.5	1.5	1.5
Jammu & Kashmir	1.4	1.4	1.6	1.4	1.5	1.5	1.5	1.4
Jharkhand	2.5	2.5	2.7	2.3	2.1	3.0	2.1	0.0
Karnataka	6.7	6.2	6.2	5.9	5.7	5.7	5.8	5.8
Kerala	5.3	4.9	4.4	4.7	4.7	4.7	4.1	4.4
Madhya Pradesh	0.4	0.5	0.5	3.5	3.6	3.7	3.5	4.6
Maharashtra	11.7	13.2	13.7	13.3	14.3	14.2	15.4	15.6
Manipur	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.5
Meghalaya	0.5	0.4	0.4	0.5	0.4	0.4	0.4	0.4
Mizoram	0.3	0.3	0.4	0.3	0.3	0.3	0.4	0.3
Nagaland	0.4	0.4	0.4	0.4	0.4	0.3	0.4	0.4
Orissa	2.9	2.7	2.7	2.6	2.9	3.0	2.9	2.9
Punjab	3.1	2.9	2.9	3.2	3.1	3.3	3.0	3.1
Rajasthan	5.0	5.1	6.0	5.3	5.5	5.3	5.7	5.5
Sikkim	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.2
Tamil Nadu	8.0	7.3	6.7	6.0	6.4	6.6	7.1	7.3
Tripura	0.6	0.7	0.6	0.7	0.8	0.8	0.8	0.7
Uttaranchal	1.7	1.6	1.7	1.7	1.7	1.5	1.1	0.4
Uttar Pradesh	11.9	11.6	11.6	10.0	9.5	9.7	10.0	10.2
West Bengal	6.5	6.8	7.1	6.8	6.8	7.0	7.5	7.6
NCT Delhi	2.4	2.1	2.1	2.3	1.9	2.0	1.9	1.9
All States	100	100	100	100	100	100	100	100

Source : State Finances – A Study of Budgets (Various Issues) – RBI

Note : Data pertaining to 2007-08 are Budget estimates.

TABLE-III
BUDGETARY SHARE OF EDUCATION IN STATE'S TOTAL EXPENDITURE

(Percentage)

State	2007-08	2006-07	2005-06	2004-05	2003-04	2002-03	2001-02	2000-01
Andhra Pradesh	10.4	11.7	11.1	8.7	3.4	11.7	12.5	13.3
Arunachal Pradesh	8.4	11.0	9.9	5.7	2.6	12.1	13.3	6.4
Assam	18.7	18.9	20.8	10.0	11.4	22.4	21.9	25.5
Bihar	16.9	17.5	19.6	13.9	13.8	18.4	20.7	23.7
Chhattisgarh	13.4	13.2	13.4	4.5	3.1	11.0	12.4	13.1
Goa	10.0	13.7	12.3	7.7	4.4	11.9	10.5	11.9
Gujarat	12.2	12.2	12.6	4.1	5.2	13.5	12.7	13.6
Haryana	14.3	12.4	13.4	6.3	4.7	13.7	13.8	14.6
Himachal Pradesh	16.8	15.0	14.1	11.6	6.1	14.5	16.2	17.0
Jammu & Kashmir	9.2	10.0	9.3	8.9	8.9	10.9	11.6	11.1
Jharkhand	15.9	15.2	15.8	11.7	11.3	19.0	16.2	—
Karnataka	14.5	13.5	14.0	9.0	5.2	14.8	16.0	17.7
Kerala	18.1	17.2	16.6	6.3	5.8	17.6	19.0	20.1
Madhya Pradesh	3.9	4.8	3.5	3.9	4.2	12.2	12.5	16.3
Maharashtra	15.0	16.2	15.7	7.0	9.3	18.9	22.1	22.3
Manipur	12.3	12.1	15.4	9.5	7.5	13.3	13.7	20.2
Meghalaya	16.7	14.8	15.5	2.4	2.1	15.3	17.9	16.6
Mizoram	13.4	13.9	13.4	11.5	5.7	14.5	16.0	14.7
Nagaland	11.2	11.8	11.6	8.2	3.8	11.0	11.0	12.9
Orissa	12.9	12.6	13.5	6.5	6.0	14.3	14.6	15.9
Punjab	10.8	10.4	11.3	3.8	3.3	12.1	11.7	13.2
Rajasthan	14.8	15.3	17.3	5.1	4.9	15.5	18.2	18.8
Sikkim	8.6	9.8	10.4	5.1	5.6	7.6	8.0	14.2
Tamil Nadu	15.1	13.2	13.6	4.4	4.8	13.7	17.3	18.0
Tripura	14.7	16.8	15.3	8.0	7.3	19.1	18.6	19.3
Uttaranchal	16.8	16.9	17.2	9.2	3.6	20.0	21.1	21.5
Uttar Pradesh	14.0	15.2	15.2	6.5	2.9	14.6	16.0	16.8
West Bengal	14.7	15.2	13.7	4.6	3.7	15.9	16.2	17.1
NCT Delhi	13.4	9.5	14.9	12.8	10.9	12.1	13.7	15.1
All States	13.9	14.0	14.2	6.2	5.0	15.0	16.1	17.4

Source : State Finances – A Study of Budgets (Various Issues) – RBI

Note : Data pertaining to 2007-08 are Budget estimates.

ATTITUDE TOWARDS IMPORTED USED CARS -AN EMPIRICAL STUDY

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As a signatory to the WTO, India could no longer apply Quantitative restrictions on the import of used cars. As the used cars are very cheap, they would pose a serious threat to the Indian car industry. To counteract the threat, the Government of India has built tariff and non-tariff barriers. An attempt has been made to understand the attitude of car buyers towards the import of used cars. The study reveals that one third of the respondents show interest in the imported used cars. The major dissuading factors are spares and service related problems and Government restrictions. Brand image and quality are cited as the influencing factors. It is also found that the demographic factors such as age, monthly household income and the number of earning members in the family have significant impact on the attitude towards the imported used cars.

Key words: Imported used car, Government restrictions, Dissuading factors, Influencing factors.

INTRODUCTION

The passenger car industry in India faces a perpetual threat from the import of used cars. As per the *WTO agreement*, quantitative restrictions (QRs) on imports were removed by the *Government of India* in April 2001. As a result, the threat from the import of used cars looms large in the face of the passenger car manufacturing companies in the country. Considering the prevailing prices of second hand cars in the foreign market, it would be difficult for the domestic car manufacturers to compete on the price term. There is every possibility that the price sensitive and utility conscious Indian car buyer is swayed by such an offer. Hence this study focuses on the willingness of the car buyers in India to buy a used car from a foreign country.

SIGNIFICANCE OF THE STUDY

The Government of India, foreseeing the threat from the import of used cars, has introduced protective measures in the form of tariff and non-tariff barriers. They include a basic import duty of 105 per cent on the *CIF* value of the used car. It is also subjected to an additional countervailing duty of 16 per cent on the *CIF* value and special additional duty of four per cent

of landed value is charged. The Government has also imposed the following restrictions on the import of used cars.

1. The imported car is not older than three years from the date of manufacture.
2. It has right hand steering and controls
3. It has a speedometer indicating the speed in kilometres.
4. It has the photometry of the head lamps to suit the 'keep left' traffic and
5. It should be certified by a notified agency that it is road – worthy for at least five years.

Moreover the import of such vehicles shall be allowed only through the customs port at Mumbai. On arrival at the Indian port and before clearance for use, the vehicle has to be submitted for testing by the *Vehicle Research and Development Establishment, Ahmed Nagar* or the *Automotive Research Association of India* or other testing agencies notified by the Government.

The policy also lays down regulations for importers and dealers who are importing such vehicles. The importing agency is to submit certificate issued by a testing agency notified by the Central Government that the vehicle being imported has been tested immediately before shipment and that the vehicle conforms to all the regulations specified in the *Motor vehicles Act, 1998*. The importer should also submit a certificate issued by a testing agency notified by the Government that the used vehicle being imported conforms to the original homologation certificate issued at the time of manufacture.

All these non-quantitative restrictions imposed by the Government reveals the gravity of the impact of the import of these used cars on the economy of the country. In this context, the study of the attitude of the Indian car buyer towards importing of used cars assumes significance.

LITERATURE STUDY

Schooler (1971) concluded that the older respondents rated foreign products more highly than the younger respondents in the *United States*.

Tongberg (1972) inferred that older consumers in the United States had more positive attitude towards foreign products.

Wang (1978) observed that the demographic characteristics were not significant in assessing the attitude towards foreign products.

Bikey and Nes (1982) found that the country of origin was a significant factor in influencing the product evaluation process of buyers in the United Kingdom.

Bhuvana Ramalingam (1999) concluded that a pragmatic approach by the Government was needed to prevent the onslaught by the import of used cars as the quantitative restrictions and local content regulations were to be lifted as per *WTO agreement*.

Raghuvir Srinivasan (2000) analysed the potential impact of the removal of quantitative restrictions on import of used cars on the passenger car manufacturing companies in India. He reasoned that one could get an imported used car for around Rs.3 lakhs, taking into account the price of an used car in a foreign country, import duty and the shipment cost. He also observed that while lower price would be attractive to the Indian buyer, service related problems and the Government restrictions would be the dissuading factors.

These studies were helpful in formulating the research objective and in identifying the important factors to be included in the study.

OBJECTIVES OF THE STUDY

The study has the following objectives

- To ascertain the level of interest among car buyers towards imported used cars,
- To identify the factors that encourage and the factors that discourage the preference for imported used cars and
- To understand the association between the demographic characteristics and the willingness to buy imported used cars.

RESEARCH METHODOLOGY

The study assumes descriptive nature as it attempts to describe the characteristics of certain groups, to estimate the proportion of people in a specified population who behave in a certain way and to make specific predictions. It also attempts to provide quantitative evidence to the findings to the extent possible.

Primary data were collected using an interview schedule from the sample respondents drawn from the car owners in *Chennai*. The list of customers given by the dealers of the car companies was used as the population frame. 150 respondents were selected using the simple random sampling method.

RESULTS AND DISCUSSION

The analysis of the data is being interpreted and discussed in the following section.

Interest in buying an imported used Car

The respondents are classified on the basis of their willingness to buy an imported used car. This classification is shown in Table 1.

TABLE 1
Interest of the Respondents in buying an imported used Car

Sl.No.	Interest level	Number of Respondents	Percentage of Respondents
1.	Interested	51	34
2.	Not interested	99	66
	Total	150	100

It could be seen that 51 respondents who constitute 34 per cent of all the respondents have expressed their interest in buying an imported used car. 99 respondents comprising 66 per cent of the total number of respondents are not interested in buying an imported used car.

Reasons for willingness to buy imported used Car

An attempt has been made to understand the reasons for the willingness of the respondents to buy an imported used car. The reasons included in the study are Quality, Brand image, Status symbol and Being different. The respondents were asked to denote the major reason for their willingness to buy an imported used car. The result is presented in Table 2.

TABLE 2
Reasons for Willingness to buy Imported used Car

Sl.No.	Major reason	Number of Respondents	Percentage of Respondents
1.	Brand Image	27	52.9
2.	Quality	11	21.6
3.	Being different	9	17.7
4.	Status Symbol	4	7.8
	Total	51	100.0

It could be seen that 27 respondents have attributed their willingness to buy an imported used car to brand image. 11 respondents have cited quality as the major reason. Being different has been given as the major reason by nine respondents. Four respondents have given status symbol as the major reason for their willingness to buy an imported used car.

It may be inferred that the majority of those respondents who expressed their willingness to buy an imported used car have mentioned the Brand image as the major reason.

Reasons for unwillingness to buy imported used Car

An attempt has been made to understand the reasons for the unwillingness of the respondents to buy an imported used car. The reasons included in the study are lack of familiarity, spares and service problems, lack of procedural knowledge and Government restrictions. The respondents were asked to denote the major reason for their willingness to buy an imported used car. The result is presented in Table 3.

TABLE 3
Reasons for Unwillingness to buy Imported used Car

Sl.No.	Major Reason for Unwillingness	Number of Respondents	Percentage of Respondents
1	Spares and service problems	50	50.5
2	Government restrictions	35	35.3
3	Lack of procedural knowledge	8	8.1
4	Lack of familiarity	6	6.1
	Total	99	100

It could be seen that 50 respondents have attributed their unwillingness to buy an imported used car to spares and service related problem. 35 respondents have cited the restrictions by the Government as the major reason. Lack of procedural knowledge has been given as the major reason by eight respondents. Six respondents have identified lack of familiarity as the major reason for their unwillingness to buy an imported used car.

It may be inferred that fifty percent of those respondents who expressed their unwillingness to buy an imported used car have cited the spares and service related problem as the major reason. A significant number of such respondents have cited the restrictions by the Government as the major reason for their unwillingness to buy an imported used car.

TABLE 4

Significant difference among the respondents regarding their willingness to buy imported used Cars

Sl.No.	Basis of Classification	Chi square Statistic
1	Age	29.325*
2	Sex	0.081
3	Level of education	4.215
4	Nature of employment	2.971
5	Monthly household income	34.401*
6	Number of earning members in the family	19.844*
7	Category of car	8.532

*Significant at 5 per cent level

It can be seen that there is significant difference among the respondents with respect to their willingness to buy imported used cars when they are classified on the basis of age, monthly household income and the number of earning members in the family. It can also be seen that there is no significant difference among the respondents with respect to their willingness to buy imported used cars when they are classified on the basis of sex, level of education, nature of employment and the category of car owned.

CONCLUSION

The study has revealed that a significant proportion of the respondents show interest in imported used cars. It has also been found that the barriers established by the Government are instrumental in dissuading the respondents from preferring an imported used car. Hence it is appropriate, in the interest of the domestic car-manufacturing sector, to continue with these restrictive measures.

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INVESTMENT PATTERN : A PSYCHOGRAPHIC STUDY OF INVESTORS OF GARHWAL REGION OF UTTARAKHAND

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Abstract

At the start of new century and millennium, the country is witnessing a rapid expansion and enrichment of business activities. The enhanced growth of business activity all over the world has increased the financial and other related activities manifold. Liberalisation, privatisation and globalisation have opened up many investment opportunities to the investors. Empirical study on the investment preferences reveals that the level of investment in any country is affected by behaviour of investors. Therefore, it is imperative to study the investors' preferences and their behaviour towards various investment options. The present paper is an attempt to identify investment perception and their behaviour for designing effective investment policies. With the formation of new state of Uttarakhand, the investment opportunities have increased manifold. Analysts seem to treat financial markets as an aggregate of statistical observations, technical and fundamental analysis. Analysis indicates the shifting trend of investor from post office and other government investment scheme to investment in bank, insurance and mutual fund schemes. Research also indicates that investors' choice of their investment scheme is associated with their age, gender categories, marital status, occupation and income but it is not associated with their level of education, family size and annual saving.

INTRODUCTION

India is the fifth largest economy in the world (ranking above France, Italy, the United Kingdom, and Russia) and has the third largest GDP in the entire continent of Asia. It is also the second largest among emerging nations after China. (These indicators are based on purchasing power parity.) India is also one of the few markets in the world, which offers high prospects for growth and earning potential in practically all areas of business. India embarked upon the process of

deregulation and liberalization of its economy in the 1980s. The process received a big boost in the early nineties, when significant changes were introduced by abolishing licensing for domestic manufacturing for all but a few industries, and private sector was allowed to enter areas hitherto reserved for the public sector. Further, import tariffs were drastically reduced (Parikh *et. al.*, 2002). Considered in international terms, globalization as the on-going process of economic, technological, social and political integration of the world is reported to have started after the Second World War. Globalization is impacting the institutional framework in both developing and industrial countries. It is changing the way in which governments perceive their role in society. It has also far reaching implications for socio economic development and educational systems of countries all over the World.

Adding one more feather in its cap, Indian capital market has also registered very rapid growth in India. It has created history. This exceptional performance is the result of many factors. Among them, confidence of investors in Indian stock market is one of them. Various studies also revealed that the level of investment in any country is also affected by behaviour of investors. Therefore, it is imperative to study the behaviour of investors. Analysts seem to treat financial markets as an aggregate of statistical observations, technical and fundamental analysis. A rich view of research waits this sophisticated understanding of how financial markets are also affected by the 'financial behaviour' of investors. With the reforms of industrial policy, public sector, financial sector and the many developments in the Indian money market and capital market, the different investment schemes, which have become an important portal for the small investors, is also influenced by their financial behaviour. Uttaranchal came into existence on November 9th, 2000 as the 27th State of the Indian Union. It was carved out of the State of Uttar Pradesh and comprised the two hill Divisions and District of Haridwar. The State is strategically located and forms part of the Northern boundary of the country sharing its borders with Nepal and Tibet (China). The priorities of the State are very clear. Be it in education, be it in drinking water or be it in the rural development or generation of Hydro-Electricity, Tourism, Horticulture, Diversified Agriculture, Information Technology, the state government endeavor is to focus on entrepreneurial development and attract large amount of investment in the state. This has opened up much investment opportunity in the state. Hence, this study has made an attempt to examine the related aspects of the fund selection behaviour of individual investors in the Garhwal region of Uttarakhand State. From the researchers and academicians point of view, such a study will help in developing and expanding knowledge in this field.

REVIEW OF LITERATURE

Investment management is a subject of growing importance and interest. Basically, investment decision is the trade off between risk and return. The entire globe is based on risk and return. Investing is an activity that is of interest to many individual regardless of occupation or income level. The existing "Behavioural Finance" studies are very few and very little information is available about investor perceptions, preferences, attitudes and behaviour. All efforts in this

direction are fragmented. Ippolito (1992) says that fund/scheme selection by investors is based on past performance of the funds and money flows into winning funds more rapidly than they flow out of losing funds. Behaviour is a reaction to a situation. So as situation changes, behaviour gets modified. Hence, findings and predictions of behaviour studies should be viewed accordingly. Segmentation of investors on the basis of their characteristics was highlighted by Rajan (1997). Investors' characteristics on the basis of their investment size Rajan (1997), and the relationship between stage in life cycle of the investors and their investment pattern was studied by Raja Rajan (1998). A study regarding the Investment Pattern And Decision Making on 227 respondents from 3 cities: 108 in Ahmedabad, 60 in Solapur, 59 in Gulbarga was conducted by Balsara Anita H. and Pestonjee D M in the year 2000 indicates no significant difference among the respondents across the cities with respect to age, family size, type of family, marital status, level of education, occupation and annual income. No cultural and demographical patterns are associated with decision making of working women. Osuntogun and Adeyemo (1981) used a Pearson correlation matrix to examine the interrelationships between the value of members' savings in the group and some other features. They found that, the larger the membership strength of the group, the higher would be the number of members striving hard to make their savings, which invariably increases the capital base of the societies. In addition, there is positive correlation between the value of members' savings and frequency of savings. While examining the saving-income ratio, Aluko (1972), Kessler and Strauss-Kalm (1984), Ayanwale and Bamire (2000) claimed that the saving behaviour of farmers in developing countries is less dependent on the absolute level of aggregate income and more dependent among other factors on the relationship between current and expected income, the nature of business, household size, wealth and demographic variables like age.

From the above review it can be inferred that psychological profiling is one of the most important aspects which needs to be taken care for various investment avenues as an investment vehicle is capturing the attention of various segments of the society, like academicians, industrialists, financial intermediaries, investors and regulators for varied reasons and deserves an in-depth study. In this paper, the author makes an attempt, mainly to study the factors, which influence the investors in their selection of the fund/scheme

Objectives and Methodology

The present paper aims to study what investors prefer in purchasing various investment policies of different sectors. On the basis of review of literature, a null hypothesis was also formulated. It was hypothesized that factors influencing consumers in their investment decision are not associated with their demographic characteristics. To attain these objectives and test the hypothesis, a random survey of 100 respondents located in Garhwal region of Uttarakhand state was administered. To collect the necessary information, various parameters were developed with the help of literature. The responses to these parameters were gathered, coded, tabulated and

analyzed. To measure the intensity of parameters open ended and close-ended questionnaire was used. To test the hypothesis χ^2 test was applied. . Table 1 indicates the profile of respondents.

ANALYSIS AND DISCUSSION

Table 1: Demographic Characteristic of Respondents

	Characteristics	No of Respondents	%
	Total Number of Respondents	150	100
Age	Up to 30	23	15.33
	31 to 40	46	30.67
	41 to 50	41	27.33
	above 50	40	26.67
Sex	Male	117	78
	Female	33	22
Marital status	Married	108	72
	unmarried	42	28
Qualifications	school	25	16.67
	graduate	38	25.33
	PG	30	20
	Profess degree	57	38
Family size	Less than 4	31	20.67
	4 to 6	103	68.67
	more than 6	16	10.33
Occupation	salaried	64	42.67
	business	21	14
	retired	33	22
	professional	32	21.33
Annual income	Below 1 lac	32	21.33
	1 to 2 lac	24	16
	2 to 3 lac	41	27.33
	3 to 4 lac	20	13.33
	above 4 lac	33	21.33
Annual Saving	Upto 25,000PA	14	9.33
	Rs.25000-50000PA	27	18
	Rs.50000-Rs100000PA	42	28
	Above Rs. 100000	67	44.67
	Total	150	100

Source: Primary data from Survey

The demographic data presented in the above table indicate that most of respondents fall in the age category of 31 to 40 years as indicated by 30.66 percent respondents in the sample. The respondents in the age group of 41 to 50 years accounts for 27.33 percent. Respondent in the age group of up to 30 years account 15.33% and the remaining 26.66percent respondents fall in the age group of above 50 years. The data pertaining to sex categories indicate that 78 percent of the respondents belong to male and 22 percent in the female category. Educational profile of the respondents indicates that most of the respondents were having postgraduate degree and above to their credit as indicated by 58% respondents in the sample. As many as 26% respondents have had education up to graduation and only 16% respondents were having school level education. The information pertaining to family size indicates that most of the respondent fall in the family size of 4 to 6 members as indicated by 68.67 % respondents in the sample. 20.66 percent respondents indicated that they are having family size up to four members. The remaining (10.66%) indicated that they are having family size of more than 6 members. Occupation-wise classified data reveal that most of the respondents fall into salaried categories. Information pertaining to occupational categories reveals that most of the respondents fall in the salaried class as it was indicated by 42.66% respondent in the sample. 14 % indicated that they belong to business class. 22 % were from retired categories and remaining 21.33% falls in the professional categories. Analysis also indicates that as many as 21.33 percent respondents were from the annual income up to 1 Lac. 16 percent respondents were having monthly family income between 1-2 Lacs. 27.33 percent respondents indicated that they were having income between 2-3 Lacs per annum. 13.33 and 21.33 % respondent respectively indicated their income between 3-4 Lacs and more than 4 Lacs annually. Data presented in the above table indicates that more than half of the respondents(44.66%) reveals that they have more than Rs. 100000 Per annum saving. 28% reveals that they have annual saving ranging from Rs.50000- Rs. 100000. 18 % respondent fall in those categories who have annual saving from 25000 to Rs50000 PA. Very few respondents (9.33%) indicated that they have annual income saving up to Rs. 25000 PA.

Table No 2 : Investment Pattern

S.N.	Description	No of Respondents	%
A	Bank	33	22
B	Post office	14	9.33
C	Insurance	30	20
D	Mutual fund	28	18.67
E	Short term deposit	12	8
F	PPF	33	22
	Total	150	100

Opening up of the Indian economy and information revolution have resulted in opportunities for the investors to invest in different schemes. Taking this into consideration an attempt has been made to study the preference of customers about their investment pattern. The information pertaining to investment pattern of respondents reveals that one fourth respondents invest their saving amount in the bank as indicated by 22% respondents in the sample. 22% respondents revealed saving in PPF. Investment in Insurance and Mutual Fund was indicated by 21 % and 18.67 % respondents each. It is significant to note that investment in post office and short-term investment is very few as denoted by 9.33% and 8% respondents respectively.

An attempt was made to assess the relationship between investment patterns of investors with their demographic profile. The information in this respect is presented in the table no 3A to 3H.

Table No.3: Degree of relationship between investment pattern of investors with their age

	Bank	Post office	Insurance	Mutual fund	short term deposit	PPF	
up to 30	8	4	6	3		2	23
31 to 40	9	3	4	7	5	18	46
41 to 50	15	3	11	3	2	7	41
above 50	1	4	9	15	5	6	40
	33	14	30	28	12	33	150
$\chi^2 = 41.77185157$							

Source: Primary data from Survey

Calculated value of chi-square equals 41.77185157. Chi-square value at 5% significance level and 2 degrees of freedom is 24.996. As calculated value of chi-square is much greater than the critical value, null hypothesis is rejected revealing that investors' choice on purchase pattern of investment scheme is associated with their age group.

Table No. 3B: Degree of relationship between investment pattern of investors with their Gender

	bank	Post office	Insurance	Mutual fund	short term deposit	PPF	
Male	27	8	23	25	7	27	117
Female	6	6	7	3	5	6	33
	33	14	30	28	12	33	150
$\chi^2 = 8.92389779$							

Source: Primary data from Survey

Calculated value of chi-square equals to 8.92389779. Chi-square value at 5% significance level and 2 degrees of freedom is 5.991. As calculated value of chi-square is much greater than the critical value, null hypothesis is rejected revealing that investors' choice on their investment pattern is associated with their gender categories.

Table No. 3C: Degree of relationship between investment pattern of investors with their Marital Status

	Bank	Post office	Insurance	Mutual fund	short term deposit	PPF	Total
Married	24	8	25	23	3	25	108
Unmarried	9	6	5	05	9	8	42
	33	14	30	28	12	33	150
$\chi^2 = 18.26144089$							

Source: Primary data from Survey

Calculated value of chi-square equals 18.26144089. Chi-square value at 5% significance level and 2 degrees of freedom is 5.991. As calculated value of chi-square is greater than the critical value, null hypothesis is rejected revealing that investors' choice on purchase pattern of investment policy is associated with their marital status.

Table No. 3D: Degree of relationship between investment pattern of investors with their Level of Education

	Bank	Post office	Insurance	Mutual fund	Short term deposit	PPF	Total
School	6	3	5	7	1	3	25
Graduate	8	3	9	7	3	8	38
Pg	12	4	1	4		9	30
Profess degree	7	4	15	10	8	13	57
	33	14	30	28	12	33	150
$\chi^2 = 20.40518991$							

Source: Primary data from Survey

Calculated value of chi-square is equal to 20.40518991. Chi-square value at 5% significance level and 15 degrees of freedom is 24.996. As calculated value of chi-square is much less than the critical value, null hypothesis is accepted revealing that investors choice on their investment pattern is not associated with their level of education.

Table No. 3E : Degree of relationship between investment patterns of investors with the size of the Family

	Bank	Post Office	Insurance	Mutual Fund	Short Term Deposit	PPF	Total
Less than 4	8	2	1	3	9	8	31
4 to 6	23	11	24	22	3	20	103
More than 6	2	1	5	3		5	16
	33	14	30	28	12	33	150
$\chi^2 = 30.793$							

Source: Primary data from Survey

Calculated value of chi-square is equal to 30.793. Chi-square value at 5% significance level and 10 degrees of freedom is 18.307. As calculated value of chi-square is greater than the critical value, null hypothesis is rejected revealing that investors' choice of their investment pattern is associated with their family size.

Table No. 3F : Degree of relationship between investment pattern of investors with their Occupation

	Bank	Post Office	Insurance	Mutual Fund	Short Term Deposit	PPF	Total
Salaried	13	3	17	19	6	6	64
Business	7	4	5			5	21
Retired	5	2	5	4	3	14	33
Professional	8	5	3	5	3	8	32
	33	14	30	28	12	33	150
$\chi^2 = 27.62$							

Source: Primary data from Survey

Calculated value of chi-square equals 27.61966006. Chi-square value at 5% significance level and 15 degrees of freedom is 24.996. As calculated value of chi-square is much greater than the critical value, null hypothesis is rejected revealing that investor preference is associated with their occupation.

Table No. 3G: Degree of relationship between investment pattern of investors with their Level of annual Income

	bank	Post office	Insurance	Mutual fund	short term deposit	PPF	Total
below 1 lac	12	5	4	4		7	32
1 to 2 lacs	1	2	3	5		13	24

2 to 3 lacs	12		6	9	3	11	41
3 to 4 lacs	3	5	3	7	1	1	20
above 4 lacs	5	2	14	3	8	1	33
	33	14	30	28	12	33	150
$\chi^2 = 63.22$							

Source: Primary data from Survey

Calculated value of chi-square equals 63.22. Chi-square value at 5% significance level and 15 degrees of freedom is 24.996. As calculated value of chi-square is much greater than the critical value, null hypothesis is rejected revealing that investors' choice on purchase pattern of investment scheme is associated with their annual income.

Table No. 3H :Degree of relationship between investment pattern of investors with their level of Annual saving

	Bank	Post office	Insurance	Mutual fund	short term deposit	PPF	Total
less than 10000	1		5			8	14
10000 to 25000	7	3	4	1	5	7	27
25000 to 50000	8		8	6	3	17	42
above 50000	17	11	13	21	4	1	67
less than 10000	33	14	30	28	12	33	150
$\chi^2 = 48.828$							

Source: Primary data from Survey

Calculated value of chi-square equals 48.828. Chi-square value at 5% significance level and 15 degrees of freedom is 24.996. As calculated value of chi-square is much greater than the critical value, null hypothesis is rejected revealing that Investors choice in their investment pattern is associated with their level of annual saving.

Table No. 4 :Intention to invest in Mutual Fund

Sl No	Description	No of Respondents	Percentage
A	Yes	62	41.33
B	No	56	37.33
C	planning to invest	32	21.34
	Total	150	100

Source: Primary data from Survey

In recent times Mutual funds have gained rapid popularity as a good investment vehicle. The variety of schemes and income options offered by Mutual Funds can suit the financial preferences of all classes of investors, be it Retail, Corporate or Institutional. Taking this into consideration an attempt was made to study the inclination of respondent towards mutual fund investment. An analysis reveals that 41.33% respondents have already invested in mutual funds. 21.34 % respondents revealed that they are not having any investment in mutual fund scheme. However, it is significant to note that 37.33 % respondents in the sample indicated that they do not possess any Mutual fund savings but are planning to purchase in future.

Table No.5 :Knowledge of Investment Scheme Before Investment

SI No	Description	No of Respo ndents	Percentage
A	great extent	33	22
B	some extent	83	55.33
C	Little	19	12.67
D	Nil	15	10
	Total	150	100

Source: Primary data from Survey

The investment pattern of consumer is shifting from one source to another. Information revolution and organizational effort are doing their best to build awareness of their product and benefits so as to attract more number of investors in favour of their offer. Keeping this in mind, an attempt was made to know to what extent the investors have the knowledge about the scheme in which they are investing. Analysis revealed that a majority of investors have some knowledge before investing their saving amount. Only 22% respondents denoted that they were having knowledge about investment scheme to a great extent before investing. Remaining 55.33 % and 12.67% respondents respectively are of the opinion that they were having some knowledge or little knowledge about investment scheme before investing. 10 % respondent revealed that they have invested without having any knowledge.

Table No. 6 :Most Effective Media for Imparting Knowledge of investment

SI No	Description	No of Respo ndents	Percentage
A	Agent	24	16
B	print/Electronic media	56	37.33
C	friends	64	42.67

D	any other	6	4
	Total	150	100

Source: Primary data from Survey

Customers' investment pattern is highly influenced by the level of information they are gathering from various sources. Today in the high-speed communication era, every investor gets information from various sources such as sales agent, print/ electronic media, friends/ relatives, and other sources. Taking this into consideration, an attempt was made to study the effective mode of media in imparting education about different investment schemes to the investors. Analysis depicts that in spite of having facilities of communication regarding investment avenues and schemes, investors prefer "Personal Communication" mode like services provided by sales agent/ brokers friend / relatives for gaining knowledge. This combine represents almost 58% respondent in the sample. Print / electronic media was represented by 37.33 % respondents in the sample. This necessitates establishment of more manually operated service centers throughout the country.

Table No. 7: Most Safe Investment

SI No	Description	No of Respondents	Percentage
A	Bank	56	37.33
B	Post office	12	8
C	Mutual fund-Govt	6	4
D	Mutual fund-pvt	5	3.33
E	Bonds/shares	2	1.33
F	LIC	46	30.67
G	PPF	20	13.33
H	Short term deposit	3	2
	Total	150	100

Source: Primary data from Survey

Investment opportunities in India are today perhaps at a peak. Supported by India's natural strengths, the country offers investment opportunities in large measures. Different investment avenues are available to investors by different companies. Keeping this in mind an attempt was made to know from the respondents the safest investment option in their opinion. Analysis indicates that 37.33% respondent are of the opinion that investment in bank is the safest. It was followed by LIC investment which accounts for 30.33% in the sample. Investment in PPF was indicated by 13.33% respondents in the sample. Investment in post office was considered safe by 8% respondent in the sample. It is significant to note that investment in mutual fund bonds shares and short term deposits were considered safe by very few respondents in the sample.

Table No. 8: Main motives behind selecting a particular investment policy

SI No	Description	No of Respo ndents	Percentage
A	High rate of return	29	19.33
B	Safe investment	58	38.67
C	Opportunity cost	24	16
D	Less risk	21	14
E	Maturity price	18	12
	Total	150	100

Source: Primary data from Survey

Empirical evidences and various research studies indicate that an investor invests in different investment schemes with different motives. An important aspect while selecting a particular scheme is the duration of the investment. Depending on the time frame, investors select a particular scheme. Besides all this, factors like promoter's image, objective of the fund and returns given by the funds on different schemes are taken into account while selecting a particular scheme. Taking these factors into consideration, an attempt was made to study the motive of investors behind selecting a particular investment scheme. Analysis reveals that safety of the fund and high rate of return have emerged as the most important motives which attract a large number of investor to. This accounts for 58% respondents in the sample. It was followed by opportunity cost and less risk which were revealed by 16% and 14% respondents in the sample. Maturity cost was supported by 12% respondents in the sample.

Table No. 9: Factors Considered for Investment Policy Taking

SI No	Description	No of Respo ndents	Percentage
A	Risk	39	28
B	Performance	27	16
C	Reputation	51	36
D	Volatility	19	11
E	Expense	14	9
	Total	150	100

Source: Primary data from Survey

Empirical studies indicate that risk and certainty are the most important factors for most of the investors for selecting the particular investment policy. Taking these into consideration, an attempt was made to study the factors which were considered by the respondents in selecting

their investment in different schemes. These factors include: fund risks, fund performance, reputation of company, volatility of funds and fund expenses. Analysis indicates that reputation of the firm and risk factor of any investment scheme have been considered most important for any investor to invest in any investment avenue as it was indicated by 36% and 28% respondent respectively. Fund past performance was considered by 16% respondents. In comparison to this volatility of fund and expense was considered by 11% and 9 % respondent respectively.

Table No. 10 :Benefit Considered Most to Invest in A Specific Scheme.

SI No	Description	No of Respondents	Percentage
A	Transparency	19	12.67
B	Efficient performance	37	24.67
C	Liquidity	15	10
D	Convenience	15	10
E	Tax benefit	33	22
F	Range of scheme	31	20.67
	Total	150	100

Source: Primary data from Survey

Post liberalization period of Indian economy has witnessed rapid strides in the financial market and has been one of the important features of the current process of globalization. However, the volatility in the foreign exchange market and the ease with which funds can be withdrawn from one sector to another have created often times panic situations. When an economy becomes more open to capital and financial flows, there is even greater compulsion to ensure that factors relating to customers preference in order to increase sustainability and profitability. Taking these into consideration, an attempt was made to study the various benefits offered by the companies which influenced the customer most in selecting the particular investment policy. Analysis indicates that efficient performance and tax benefit were the most important benefits considered by the investor as it was indicated by 24.67% and 22% respondents in the sample. Range of scheme and transparency were considered by 20.67% and 12.67% respondents in the sample. Liquidity and investors' convenience were considered by 10% of the respondents each.

CONCLUSIONS

In the present economic environment, the financial system has undergone a considerable change. Only a few years ago its vital aspect used to be a closed, opaque, classified shaped affair and regulated by the mandarins of the finance ministry. It was under the control of governmental orthodoxy. Today, it is very different. Since liberalisation, privatisation and globalisation of

government policies from 1991, it gradually metamorphosed into a substantive, self regulating system and developed as one obeying no rules or dictate other than those consistent with its own character. It has posed many problems and opened many opportunities to the investors engaged in different investment schemes. The survey reveals how experts recommend investors to go about making investment fund purchase decisions and how investors actually do so. These have important implications both for policy-makers and for investor-educators. In some cases, the survey findings reveal a real failure on the part of investors to take important steps to protect their interests. In these cases, the challenge for investor-educators is to figure out how to convey their message more effectively. In other cases, however, the gap between expert recommendations and investor behavior may reveal unrealistic expectations on the part of experts as they develop their education messages, a failure to tailor their messages for different segments of the market, or both. By beginning to explore the nature of the gap between expert recommendations and investor behavior, this survey can help us develop more effective investor education materials and methods that concur more closely with the real world experiences of investors and build on their preferences for receiving information.

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TRADE WITHIN AFRICA: A THEORETICAL AND EMPIRICAL ANALYSIS OF INTRA-AFRICAN TRADE

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Abstract

According to the United Nation's Economic Commission for Africa (2004), Africa's trade performance is weak in comparison to other world regions. Indeed, Africa's share in world merchandise exports fell from 6.3% in 1980s to 2.5% in 2000 in value terms. It recorded a meagre 1.1% average annual growth over the 1980-2000 period compared to 5.9% in Latin America and 7.1% in Asia. The report blames trade policies of rich countries for these developments together with Africa's internal problems. In this paper we will concentrate on the latter.

While much is researched and written about Africa's trade with countries outside Africa, few studies focus on trade within Africa. This is not surprising because as the results show, the African nations trade more with countries around the world than with each other. Nonetheless, understanding the current nature of trade within Africa is important as they move towards African regional integration. The paper also hopes to review discussions on "South-South" trade, which scholars such as Geda (2002) propose as solution for the current global trade inequities. Thus, this paper aims to shed light on current trade patterns within Africa between African nations (intra-Africa trade). Furthermore, the paper will examine which of the four most common trade theories -- Ricardo's comparative advantage theory, intra-industry trade theory, the economies of scale theory and the Heckscher-Olin theorem appear to explain these patterns.

In reference to methodology, cross-sectional analysis will be conducted taking a snapshot at the patterns of trade within Africa around 2003. The following methodological limitations ought to be kept in mind when reading this paper. First, data were missing for some key

countries for the target year (2003). In such instances, data from 2001 and 2002 were used as proxies.

What the paper hopes to achieve is a picture of the trade patterns within Africa and which of the trade theories mentioned, appear on the surface (or *prima facie*) to explain such patterns. Perhaps, more in-depth studies using more specific commodity data could follow this cursory analysis at some later stage.

The paper begins by examining the four common trade theories mentioned and their predictions of trade patterns. Then a picture is painted of African trade within the global context. The third section delves into the nature and patterns of intra-African trade while the fourth section applies the stated theories in an attempt to explain the patterns noted. The concluding section wraps up the discussion, summing up the main findings of the study.

INTRODUCTION

According to the United Nation's Economic Commission for Africa (2004: xi), Africa's trade performance is weak in comparison to other world regions. Africa's share in world merchandise exports fell from 6.3% in the 1980s to 2.5% in 2000 in value terms. It recorded a meager 1.1% average annual growth over the 1980-2000 period compared to 5.9% in Latin America and 7.1% in Asia. The report singles out trade policies of rich countries as blameworthy for these developments. It also blames Africa's internal problems. In this paper we will focus on the latter.

While much is researched and written about Africa's trade with countries outside Africa, few studies focus on trade within Africa. This is not surprising because as we shall see, African nations trade more with countries around the world than with each other. Nonetheless, understanding the current nature of trade within Africa is important as the move towards African regional integration gains momentum among African policymakers. The paper also seeks to inform discussions on "South-South" trade, which scholars such as Geda (2002) propose as a solution for the current global trade inequities. Thus, this paper aims to shed light on current trade patterns within Africa between African nations (*intra-Africa trade*). Furthermore, it will examine which of the four most common trade theories -- Ricardo's comparative advantage theory, intra-industry trade theory, the economies of scale theory or the Heckscher-Olin theorem appear to explain these patterns.

In reference to methodology, cross-sectional analysis will be conducted taking a snapshot of the patterns of trade within Africa around 2003. The following methodological limitations should be kept in mind when reading this paper. First, data were missing for some key countries for the target year (2003). In such instances, data from 2001 and 2002 were used as proxies. This obviously created distortions in value terms because trade figures may vary drastically from one

year to the next. Nonetheless, we hope this analysis still gives a useful, though somewhat rough, depiction of the trade patterns at hand.

What the paper hopes to achieve instead, is to provide a picture of the trade patterns within Africa and to explore which of the trade theories mentioned, *appear on the surface* (or *prima facie*) to explain such patterns. Perhaps, more in-depth studies using more specific commodity data could follow this cursory analysis at some later stage.

The paper begins by examining the four common trade theories mentioned and their predictions of trade patterns. Then a picture is painted of African trade within the global context. The third section delves into the nature and patterns of intra-African trade while the fourth section applies the stated theories in an attempt to explain the patterns noted. The concluding section wraps up the discussion, summing up the main findings of the study.

THEORETICAL UNDERPINNINGS: THE FOUR TRADE THEORIES

Geda (2002: 52-58) cautions against applying conventional *Western-devised trade theories* to the African context. He explains that neoclassical trade theories such as the *Heckscher-Ohlin (H-O) theorem* were developed at the turn of the century in response to the rigidity of the classical school's assumptions in relation to trade. They emphasized factor endowment differentials as the source of trade thereby relegating Africa and other developing countries (the South) to the marginal and volatile role of primary commodity producer.

The importance of technology by the 1950s and 60s led to an evolution of other theories based on technological gaps (*Posner 1961 and Vernon 1966*). These theories also continued to place the South in a disadvantageous position, promoting Western (the North) economic interests. According to these theories, technological advances required high levels of infrastructure and semi-skilled labor based in manufacturing, which the South, especially most of Africa, did not have. Nonetheless, these theories even failed to explain the patterns of trade in developed countries. In response, "*new trade theories*" emerged in the 1980s (*Lancaster 1980, Helpman (1981), Krugman (1979-81)*).

The "new trade theories" emphasize the importance of increasing returns to scale as a cause of trade and the need for models embedded within imperfectly competitive markets. They focus on intra-industry trade and intra-firm trade. *Geda cites Stewart (1984)* explaining that these models too are designed primarily to explain trade patterns in developed countries, which have similar trade preferences (*Linder 1961*). The South is perceived to be at a great disadvantage since it does not have large markets and endures transportation costs which jeopardize its benefits from trade. For various other reasons, he concludes that this type of analysis and set-up effectively biases development against the South.

He thus proposes "non-orthodox" models of trade as alternative models for analyzing gains from trade. These take into account the South's particular characteristics such as primary commodity production and their vulnerabilities to external shocks, which traditional models ignore. Such models include *Emmanuel's unequal exchange theory* (1972) and the *Prebisch-Singer hypothesis* and *Patnaik* (1996)'s thesis (pp.56-7).

It is with these admonitions in mind that the paper now proceeds to examine four of the most popular trade theories – the H-O theorem, Ricardo's comparative advantage theory, the intra-industry trade theory and the economies of scale argument. The H-O theorem and Ricardo's comparative advantage theory fall under *Geda* (2002)'s category of neoclassical theories, while the intra-industry trade and economies of scale theories fall under his "new trade theory" umbrella.

Ricardian Theory of Comparative Advantage

This is the basic model of international trade. It posits that trade between two countries can benefit both countries if each country exports the goods in which it has a comparative advantage.¹ *Krugman and Obstfeld* (2005: 44-5) explain that factors such as high transport costs could discourage trade so that potentially tradable goods could become nontraded in spite of their comparative advantage. Furthermore, in some cases such as with services, trade is virtually impossible. They conclude that in reality, many goods end up being nontraded either because of the absence of strong national cost advantages or because of high transportation costs. They also explain that most nations do spend a large share of their income on nontraded goods (ibid.).

Though limited in a number of ways, *Krugman and Obstfeld* contend that the *Ricardian model* of international trade is still extremely useful in thinking about the reasons why countries trade and the effects of international trade on national welfare. The limitations of this theory include its prediction of an extreme degree of specialization, which is not observed in the real world due to factors such as transportation costs. It also ignores the income disparities within countries and assumes that everyone in the economy will benefit from trade. Further, it does not allow for differences in resources among countries as a cause of trade, which fails to explain the large trade flows normally evidenced between similar nations. However, its wisdom that productivity differences play an important role in international trade and that it is comparative advantage and not absolute advantage that matters have been illuminating and supported by evidence (ibid.).

The Heckscher-Ohlin Model

According to *Krugman and Obstfeld* (2005), this model posits that differences in resources are what explain patterns of world trade. In brief, the theory proposes that countries tend to produce

¹ A country has a comparative advantage in producing a good if the opportunity cost of producing that good in terms of other goods is lower in that country than it is in other countries (*Krugman and Obstfeld* 2005: 26)

relatively more of the goods that use its abundant resources intensively. Thus, a labor-abundant country will specialize in and export labor-intensive goods, while a capital-abundant country will specialize in and export capital-intensive goods. However, as Krugman and Obstfeld contend, trade often does not run in the direction that the H-O model predicts (p.74). Tests conducted by scholars such as *Leontief (1953)*, *Bowen, Leamer and Sveikauskas (1987)* and *Trefler (1995)* showed the limitations of this theory.

Nonetheless, *Krugman and Obstfeld* assert that this theory does better explain North-South trade patterns in manufacturing since, for instance, China, being labor-abundant exports products that are to a large extent labor-intensive such as clothing, while the United States, being capital-intensive exports sophisticated, skill-intensive products such as chemicals and machinery. This model is based on the assumption of similarities in technologies between countries (i.e. a given amount of land and labor yields the same output of either product in two countries), constant factor prices, as well as similarities in tastes and preferences between the trading countries. Krugman and Obstfeld argue that this is a severe limitation given today's substantial differences in technology levels (p.77). Nonetheless, scholars such as *Brecher et al (1993)* did find some support for at least the production side of the H-O theorem.

The Economies of Scale Argument

This is a modification of Ricardo's model of comparative advantage, which is based on the assumption of constant returns to scale – if inputs to an industry were doubled, industry output would also double. The economies of scale argument to trade takes into account the reality that in practice, constant returns to scale is rare. What is more common in many industries is the economies of scale, which means production is more efficient the larger the scale at which it takes place. Because of economies of scale, countries specialize in a narrow range of products, which enables them to produce these goods more efficiently than if they tried to produce everything for themselves. Thus, it is goods with high economies of scale that will be exported because economies of scale generate a commodity surplus.

Nonetheless, Krugman and Obstfeld warn that economies of scale typically lead to imperfect competition, especially if the economies of scale is internal.² Thus, they propose that models for imperfect competition, such as the monopolistic competition model, need to be applied in analyzing the effect of economies of scale.

² There are two kinds of economies of scale – external and internal economies of scale. External economies of scale occur when the cost per unit depends on the size of the industry but not necessarily on the size of any one firm. Here efficiency of the firm is increased by having a larger industry, without changing the size of the firm. Internal economies of scale occur when the cost per unit depends on the size of an individual firm and not on that of the industry.

In monopolistic competition, an industry contains a number of firms producing differentiated products. These firms act as individual monopolists but additional firms enter a profitable industry until monopoly profits are competed away. Equilibrium is affected by the size of the market so that a large market (as fostered by regional integration) will support a larger number of firms, each producing at larger scale, thus lowering average cost more than in a small market. Each country can specialize in producing a narrower range of products than it would in the absence of trade and by buying goods that it does not make from other countries, each nation can simultaneously increase the variety of goods available to its consumers. In these ways, trade offers mutual gains even when countries do not differ in their resources or technology (Krugman and Obstfeld 2005: 120-123).

Furthermore, Krugman and Obstfeld explain that when economies of scale occur at the level of the industry instead of the firm (external economies), patterns of trade is determined more by history or accident. When external economies are important, a country starting with a large industry may retain that advantage even if another country could potentially produce the same goods more cheaply. Countries can conceivably lose trade under these circumstances.

Intra-Industry Trade (IIT) Argument

Combining comparative advantage with the economies of scale thesis allows us to determine trade patterns through the model of intra-industry trade. This model assumes that the goods under consideration are not in a perfectly competitive market producing a homogenous product. Rather, it is a monopolistically competitive industry in which a number of firms all produce differentiated products. Thus, because of economies of scale, neither country is able to produce the full range of any one product by itself, although both countries may produce different components of the same product or different versions of the same product.

Krugman and Obstfeld explain that this occurs because even though a country may be a net exporter of a certain product, its consumers may demand a similar product or varieties of the same export produced by a different country. The end result is trade within the industry (intra-industry trade), which has nothing to do with comparative advantage. In other words, even if countries had the same overall capital-labor ratio, their firms would continue to produce differentiated products while the demand of their consumers for products made abroad would continue to generate intra-industry trade.

Countries with similar capital-labor ratios have higher intra-industry trade. Intra-industry trade plays a large role in the trade of manufactured goods among industrialized nations (in goods such as chemicals, pharmaceuticals and power-generating equipment) which also accounts for most of the world trade. Overall, it is dominant between countries at a similar level of economic development. Krugman and Obstfeld explain that this is because such countries' levels of technology have become similar as well as their availability of capital and skilled labor. Thus

there is no clear comparative advantage within their manufacturing industries but economies of scale drives the two-way exchanges within their industries. Also noteworthy is the point made by Krugman and Obstfeld that industries for which exports and imports are almost equal have a high intra-industry. Lastly, gains from this trade are high when economies of scale are strong and products are highly differentiated as is more characteristic of sophisticated manufactured goods than raw materials. Labor intensive products such as footwear and apparel tend to have little intra-industry trade. Having established what the stated trade theories predict in terms of world trade patterns, the discussion can now focus on Africa's trade patterns.

AFRICAN TRADE WITHIN THE GLOBAL CONTEXT

According to the *Economic Commission for Africa (ECA hereafter) (2004)*, trade amongst African countries accounts for only about 10% of their total exports and imports (see Appendix 1). This means that over 80% of the trade Africa conducts is with countries outside Africa. *Appendix 1* suggests that intra-African trade has been slightly increasing over the last decade. *The International Monetary Fund (IMF) (2000)* attributes this increase to the trade and exchange liberalization attempts that most African nations undertook in the 1990s, often in the context of World Bank and IMF's Structural Adjustment Programs.

Figure 1: Direction of Africa's trade by continent in 2003

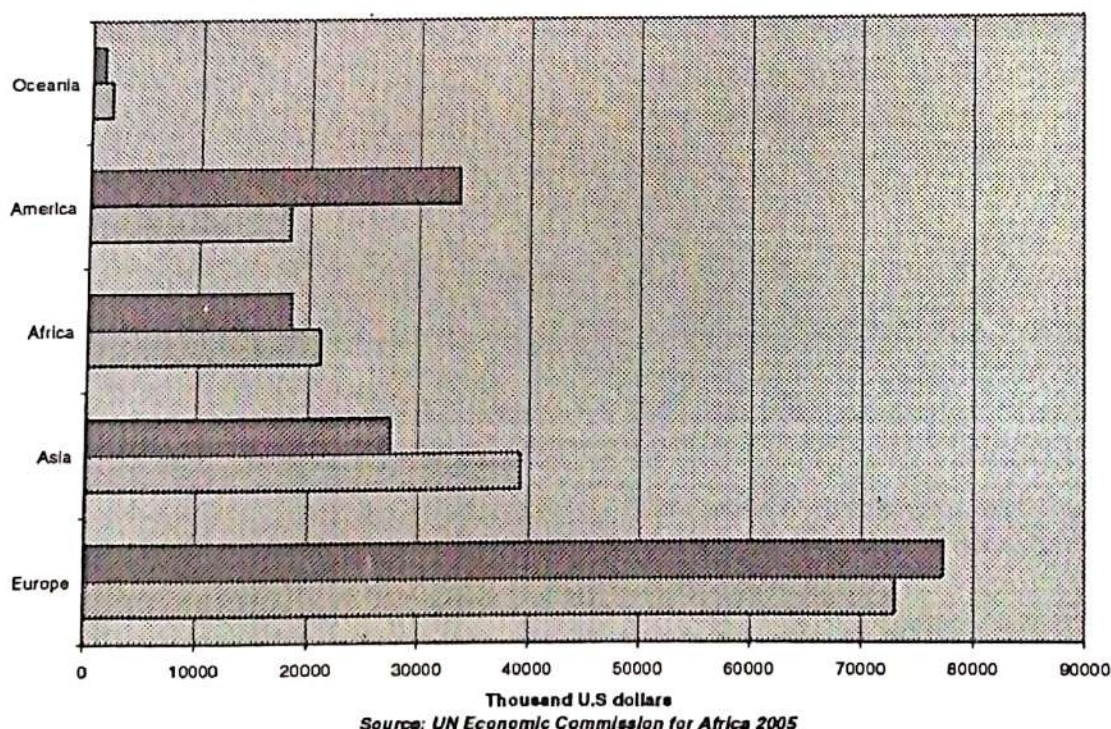


Figure 1 above shows that most of Africa's trade (imports and exports) in 2003 was conducted with *Europe*, suggesting an ongoing strong economic links with its former colonizers. This is followed by trade with *Asia* and *America*, with *Asia* serving as the second highest

importer and *America* serving as the second highest exporter. By comparison, intra-African trade is the second lowest, after trade with *Oceania*. Table 1 gives a breakdown of trade destinations of African goods for selected regions and countries. This table shows that within Europe, most of Africa's trade is conducted with the *EU* (over 90% for both exports and imports); within the Americas it is the United States that is the leading destination for Africa's products.

The *ECA* blames the noted low levels of intra-African trade on poor transportation systems. They explain that Africa's network of transportation infrastructure and services is still "disjointed" and Africa's transport costs are among the world's highest.³ The slow trade progress is also seen due to "a low level of implementation of treaty obligations, an inability to prevent and resolve conflicts decisively, and a lack of resources to support integration." Too many regional economic communities with overlapping memberships duplicate efforts and waste scarce resources. Of sub-Saharan Africa's 53 countries, 6 are members of a one regional economic community, 26 belong to two and 20 are members of at least three. Fewer regional bodies would reduce administration costs and provide funds to improve day to day operations and finance projects.

Source: UN Economic Commission for Africa 2005

Table 1: Breakdown of African Trade by destination to some countries around the world
2003

To/From	Imports	Exports	Imports as % Regional Trade	Exports as % of Total Regional Trade
FOR EUROPE				
Europe	72992	77328		
Eastern Europe	4738	1004	6.5	1.3
EU	66034	70516	90.5	91.2
European Free Trade Area	2191	3545	3.0	4.6
Russia	2184	460	3.0	0.6
FOR AMERICA				
Total America	18264	33579		
USA	11823	27443	64.7	81.7
Latin America	4116	3892	22.5	11.6

³ They give an example of how trade along the West African corridor -- which provides port access to Burkina Faso, Mali and Niger -- trucking companies, in 1997, paid an estimated \$320 million for drivers to pass through various national police and customs checkpoints; fees that would not be payable if the regional transport accord eliminating such fees had been implemented.

PATTERNS OF INTRA-AFRICAN TRADE

Who is Trading with Whom?

As already mentioned, despite an abundance of trade liberalization schemes and reforms to open African markets, intra-community and inter-Africa trade remains low and undiversified. According to the *IMF (2000)*, such liberalization throughout Africa in the 1990s took place during a period of increasing globalization of trade and investment, the conclusion of the *Uruguay Round of trade negotiations*, and the creation or expansion of regional integration, resulting in the establishment or renewal of regional organizations and bilateral as well as *Regional Trade Agreements (RTAs)* such as the *Cross-Border Initiative (CBI)*, the *Common Market for Eastern and Southern Africa (COMESA)* and the *West African Economic and Monetary Union (WAEMU)*.

In Africa, there are currently about 18 functioning *RTAs*, according to *Kirkpatrick (2005)*. These agreements take a variety of forms, including free trade agreement (*FTA*), common market and customs union. Trade liberalization is not uniform within these *RTAs* though. *The ECA (2004)* reports that the *Southern African Development Community (SADC)* accounts for the largest shares of exports (31%) and imports (30%), followed by the *Economic Community of West African States (ECOWAS)* in both exports (almost 20% of the intra-community total) and imports (21%).

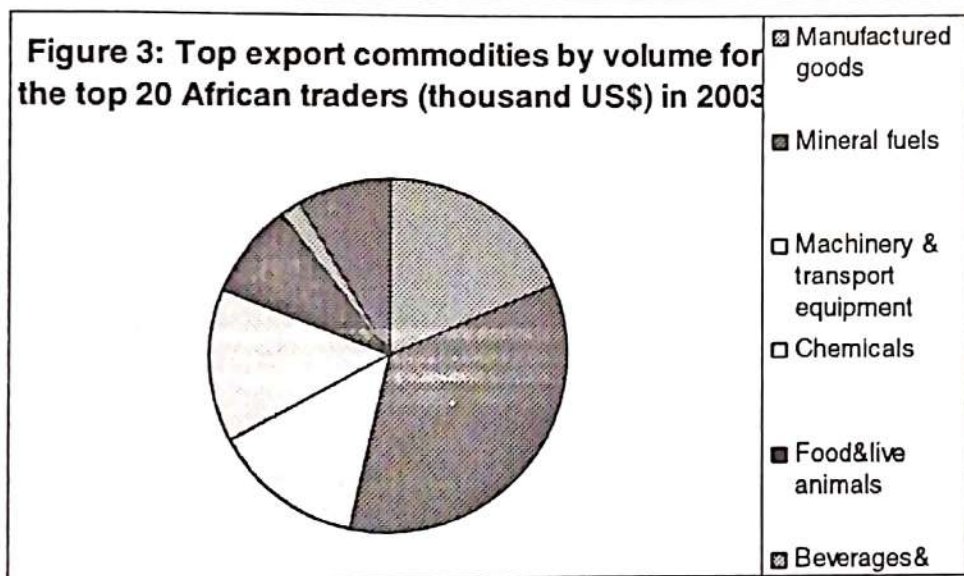
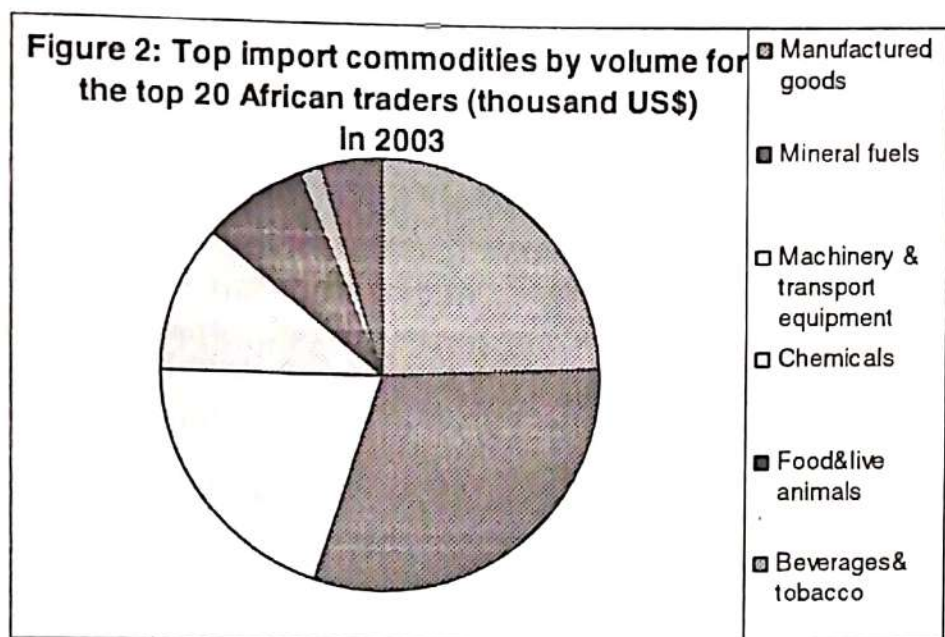
Not surprisingly, color-coded data in *Appendix 2* shows that Southern African countries dominate the list of the continent's top 20 trading partners. *Mozambique* and *Botswana* (both *SADC* members) are the continent's largest importers, while South Africa is by far the most dominant exporter, followed by *Nigeria*. *Cote D'Ivoire* and *Ghana* (*ECOWAS* members) are also amongst the top 5 importers. *Appendix 2* also demonstrates that indeed most of the trade occurs within sub-regions rather than across them. The majority of the anomalies to this trend involve South Africa and, to a lesser extent, a few other southern African countries (notably Zimbabwe and Swaziland) and Nigeria.

What is Being Traded?

According to the *ECA (2004: 81)*, for most African countries, the structure of trade over the past 40 years can be characterized as follows (see *Appendix 6* for classification description):

- A commodity structure of exports dominated by primary products in Standard International Trade Classification (*SITC*) categories 0–4.
- More than 80% of export earnings from primary commodities (*ADB 2000*).
- A commodity composition of imports heavily weighted in manufactured goods in *SITC* product categories 5–8.
- A heavy concentration of exports (more than 80%, mostly primary commodities) and imports (a similar share) in markets in Europe, Asia, and North America.

Figures 2 and 3 below suggest that around 2003, a majority of intra-African trade was in mineral fuels (for both imports and exports) then followed by manufactured goods. Furthermore, Appendix 3 shows that the top mineral fuel importers (Cote D'Ivoire, South Africa and Ghana) import mineral fuels from Nigeria. Nigeria's top mineral fuel export destination is South Africa. Algeria, Kenya and South Africa also supply mineral fuels to many of the top 20 mineral fuel importers.



Source: UN Economic Commission for Africa
2005

Also suggested by *Appendix 3* is that the top importers of manufactured products (*Botswana, Zimbabwe, Swaziland, Kenya and Tanzania*) all import their manufactured products from South Africa. South Africa's top destination for its manufactured goods is Zimbabwe followed by Mozambique and Kenya. Manufacturing and transport equipment come third in trade volume for both imports and exports. The imports are led by Zimbabwe, Botswana, Swaziland and Mozambique who all import this equipment from South Africa. Here too, South Africa's top export destination for this commodity is Zimbabwe, followed by Zambia, Angola and Mozambique. Fourth in trade volume are chemicals for both imports and exports, led by South Africa as their main source. The bulk of the trade in this commodity goes to southern Africa.

Nonetheless, in terms of overall economic growth, surprisingly, North Africa saw the highest sub-regional growth (see *Appendix 7*). Furthermore, within southern Africa, varying levels of economic growth were seen for the year 2003, as suggested by SADC Review 2006. The World Bank classifies 7 out of the 14 SADC countries as low income, 5 out of 14 as lower-middle income and 2 out of 14 as upper-middle income (South Africa and Botswana). According to *Appendix 2*, South Africa is conducting the most trade with low-income countries, Mozambique, Zimbabwe and Nigeria.

THEORETICAL ANALYSIS OF AFRICA'S INTRA-AFRICAN TRADE

In short, the description of intra-African trade given above suggests that first and foremost, southern Africa (the SADC community) is most active in intra-African trade, followed by western Africa (ECOWAS members). More specifically, for the most part, Nigeria supplies the continent with its number-one trade commodity (mineral fuels), while South Africa produces the second, third and fourth most traded commodities – manufactured goods, manufacturing and transport equipment and chemicals. Most of the trade among the continent's top 20 traders occurs within the SADC community, with a few extra-regional trade instances involving the main export suppliers South Africa and Nigeria. This section will attempt to explain these findings using the four trade theories mentioned. In order to do so effectively, the findings will be parsed into three separate questions, each addressing an element of the findings described.

Why the predominance of SADC trade?

At first glance, one would surmise that geography has something to do with this pattern. SADC countries are close together distance-wise, meaning transportation costs would be relatively lower. Indeed, as discussed in relation to the Ricardian model, transport costs can impede trade, turning goods with a comparative advantage into nontraded goods. This point is supported by the IMF (2000)'s contention already discussed, arguing that transportation is one of the biggest hurdles Africa faces in relation to trade. Notably, this could explain why trade is low across

regions and especially in relatively poorer regions of Africa where transportation infrastructure might not exist.

One could also point to the 1990s liberalization process and subsequent regional integration efforts as additional factors contributing to this high level of trade among southern African nations. However, without further analysis of the respective countries' productivity levels it is not possible to draw any further conclusions about the relevance of the notion of comparative advantage to the observed trade patterns.

The IMF (2000: 23) explains that with the exception of South Africa, most African countries have insignificant levels of intra-industry trade. They claim that even South Africa is mediocre in comparison to its global emerging market counterparts on this measure (see *Appendix 5*). This assertion is indeed supported by *Appendix 4*, which shows no signs of countries engaging in reciprocal trade in the same commodity type. Furthermore, the fact that South Africa, an upper-middle income country, is conducting most of its trade with low-income countries (Mozambique, Zimbabwe and Nigeria) is a testament that intra-industry trade is likely not to be an explanatory factor here. Intra-industry trade works best between countries at similar levels of development as discussed.

Why are mineral fuels Africa's number one trade commodity followed by manufactured goods, transportation equipment and chemicals?

The simplest explanation to this question could be that Africans need fuel and they happen to be endowed with generous amounts of it, a tentative absolute advantage or even comparative advantage explanation. As already mentioned, Nigeria tops the mineral fuel producer list, but most other African countries also possess some mineral fuels (see *Appendix 4*), which they export. Mineral fuels entail high levels of infrastructure investment and sunk costs, but also high potential for returns based on economies of scale.

Appendix 3 demonstrates that in fact, the production of manufactured goods, manufacturing equipment and chemicals is done almost solely by South Africa. The explanation for this is given in the next section.

Why does Nigeria predominantly export mineral fuels to the continent while South Africa exports manufactured goods, transport equipment and chemicals?

Appendix 4 which depicts the top commodities traded by Africa's biggest traders (top 20) intimates the possibility of comparative advantage playing a role in the trade patterns at hand. The appendix shows that some countries seem to engage in reciprocal trade in the goods that they are renowned for. For instance, Nigeria, being one of the world's largest oil producers, is seen to export mineral fuels to South Africa in this appendix, while South Africa, being more

developed than Nigeria and thus having a higher manufacturing capacity, exports manufacturing goods to Nigeria in exchange for Nigeria's mineral fuels.

Without knowing the two countries' productivity capacities, one could not verify the seeming role of comparative advantage here. However, the described exchange is very much in line with the extrapolations made in relation to Ricardo's theory earlier in the paper. Put differently, it appears Nigeria could have a comparative advantage in mineral fuels and that it is *actually* specializing in and exporting them, while South Africa might have a comparative advantage in manufactured goods, which it is also specializing in and exporting to Nigeria.

The H-O theorem proposes that countries export those goods which utilize their abundant factor intensively. Returning to the example of South Africa and Nigeria, the two commodities traded by the two countries, mineral fuels and manufactured goods are capital-intensive. Nigeria, like most low-income countries is labor abundant and South Africa is relatively more capital abundant. If the H-O theorem held, Nigeria would export to South Africa a labor-abundant good. This is clearly not the case, even though South Africa's exporting of manufactured goods to Nigeria is in line with the H-O theorem. Thus, it does not appear that the H-O theorem is playing a role here. Even outside the South Africa-Nigeria trade relationship, it does not appear that the H-O theorem has much explanatory power since none of the remainder of the top 20 traders exchange the same two commodities.

The explanation for South Africa's dominance in the production of manufactured goods, machinery and transport equipment and chemicals may have to do with its relatively higher capital endowments. These are capital-intensive commodities and in comparison to most other African countries, South Africa has the most capacity to produce them. This could be a comparative advantage argument, though without productivity data, it would be hard to validate the argument.

SUMMARY AND CONCLUSIONS

In spite of decade-long trade liberalization efforts, Africa's share of global trade is still low in comparison to other regions. The bulk of African trade is with Europe and America, the EU and the United States in particular. Intra-African trade is even lower (only 10% of Africa's total trade) in spite of the proliferation of regional trading blocs in the 1990s. The IMF blames this poor performance, first and foremost, on high transportation costs.

According to data around 2003, within Africa, southern Africa dominates trade then followed by West Africa. The single most traded commodity in Africa is mineral fuels, which many African countries possess in abundance. Nigeria supplies the continent with most of its mineral fuels. After mineral fuels, manufacturing goods are the second most traded commodity. Exports of this commodity are led by South Africa, which also supplies the continent with the

third and fourth most traded commodities (machinery and transport equipment, as well as chemicals).

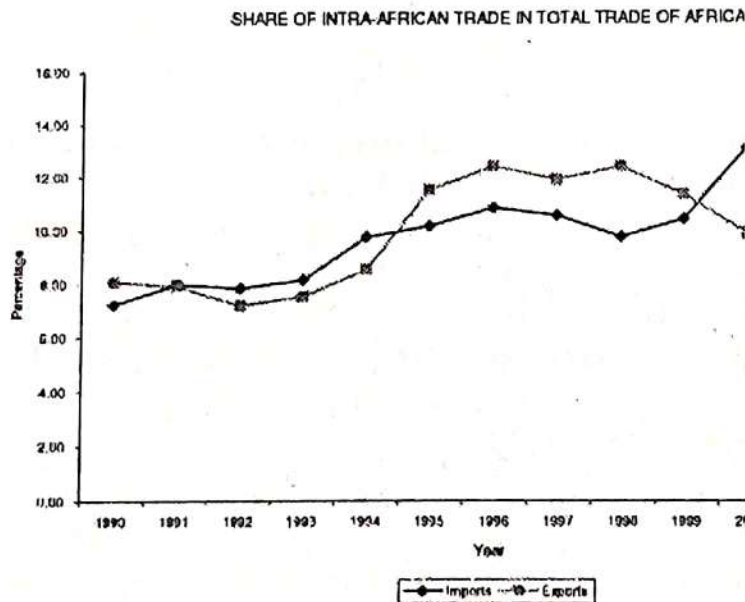
Although scholars such as Geda (2002) argue that mainstream trade theories developed in the North (developed countries) cannot adequately explain Africa's trade patterns, the cross-sectional analysis undertaken in this paper suggests, that some aspects of the four main theories may indeed apply to intra-African trade. Though the lack of experimental depth precludes any firm conclusions being drawn from this study, it appears that *on the surface*, some findings can be explained in terms of the theories of comparative advantage, economies of scale and intra-industry trade. The findings appear to contradict more strongly explanations along the lines of the H-O theorem. Thus, in spite of theoretical imperfections, it appears that some of the traditional trade theories may offer plausible explanations for trade patterns within Africa. Empirical studies testing trade theories more rigorously like Helpman (1981) and Lancaster's (1980) could indeed lead to the refinement of whatever theoretical shortcomings exist with the four theories mentioned. Throwing out the baby with the bathwater as Geda (2002) suggests may not be the wisest move regarding theoretical advancement!

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 (accessed May 24th, 2007)

Appendix 1



Appendix 2: Volume of Intra-African Trade of the top 20 trading countries by sub-region (in thousands US dollars) in 2003 (arranged from highest to lowest volume trade)

Imports			Exports		
Of	From		Of	To	
Mozambique	South Africa	712337	South Africa	Zimbabwe	858565
Botswana	Namibia	654990	South Africa	Mozambique	745476
Cote D'Ivoire	Nigeria	509811	Nigeria	South Africa	589809
Ghana	Nigeria	491497	South Africa	Zambia	536880
South Africa	Nigeria	405068	Nigeria	Ghana	454751
Zimbabwe	Malawi	383580	South Africa	Angola	447327
Botswana	South Africa	368480	Zimbabwe	Malawi	387975
Uganda	Kenya	357194	Nigeria	Cote D'Ivoire	360309
Libya	Tunisia	352794	Tunisia	Libya	352128
Botswana	Zimbabwe	348589	South Africa	Nigeria	334077
South Africa	Zimbabwe	347784	Nigeria	Cameroon	313144
Angola	South Africa	334629	Algeria	Egypt	307143
Zimbabwe	Mozambique	329445	South Africa	Kenya	287684
Swaziland	South Africa	324065	South Africa	Mauritius	271327
Zimbabwe	South Africa	314625	Nigeria	Senegal	254168
Egypt	Algeria	312612	South Africa	Tanzania	248816
Tanzania	South Africa	306263	South Africa	Malawi	224031
Kenya	South Africa	296329	Swaziland	South Africa	192289
Malawi	South Africa	291000	Swaziland	Kenya	178398
Nigeria	South Africa	290867	Algeria	Morocco	167514
Mauritius	South Africa	288658	Cote D'Ivoire	Nigeria	164394
Zimbabwe	Kenya	269557	South Africa	DRC	163521
Swaziland	Ethiopia	266999	Zimbabwe	South Africa	162276
Zimbabwe	Mauritius	248541	Zimbabwe	Kenya	161892
Nigeria	Togo	242636	South Africa	Ghana	151078
Angola	Namibia	226543	Libya	Tunisia	146886
Swaziland	Uganda	213842	Cote D'Ivoire	Equatorial Guinea	130854
Lesotho	South Africa	192642	Cote D'Ivoire	Ghana	124357
Sudan	Egypt	186990	Cote D'Ivoire	Togo	121206
Morocco	Algeria	174869	Botswana	South Africa	116957
Source: UN Economic Commission for Africa 2005					
KEY:					
North Africa					
West Africa					
Central Africa					
East Africa					
Southern Africa					

Appendix 3: Imports & Exports of top commodities within the top 20 intra-African traders by volume (in thousands US\$) , 2003 approximations from highest to lowest importer									
Of	From	Imports							
		Manufactured goods	Mineral fuels	Machinery & transport equipment	Chemicals	Food&live animals	Beverages& tobacco	Crude material except fuel	
*Mozambique	South Africa	84775	73385	100116	27148	24168	3029	4397	
*Botswana	Namibia	42	3156	347	45	1467	246	70	
Cote D'Ivoire	Nigeria	1021	506359		2397	8			
*Ghana	Nigeria	4544	311276	2491	982	678	16	576	
South Africa	Nigeria	735	399159	306	914	1771	8	2173	
*Zimbabwe	Malawi	244		225	266	695		744	
*Botswana	South Africa	488873	117653	416203	112712	184456	24897	25795	
Uganda	Kenya	90912	183478	12740	32047	15556	2260	18988	
*Libya	Tunisia	79332			34758				
*Botswana	Zimbabwe	21543	236	3819	1511	21103	159	4738	
South Africa	Zimbabwe	89205	9401	13174	4040	20958	25319	185582	
Angola	South Africa								
*Zimbabwe	Mozambique	269	41073	480	55	1827		1509	
*Swaziland	South Africa	198850	112758	181535	97273	125576	17488	24661	
*Zimbabwe	South Africa	349744	65435	419392	267390	97398	13304	49251	
Egypt	Algeria	481	310986	32	876	82		155	
Tanzania	South Africa	113113	30889	99119	38961	19978	1857	2023	
Kenya	South Africa	137904	7464	61971	58953	24443	2045	3502	
Malawi	South Africa	67615	64452	73983	61462	15026	1923	4456	
Nigeria	South Africa	79771	2327	89050	66908	28349	20703	3734	
	TOTAL	1808973	2239487	1474983	808698	583539	113254	332354	

Appendix 4: Top commodities imported/exported by the top 20 African trading countries data for 2003 unless specified otherwise

Of	Imports		SITC	Exports		SITC
	From			Of	To	
*Mozambique	South Africa		<i>Machinery & transport equipment/ manufactured goods/ mineral fuels 2002</i>	South Africa	Zimbabwe	<i>Machinery & transport equipment/ manufactured goods/ food & live animals</i>
*Botswana	Namibia		<i>Mineral fuels/ food & live animals 2001</i>	South Africa	Mozambique	<i>Machinery & transport equip/ manufactured goods/ food & live animals</i>
Cote D'Ivoire	Nigeria		<i>Mineral fuels</i>	Nigeria	South Africa	<i>Mineral fuels</i>
*Ghana	Nigeria		<i>Mineral fuels 2000</i>	South Africa	Zambia	<i>Machinery & transport equip/ manufactured goods/ chemicals</i>
South Africa	Nigeria		<i>Mineral fuels</i>	Nigeria	Ghana	<i>Mineral fuels</i>
*Zimbabwe	Malawi		<i>Crude material except fuel/ food & live animals 2002</i>	South Africa	Angola	<i>Manufactured goods/ chemicals/ beverages & tobacco</i>
*Botswana	South Africa		<i>Manufactured goods 2001/ machinery & trans equipment</i>	*Zimbabwe	Malawi	<i>Manufactured goods/ food & live animals 2002</i>
Uganda	Kenya		<i>Mineral fuels/ Manufactured goods</i>	Nigeria	Cote D'Ivoire	<i>Mineral fuels</i>
*Libya	Tunisia		<i>Manufactured goods 1998/ Chemicals</i>	Tunisia	Libya	<i>Manufactured goods/ food & live animals</i>
*Botswana	Zimbabwe		<i>Manufactured goods/ food & live animals 2001</i>	South Africa	Nigeria	<i>Manufactured goods/ machinery & transport equipment</i>
South Africa	Zimbabwe		<i>Crude material except fuel/ manufactured goods</i>	Nigeria	Cameroon	<i>Mineral fuels/ machinery & trans equip</i>
Angola	South Africa			Algeria	Egypt	<i>Mineral fuels</i>

*Zimbabwe	Mozambique	<i>Mineral fuels 2002</i>	South Africa	Kenya	Manufactured goods/chemicals
*Swaziland	South Africa	<i>Chemicals/ manufactured goods 2002</i>	South Africa	Mauritius	Manufactured goods/food & live animals
*Zimbabwe	South Africa	<i>Machinery & transport equipment/ Manufactured goods/chemicals</i>	Nigeria	Senegal	Mineral fuels
Egypt	Algeria	Mineral fuels	South Africa	Tanzania	Manufactured goods/machinery & transport equipment
Tanzania	South Africa	Manufactured goods/machinery & transport equipment/chemicals	South Africa	Malawi	Machinery & transport equipment/ manufactured goods
Kenya	South Africa	Manufactured goods/machinery & transport equipment/chemicals	*Swaziland	South Africa	<i>Chemicals/ Manufactured goods 2002</i>
Malawi	South Africa	Machinery & transport equipment/ Manufactured goods/mineral fuels	*Swaziland	Kenya	<i>Chemicals 2002</i>
Nigeria	South Africa	Manufactured goods/machinery & transport equipment/chemicals	Algeria	Morocco	Mineral fuels/ chemicals

Appendix 5

Selected Eastern and Southern African Countries: Intra-Industry Trade Ratios, 1988 and 1996

Country	Year	Intra-Industry Trade Ratios ¹		
		Transport and machinery	Other manufactures	All manufactures
Kenya	1988	0.04	0.10	0.07
	1996	0.05	0.14	0.11
Madagascar	1988	0.01	0.04	0.04
	1996	0.02	0.12	0.09
Malawi	1988	0.02	0.05	0.04
	1996	0.03	0.11	0.08
Mauritius	1988	0.04	0.30	0.15
	1996	0.09	0.18	0.15
South Africa	1988	0.07	0.35	0.18
	1996	0.20	0.36	0.30
Uganda	1988	0.02	0.02	0.02
	1996	0.02	0.02	0.02
Zambia	1988	0.02	0.05	0.04
	1996	0.01	0.04	0.03
Zimbabwe	1988	0.02	0.07	0.06
	1996	0.02	0.13	0.10
Mexico: Mexico Items				
Brazil	1996	0.57	0.50	0.53
Chile	1996	0.08	0.28	0.22
Rep. of Korea	1996	0.56	0.56	0.55
Turkey	1996	0.23	0.31	0.28
Taiwan, Province of China	1996	0.64	0.52	0.57

¹The intra-industry trade ratio for any industry *i* is calculated as $R_i = 1 - (|X_i - M_i| / (X_i + M_i))$, where X_i and M_i are the industry's exports and imports, respectively. The value of the index lies between 0 (no intra-industry trade) and 1 (full intra-industry trade).

Source: The International Monetary Fund 2000

Appendix 6: The United Nations' SITC classification categories

SITC Rev.3

Click on any code to see more detail. Click [here](#) for top level only.

- 0 - Food and live animals
 - 00 - Live animals other than animals of division 03
 - 01 - Meat and meat preparations
 - 02 - Dairy products and birds' eggs
 - 03 - Fish (not marine mammals), crustaceans, molluscs and aquatic invertebrates, and preparations thereof
 - 04 - Cereals and cereal preparations
 - 05 - Vegetables and fruit
 - 06 - Sugars, sugar preparations and honey
 - 07 - Coffee, tea, cocoa, spices, and manufactures thereof
 - 08 - Feeding stuff for animals (not including unmilled cereals)
 - 09 - Miscellaneous edible products and preparations
- 1 - Beverages and tobacco
 - 11 - Beverages
 - 12 - Tobacco and tobacco manufactures
- 2 - Crude materials, inedible, except fuels
 - 21 - Hides, skins and furskins, raw
 - 22 - Oil-seeds and oleaginous fruits

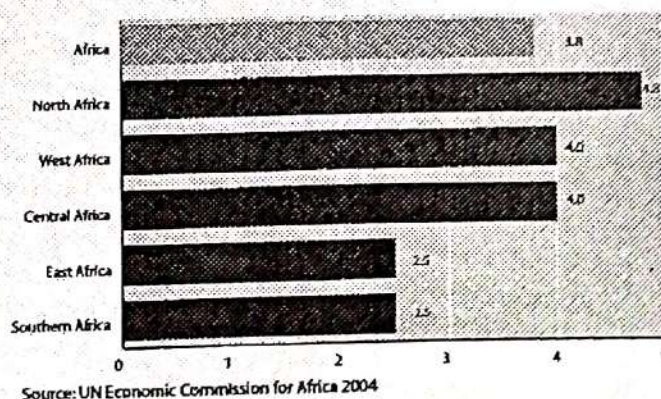
- 23 - Crude rubber (including synthetic and reclaimed)
- 24 - Cork and wood
- 25 - Pulp and waste paper
- 26 - Textile fibres (other than wool tops and other combed wool) and their wastes (not manufactured into yarn or fabric)
- 27 - Crude fertilizers, other than those of division 56, and crude minerals (excluding coal, petroleum and precious stones)
- 28 - Metalliferous ores and metal scrap
- 29 - Crude animal and vegetable materials, n.e.s.
- 3 - Mineral fuels, lubricants and related materials
 - 32 - Coal, coke and briquettes
 - 33 - Petroleum, petroleum products and related materials
 - 34 - Gas, natural and manufactured
 - 35 - Electric current
- 4 - Animal and vegetable oils, fats and waxes
 - 41 - Animal oils and fats
 - 42 - Fixed vegetable fats and oils, crude, refined or fractionated
 - 43 - Animal or vegetable fats and oils, processed; waxes of animal or vegetable origin; inedible mixtures or preparations of animal or vegetable fats or oils, n.e.s.
- 5 - Chemicals and related products, n.e.s.
 - 51 - Organic chemicals
 - 52 - Inorganic chemicals
 - 53 - Dyeing, tanning and colouring materials
 - 54 - Medicinal and pharmaceutical products
 - 55 - Essential oils and resinoids and perfume materials; toilet, polishing and cleansing preparations
 - 56 - Fertilizers (other than those of group 272)
 - 57 - Plastics in primary forms
 - 58 - Plastics in non-primary forms
 - 59 - Chemical materials and products, n.e.s.
- 6 - Manufactured goods classified chiefly by material
 - 61 - Leather, leather manufactures, n.e.s., and dressed furskins
 - 62 - Rubber manufactures, n.e.s.
 - 63 - Cork and wood manufactures (excluding furniture)
 - 64 - Paper, paperboard and articles of paper pulp, of paper or of paperboard
 - 65 - Textile yarn, fabrics, made-up articles, n.e.s., and related products
 - 66 - Non-metallic mineral manufactures, n.e.s.
 - 67 - Iron and steel
 - 68 - Non-ferrous metals
 - 69 - Manufactures of metals, n.e.s.
- 7 - Machinery and transport equipment
 - 71 - Power-generating machinery and equipment
 - 72 - Machinery specialized for particular industries
 - 73 - Metalworking machinery
 - 74 - General industrial machinery and equipment, n.e.s., and machine parts, n.e.s.

- 75 - Office machines and automatic data-processing machines
- 76 - Telecommunications and sound-recording and reproducing apparatus and equipment
- 77 - Electrical machinery, apparatus and appliances, n.e.s., and electrical parts thereof (including non-electrical counterparts, n.e.s., of electrical household-type equipment)
- 78 - Road vehicles (including air-cushion vehicles)
- 79 - Other transport equipment
- 8 - Miscellaneous manufactured articles
 - 81 - Prefabricated buildings; sanitary, plumbing, heating and lighting fixtures and fittings, n.e.s.
 - 82 - Furniture, and parts thereof; bedding, mattresses, mattress supports, cushions and similar stuffed furnishings
 - 83 - Travel goods, handbags and similar containers
 - 84 - Articles of apparel and clothing accessories
 - 85 - Footwear
 - 87 - Professional, scientific and controlling instruments and apparatus, n.e.s.
 - 88 - Photographic apparatus, equipment and supplies and optical goods, n.e.s.; watches and clocks
 - 89 - Miscellaneous manufactured articles, n.e.s.
- 9 - Commodities and transactions not classified elsewhere in the SITC
 - 91 - Postal packages not classified according to kind
 - 93 - Special transactions and commodities not classified according to kind
 - 96 - Coin (other than gold coin), not being legal tender
 - 97 - Gold, non-monetary (excluding gold ores and concentrates)
- I - Gold, monetary
- II - Gold coin and current coin

Source: <http://unstats.un.org/unsd/cr/registry/regcst.asp?Cl=14>

Appendix 7

Figure 1.13
North Africa leads Africa's subregional growth, 2003 (%)



PRIME DETERMINANTS OF PROFITABILITY IN INDIAN BANKS - EMERGING ISSUES AND FUTURE OUTLOOK

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ABSTRACT

Profitability is an important criterion to evaluate the overall efficiency of a bank group. The present paper examines the comparative trends in profitability behaviour of five major bank groups in the post liberalization and globalization era. The paper further examines the factors which are affecting the profitability of these bank groups. The paper concludes that average profitability is the highest in case of New Private Sector Banks and in Foreign Banks. The selected factors have differently affected the profitability of these bank groups. With the help of Correlation Co-efficient Matrix and R - Square, this paper examines the impact of each selected variable on the profitability of each group. The paper offers suggestions on the basis of empirical results to increase the profitability and measures to be taken to increase the level of spread and to curtail the burden.

Keywords: Prime Determinants, Emerging Issues and Future Agenda

INTRODUCTION

With the globalization trends world over, it is difficult for any nation, big or small, developed or developing, to remain isolated from what is happening around. For a country like India, which is one of the most promising emerging markets, such isolation is nearly impossible. More particularly, in the time of these dynamic changes, India has also adopted liberalization, privatization and globalization policies under banking sector reforms in 1991, which has improved the performance of the banks to a large extent.

Due to these changes, the concept of banking has drastically changed from a business dealing with money transactions alone to a business related to information on financial transactions. It is so because with the entry of foreign and new private sector banks, competition

has increased and banking business has become vast to the extent that even education fee, bills payment, reservations and more particularly, security market and many non-banking transactions etc. are made through banks. It has become possible just because of the use of latest techniques of information technology under the liberalized policies.

Due to liberalization and globalization, competition has increased. Along with the new products, quality of services has also improved. Liberalization and globalization, on the one hand increase competition; on the other hand they have opened new vistas of business for Indian banks in the global markets. Their gain is directly proportional to their efficiency. So, Indian banks now should explore these opportunities in a big way to gain momentum in the global markets.

Liberalization as well as globalization has changed the ways of banking business and the banks are facing fierce competition to stay in foreign markets. They are facing a number of challenges to improve their performance on one hand, and to serve the customers in new ways with greater efficiency and effectiveness on the other hand. Now a days, profitability and social objectives are the two opposing considerations which a bank is required to keep in mind. Although, profits today are no longer the be-all and end-all of banking business, any concern for healthy growth, long-term viability and lasting contribution of banks must accord due emphasis to profitability.

Profitability is an important criterion for determining the efficiency of banks. This has to be considered in relation to the growth of various selected variables. Raising profitability is one of the important ways by which a bank can vigorously expand its operations on a sustained long-term basis. Profit is the very reason for the continued existence of every commercial organization. The rate of profitability, therefore, is rightfully considered as indicator of efficiency in the deployment of resources of banks.

The present paper is mainly concerned with the analysis of profitability and its prime determinants of Indian commercial banks in the post liberalized and globalized era. Indian banking has witnessed a sea change in recent years, reflecting the onset of deregulation, liberalization, privatization and globalization. The financial sector reforms focused on reforms in ownership and control, to increase competition in regulation and the policy environment. These sharp changes in the policy environment concerning the operations of the banking system have direct and indirect implications for the performance of the banking sector. All these policy changes have great impact on banks' performance and lead them to face high competition to retain their share in the market.

In the recent days, Indian banking system has become quite complex and varied. Banks have evolved into a technology for delivering a wide range of financial services. The activities of banks have encompassed advisory and counseling roles as well as a monitoring function with a distinct discipline base coupled with entry in non-banking and fee-based activities. Due to the increasing expectations and demands of customers, now commercial banks are facing number of challenges to serve the customers efficiently and effectively.

Today, Indian banking is facing a challenge to improve its profitability on one the hand and to serve the customers efficiently in innovative ways, on the other hand. Hence, the degree of profitability has great pressure to improve in the current era of globalization. No doubt, the performance of the banks has been improved but profitability of number of banks in all bank groups is deteriorating at regular pace. Therefore, there is a need to concentrate more on efforts to analyze the working of all commercial banks so that appropriate and timely strategies can be developed to improve the profitability of poor performing banks.

The paper is mainly concerned with Indian commercial banks and the profitability is examined at bank level and bank group level from 1998-99 to 2005-06. The profitability of Indian commercial banks is analyzed along with the study of impact of selected factors on the profitability.

ORGANIZATION OF PAPER

The whole paper is divided into four parts. After a brief introduction of the theme, it reviews the related studies and describes the methodology. The third part analyzes the results whereas last part concludes the paper with some policy recommendations.

II

REVIEW OF LITERATURE

Various studies have been conducted to analyse the profitability of the banks at different levels *Arora & Verma (2005)* have observed in their study that the Indian Banking System is becoming increasingly mature in the areas of transformation of business process and the appetite for risk management.

Bhattacharya, (1997) has found *PSBs* with the highest efficiency among the three categories of bank groups as foreign and private sector banks have much lower efficiencies. However *PSBs* started showing a decline in efficiency after 1987; private banks witnessed no change and foreign banks disclosed sharp rise in efficiency.

Das (1999) has observed concluded that while there is a welcome increase in emphasis on non- interest income, banks have tended to show risk-averse behavior by opting for risk- free investments over risky loans.

Das M R (2003) has noted that during 2000-01, *Corporation Bank* emerged as the topmost bank followed by *Andhra Bank* and OBC whereas in business performance. During 2000-01, the listed banks ranked higher than the unlisted ones.

Garg, Mohini (1994) studied that Indian scheduled commercial banks have achieved remarkable progress in last two decades under study, particularly in branch expansion in rural areas, deposit mobilization and credit deployment to priority sector and small borrowers but their profits have not kept pace with their growth, and hence, their share in profits have come down, whereas foreign banks with a much smaller geographical spread and resource base, earn almost as much by way of profits as the 20 nationalized banks put together. There is a lot of difference in the pattern of advances and investments and even lending rates between Indian and foreign banks.

Johri & Jauhari, (1994) also analyzed whether banks use e-commerce and other IT systems to reinvent themselves, gain access to new markets or become extinct as dinosaurs; whether advances in technology create new opportunities for banks, or they become extinct. *Kaveri, (2001)* has presented some evidence to indicate that no bank can become weak or potentially weak all of a sudden. There is a gradual deterioration in the position of loan default and profitability.

Murty, (1996) examined the impact of monetary policy and market interest rates on the bank profitability and also suggested various measures to improve the profitability of the public sector banks in India.

Nayar, Anita (1992) concluded that overall profitability of banks has been under constant strains during the study period except 1970-74 and downfall was experienced between 1970-1974.

Roger, (2000) said that business is being completely reinvented because transaction costs are much lower on the Internet than in traditional channels. The banks are rapidly shifting their business functions and customers relationships on to the Web.

Sarker and Das, (1997) find PSBs comparing poorly with the other two categories. However, they caution that no firm inference can be derived from a comparison done for a single year.

Satyamurty, (1994) clarified the concepts of profits, profitability & productivity applicable to the banking industry. He concluded that the pressure on the profitability is more due to the factors beyond their control.

Shah, (1977) examined that slow growth in productivity and efficiency, wasteful work of banks that higher profitability can result from increased spread and that innovations have a limited role. He favored written job descriptions for improvement of staff productivity. He also emphasized reduction of costs, creation of a team spirit improvement in the management for improving bank profitability and productivity.

Singh, Inderjeet & Parmod Kumar (2006) analyzed that deposits is a major determinant of spread followed by borrowings and labour. The study again concluded that average technical and allocative efficiency are the highest in foreign banks; while of PSBs is lower than FBs but much better than private sector banks.

Singla & Arora (2005) studied the comparative performance of Canara Bank and Indian Bank concluding that both the banks have improved their financial performance during the study period where *Canara Bank* has an upper hand in growth of deposit, advances and average working funds. In case of productivity, it is rising in both the banks but remained much higher in *Canara Bank*.

Swamy, (2001) concludes that in many respects *NPSBs* are much better than *PSBs*; they are even better than foreign sector banks.

T. Padamasai (2000) pointed out that productivity and profitability of five big banks increased throughout the post-reforms period in terms of selected ratios of each parameter; but on account of efficiency, the performance of the top five banks is very dismal as inefficiency has increased during the study period. He suggested that if the government sells its share in the profit making banks, it would be able to bail out the weak banks.

There have been a number of studies on liberalization programmes and their impact on efficiency in industrialized countries and transition economies. But there is lack of material particularly related to the prime determinants of profitability. Hence, there is a need to explore this area for research in detail as review of the literature on the subject indicated that the changes due to emerging competition are very vital for the present banking system. This paper is an attempt to study the profitability of Indian commercial banks in the post-liberalized and globalized era along with the analysis of its impact in terms of twelve selected factors of profitability.

OBJECTIVES

- To study and analyze the trends and growth in profitability and prime determinants of major bank groups.
- To analyze the impact of determinants on profitability of major bank groups.
- To suggest possible measures to improve the profitability of poor performing banks.

HYPOTHESIS

There is insignificant correlation between profitability and its determinants.

METHODOLOGY

The present paper is mainly concerned with profitability analysis of commercial banks in India.

RESEARCH DESIGN

The present study evaluates the profitability of Indian banking industry in the liberalized and globalized environment. Further, from among the Indian banking industry, only commercial banks have been chosen for the study whereas RRBs are excluded from the study.

SAMPLE DESIGN

The whole Indian banking industry is taken in terms of five major bank groups as given below:

- G-I comprises Nationalized Banks
- G-II comprises SBI & Associates
- G-III comprises Old Private Sector Banks
- G-IV comprises New Private Sector Banks
- G-V comprises Foreign Banks

PROFITABILITY ANALYSIS

The performance of a bank can be measured by a number of indicators. Profitability is the most important and reliable indicator as it gives a broad indication of the capability of a bank to increase its earnings. The analysis of profitability is made at bank group level. For measuring the profitability of commercial banks, the present study employs two methods viz., trend analysis and ratio analysis.

TREND ANALYSIS:

Trend indicates the direction of operations over a period of time. It also predicts the historical developments in the banks' operations. Trend analysis in this study is used to predict the trends in profitability and its prime determinants. Here, overall growth rate is also calculated with the help of following formula, which indicates the overall change in a factor under study during the whole study period.:

$$G = \frac{Y(t) - Y(t_0)}{Y(t_0)} * 100$$

Where;

G= simple percentage growth rate over the base year

Y (t) = value of the given parameter in the current year i.e. 2005-06

Y t₀= value of the given parameter in the base year i.e. 1998-99

RATIO ANALYSIS:

Ratio provides a convenient means of analysis and expression of the various operational aspects of banks. In this paper 13 ratios are calculated to analyze the profitability of commercial banks viz:

- Net Profit as a percentage of Total Assets (Y₁)
- Rural Branches as percentages of Total Branches (X₂)
- Priority Sector Advances as a percentage of Working Funds (X₃)
- Net NPAs as percentage of Net Advances (X₄)
- Interest Income as percentage of Total Income (X₅)
- Non- Interest Income as percentage of Total Income (X₆)
- Establishment Expenditure as a percentage of Total Expenditure (X₇)
- Spread as a percentage of Working Funds (X₈)
- Burden as a percentage of Working Funds (X₉)
- Current Deposits as a percentage of Total Deposits (X₁₀)
- Fixed Deposits as a percentage of Total Deposits (X₁₁)
- Saving Deposits as a percentage of Total Deposits (X₁₂)
- Total Credit as a percentage of Total Deposits (X₁₃)

Among these, profitability is dependent factor whereas other twelve factors are independent. In this study, it is analyzed whether the selected twelve factors have any factors contributing positively to profitability and which are the factors affecting profitability; if so then to what extent these factors affect the profitability of five major bank groups. This analysis provides an important result to examine the variables which impacts negatively, so that appropriate strategies can be developed in the light of this analysis.

TIME PERIOD FOR THE STUDY:

Time period for the study is taken from post second banking sector reforms i.e. from 1998-99 to 2005-06. The time period is taken so because the true impact of liberalization and globalization can be studied only after second banking sector reforms period as competition is increased, *IT Act, 2000* is implemented, free entry of foreign and private sector banks, implementation of *WTO*

with new facilities etc. These mixed factors which affect banking industry are studied in the selected time period.

COLLECTION OF DATA

The present paper is based on secondary data and it has been collected for the analysis of profitability from Performance Highlights, Various Issues, 1998-99 to 2005-06 and *IBA Bulletin*, 1998-99, 2003-04.

ANALYSIS OF THE DATA

These ratios are analyzed and interpreted by calculating Mean, Standard Deviation, Co-efficient of Variation to get a better picture of the performance of Indian commercial banks at group level. Besides this correlation co-efficient and R-square are also calculated to study the relationship between profitability and selected factors of profitability where r-square provides more useful information as it tells the extent of relationship between the factors under study. Data is calculated with the help of SPSS 15.00 Version.

III

PROFITABILITY

Table 1 exhibits that all bank groups have shown fluctuating trend in their profitability during the study period and here, it is interesting to note that profitability was the highest in the year 2003-04 in all bank groups but further started to decline in the next years under study. All banks have recorded improvement in their profitability as foreign banks witnessed the highest growth i.e. 120.29 pc and also have the highest average profitability i.e. 1.27 pc. On the other hand, private sector banks have recorded the least rate of growth i.e. 39.68 pc where new private sector banks witnessed only 6.38 pc growth but have 0.93 pc average profitability which was the second highest among all bank groups. Interesting to note that all scheduled commercial banks have recorded 0.71 pc average profitability with an excellent rate of growth i.e. 423.53 pc Group-wise variations were the highest (46.05 pc) in old private sector banks.

Table 1: Net Profits/Loss as Percentage of Total Assets – Y₁ (At Bank Group Level)

												(Per cent)	
Sr. No.	Banks	1998-99	1999-2000	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	Average	S.D.	C.V. (%)	Overall Growth
1	G-I	0.37	0.44	0.33	0.69	0.98	1.19	0.89	0.81	0.71	0.31	43.66	118.92
2	G-II	0.51	0.80	0.55	0.77	0.91	1.02	0.91	0.86	0.79	0.18	22.78	68.63
3	PSBs (G-I +II)	0.42	0.57	0.42	0.72	0.96	1.12	0.89	0.83	0.74	0.26	35.14	97.62
4	G-III	0.47	0.78	0.68	1.04	1.17	1.16	0.20	0.54	0.76	0.35	46.05	14.89
5	G-IV	0.94	0.85	0.76	0.39	1.08	1.21	1.17	1.00	0.93	0.26	27.96	6.38

6	IPSRs (G-III+IV)	0.63	0.81	0.71	0.62	1.12	1.19	0.85	0.88	0.85	0.21	24.71	39.68
7	G-V	0.69	1.17	0.93	1.32	1.56	1.65	1.29	1.52	1.27	0.33	25.98	120.29
8	ASCBs	0.17	0.23	0.55	0.76	1.03	1.16	0.91	0.89	0.71	0.36	50.70	423.53
	Average	0.60	0.81	0.65	0.84	1.14	1.25	0.89	0.95				
	S.D.	0.22	0.26	0.23	0.35	0.25	0.24	0.42	0.36				
	C.V. (%)	36.67	32.10	35.38	41.67	21.93	19.20	47.19	37.89				

Year-wise, average profitability was the highest i.e. 1.25 pc in 2003-04 whereas it has decreased to 0.95 pc in 2005-06 mainly because of declining profitability of maximum old private sector banks and some of public sector banks. Variations were the highest in 2004-05 i.e. 47.19 pc in terms of C.V.

Overall, it is concluded that profitability of foreign banks has shown an excellent trend of improvement and average profitability was also the highest i.e. 1.27 pc in this group followed by new private sector banks who have 0.93 pc average profitability. Overall, profitability of all scheduled commercial banks has increased at 423.53 pc rate of growth which was improved from 0.17 pc in 1998-99 to 0.89 pc in 2005-06.

PRIME DETERMINANTS

From the analysis of profitability of major bank groups, it is concluded that profitability of Indian banking industry was deteriorating continuously. Now the question arises what are the factors that contribute to the improvement in profitability and mainly what are the factors responsible for deterioration in profitability of the banks? Here, an attempt has been made to estimate the impact of selected factors on bank profitability. Here, it is empirically tested that whether the correlation between profitability and selected factors is significant or not if so to what extent these factors affect the profitability. For this purpose, firstly selected factors are studied to examine the trends and growth during the period of 1998-99 to 2005-06 and then correlation analysis and regression analysis (R-square) are used to test the impact of these factors on the profitability of five major bank groups separately.

Rural Branches as Percentage of Total Branches (X_2):

Table 2 shows decreasing trend in their share of rural branches from total branches in all bank groups except new private sector banks Private sector banks have recorded the highest rate of decline i.e. 23.39 pc whereas foreign banks haven't any branch in rural areas of India. On an average, public sector banks have recorded the highest share of rural branches i.e. 41.53. New private sector banks have shown the highest variations i.e. 62.70 pc in terms of C.V. witnessed high competition among new private sector banks.

Overall, rural branches' share from total branches was decreasing at 9.46 pc rate during the study period and have only 39.74 pc average share in total branches of scheduled commercial banks.

Table 2: Rural Branches as Percentage of Total Branches – X₂ (Per cent)

Bank Group	1998-99	1999-2000	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	Average	S.D.	C.V. (%)	Overall Growth
G-I	43.41	42.91	42.70	42.44	41.93	41.49	40.89	40.01	41.97	1.13	2.69	-7.83
G-II	41.69	41.14	40.67	40.52	40.44	40.07	39.82	39.35	40.46	0.74	1.83	-5.61
PSBs (G-I+II)	42.91	42.39	42.10	41.87	41.50	41.08	40.58	39.82	41.53	1.01	2.43	-7.20
G-III	34.21	33.51	29.68	29.19	25.43	27.89	26.62	26.75	29.16	3.22	11.04	-21.81
G-IV	1.74	2.39	12.92	10.22	7.42	8.47	7.70	18.45	8.66	5.43	62.70	960.34
IPSBs (G-III+IV)	31.72	30.47	26.93	25.66	21.33	23.79	22.03	24.30	25.78	3.75	14.55	-23.39
G-V	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ASCBs	41.77	41.15	40.45	40.06	39.24	39.09	38.32	37.82	39.74	1.37	3.45	-9.46
Average	24.21	23.99	25.19	24.47	23.04	23.58	23.06	24.91				
S.D.	21.59	21.12	18.38	18.74	18.92	18.68	18.57	16.60				
C.V. (%)	89.18	88.04	72.97	76.58	82.12	79.22	80.53	66.64				

Source: Performance Highlights, Various Issues, 1998-99 to 2005-06

Priority Sector Advances as Percentage of Total Advances (X₃):

Table 3 shows that all bank groups except old private sector banks have recorded increasing trend in the share of priority sector advances from total advances. Among all, new private sector banks have recorded the highest growth i.e. 59.29 pc in its priority sector advances' share but has the least average share i.e. 20.28 pc. On an average, it was the highest in nationalized banks (34.03 pc) followed by old private sector banks. It was the least in new private sector banks even C.V. is the highest i.e. 25.20 pc that reflected higher competition in this bank group and resulted in the higher growth.

Table 3: Priority Sector Advances as Percentage of Total Advances- X₃ (Per cent)

Bank Group	1998-99	1999-2000	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	Average	S.D.	C.V. (%)	Overall Growth
G-I	32.25	31.40	31.48	31.33	33.84	36.25	37.75	37.97	34.03	2.88	8.46	17.74
G-II	30.52	29.09	29.06	28.93	28.94	30.81	32.33	33.65	30.42	1.78	5.85	10.26
PSBs (G-I+II)	31.61	30.73	30.61	30.51	32.16	34.36	35.85	36.45	32.78	2.43	7.41	15.31
G-III	32.99	33.18	31.66	31.02	29.94	31.44	31.31	32.16	31.71	1.06	3.34	-2.52
G-IV	18.89	16.32	15.49	15.97	18.18	24.15	23.16	30.09	20.28	5.11	25.20	59.29
IPSBs (G-III+IV)	28.32	26.48	24.48	26.87	22.36	26.69	25.78	30.65	26.45	2.46	9.30	8.23
G-V	22.12	21.60	21.42	21.48	21.91	23.47	25.77	26.88	23.08	2.13	9.23	21.52

ASCBs	30.65	29.47	29.06	27.37	29.51	31.91	33.16	34.57	30.71	2.37	7.72	12.79
Average	27.35	26.32	25.82	25.75	26.56	29.22	30.06	32.15				
S.D.	6.42	7.12	7.12	6.76	6.36	5.38	5.74	4.13				
C.V. (%)	23.47	27.05	27.58	26.25	23.95	18.41	19.10	12.85				

Source: Performance Highlights, Various Issues, 1998-99 to 2005-06

Overall, all scheduled commercial banks have recorded 12.79 pc growth having 30.71 pc average share of priority sector advances in total advances during the study period. New private sector banks and foreign banks were gaining momentum with an excellent growth in priority sector advances and hence Public sector banks are facing challenges from these banks to retain their share in the market.

Net Non-Performing Assets (NPAs) as Percentage of Total Advances (X_4):

Table 4 exhibits that all bank groups have recorded declining trend in the non-performing assets level where foreign banks witnessed the highest decline at 86.78 pc and average non-performing assets of 3.60 pc which was the least among all bank groups under study. Nationalized banks followed with 86.54 pc decline but still have the highest level of non-performing assets i.e. 5.23 pc. New private sector banks have recorded the least decline of 78.51 pc.

Overall, all bank groups have succeeded to bring down their non-performing assets and public sector banks, although have the highest level of non-performing assets among all bank groups but still recorded a decline of big amount.

Table 4: Net NPAs as Percentage of Net Advances – X_4

(Per cent)

Bank Group	1998-99	1999-2000	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	Average	S.D.	C.V. (%)	Overall Growth
G-I	8.69	8.08	7.56	6.60	4.74	3.13	1.86	1.17	5.23	2.93	56.02	-86.54
G-II	9.22	7.76	6.90	5.12	4.12	2.71	2.24	1.64	4.96	2.78	56.05	-82.21
PSBs (G-I + II)	8.96	7.92	7.36	6.16	4.50	3.00	1.99	1.33	5.15	2.87	55.73	-85.16
G-III	9.13	8.10	8.46	9.22	5.50	3.80	2.84	1.71	6.09	3.02	49.59	-81.27
G-IV	3.49	2.60	3.20	4.44	4.60	2.40	1.41	0.75	2.86	1.36	47.55	-78.51
IPSBs (G-III+IV)	6.31	5.35	7.06	7.95	4.95	2.84	1.87	1.01	4.67	2.52	53.96	-83.99
G-V	6.28	7.42	8.40	1.73	1.76	1.49	0.86	0.83	3.60	3.19	88.61	-86.78
ASCBs	7.18	6.90	7.20	9.34	4.40	2.90	1.89	1.23	5.13	2.94	57.31	-82.87
Average	7.36	6.79	6.90	5.42	4.14	2.71	1.84	1.22				
S.D.	2.48	2.36	2.17	2.76	1.42	0.86	0.76	0.44				
C.V. (%)	33.70	34.76	31.45	50.92	34.30	31.73	41.30	36.07				

Source: Performance Highlights, Various Issues, 1998-99 to 2005-06

Interest Income as Percentage of Total Income (X_5):

Table 5 shows declining trend in interest income of all bank groups till 2003-04 and then started to increase where foreign banks recorded the highest decline at 12.94 pc rate followed by new private sector banks with 11.37 pc which was mainly because these banks concentrated more on fee-based income. Public sector banks have shown 2.65 pc decline even having the highest average interest income i.e. 85.18 pc during the study period whereas it was the least in foreign banks group i.e. 74.81 pc. Overall, all scheduled commercial banks have recorded 4.73 pc decline in interest income.

Overall trend was declining, which is obvious in globalized environment as more concentration is diverted towards fee-based activities which give handsome income to the banks

Table 5: Interest Income as Percentage of Total Income – X_5 **(Per cent)**

Bank Group	1998-99	1999-2000	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	Average	S.D.	C.V. (%)	Overall Growth
G-I	89.48	88.38	88.85	85.50	83.32	79.97	83.94	87.15	85.82	3.27	3.81	-2.60
G-II	85.61	85.81	86.74	86.56	83.63	78.93	82.29	83.38	84.12	2.64	3.14	-2.60
PSBs (G-I+II)	88.04	87.41	88.05	85.90	83.44	79.57	83.31	85.71	85.18	2.93	3.44	-2.65
G-III	88.15	85.05	88.64	79.65	79.07	78.99	87.72	87.92	84.40	4.41	5.23	-0.26
G-IV	85.57	81.91	85.86	79.40	75.94	75.94	76.74	75.84	79.65	4.30	5.40	-11.37
IPSBs (G-III+IV)	87.27	83.85	87.37	79.58	77.05	77.04	80.46	79.15	81.47	4.20	5.16	-9.30
G-V	80.61	79.16	79.04	74.54	74.49	70.09	70.36	70.18	74.81	4.38	5.85	-12.94
ASCBs	87.25	86.25	87.15	84.07	81.66	78.53	81.91	83.12	83.74	3.06	3.65	-4.73
Average	85.88	84.06	85.83	81.13	79.29	76.78	80.21	80.89				
S.D.	3.39	3.58	4.00	4.93	4.16	4.04	6.78	7.67				
C.V. (%)	3.95	4.26	4.66	6.08	5.25	5.26	8.45	9.48				

Source: Performance Highlights, Various Issues, 1998-99 to 2005-06

Non-Interest Income as Percentage of Total Income (X_6):

Non-interest income is very important source of income that contributes maximum in banks' income and gaining momentum share in total income.

Table 6: Non-Interest Income as Percentage of Total Income – X_6 **(Per cent)**

Bank Group	1998-99	1999-2000	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	Average	S.D.	C.V. (%)	Overall Growth
G-I	10.52	11.62	11.15	14.50	16.68	20.03	16.06	12.85	14.18	3.27	23.06	22.15
G-II	14.39	14.19	13.26	13.44	16.37	21.07	17.71	16.63	15.88	2.64	16.62	15.57
PSBs (G-I+II)	11.96	12.59	11.95	14.10	16.56	20.43	16.69	14.29	14.82	2.93	19.77	19.48

G-III	11.85	14.95	11.36	20.35	20.93	21.01	12.28	12.08	15.60	4.41	28.27	1.94
G-IV	14.43	18.09	14.14	20.60	69.56	24.06	23.26	24.16	26.04	18.04	69.28	67.43
IPSBs (G-III+IV)	12.73	16.15	12.63	20.42	52.35	22.96	19.54	20.85	22.04	12.76	57.89	63.79
G-V	19.39	20.84	20.96	25.46	25.50	29.91	29.64	29.82	25.19	4.38	17.39	53.79
ASCBs	12.75	13.75	12.85	15.93	18.34	21.47	18.09	16.88	16.26	3.06	18.82	32.39
Average	14.12	15.94	14.17	18.87	29.81	23.22	19.79	19.11				
S.D.	3.39	3.58	4.00	4.93	22.53	4.04	6.78	7.66				
C.V. (%)	24.01	22.46	28.23	26.13	75.58	17.40	34.26	40.08				

Source: Performance Highlights, Various Issues, 1998-99 to 2005-06

From table 6, it is observed that all bank groups have shown fluctuating trend in non-interest income and recorded increase during the study period. Here, new private sector banks have recorded the highest growth i.e. 67.43 pc among all bank groups witnessed the highest average level of non-interest income i.e. 26.04 pc followed by foreign banks with 53.79 pc growth and 25.19 pc average non-interest income level. Growth was the least in old private sector banks i.e. only 1.94 pc and average non-interest income level was the least i.e. 14.82 pc in public sector banks.

Establishment Expenditure as Percentage of Total Expenditures (X₇):

Table 7 shows fluctuating trend in establishment expenditure of all bank groups. The share of establishment expenditure from total expenditure was increasing in new private sector banks group at the highest i.e. 167.65 pc growth rate with the highest variations (38.40 pc) and the least average establishment expenditure (5.13 pc). Foreign banks followed with 60.37 pc growth and have shown 10.51 pc average establishment expenditure. Whereas, public sector banks have shown 0.15 pc decline and have the highest average establishment expenditure i.e. 19.36 pc among all the bank groups although they were trying to bring down establishment expenditure.

Overall, all scheduled commercial banks have shown 1.37 pc decline and have 16.94 pc average share of establishment expenditure in total expenditure.

Table 7: Establishment Expenditure as Percentage of Total Expenditure – X₇
(Per cent)

Bank Group	1998-99	1999-2000	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	Average	S.D.	C.V. (%)	Overall Growth
G-I	19.59	19.22	21.19	18.21	18.19	18.75	20.46	19.26	19.36	1.05	5.42	-1.68
G-II	19.70	18.91	21.08	16.36	16.72	18.05	18.83	20.14	18.72	1.63	8.71	2.23
PSBs (G-I+II)	19.63	19.07	21.15	17.51	17.63	18.52	19.87	19.60	19.12	1.22	6.38	-0.15
G-III	12.97	13.34	12.10	11.85	12.91	13.79	14.21	15.90	13.38	1.29	9.64	22.59
G-IV	3.06	3.37	3.64	4.74	4.39	5.87	7.79	8.19	5.13	1.97	38.40	167.65
IPSBs (G-III+IV)	9.71	9.61	8.31	8.44	7.35	8.68	10.17	10.41	9.09	1.05	11.55	7.21

G-V	8.58	9.28	8.95	9.79	10.15	11.20	12.35	13.76	10.51	1.80	17.13	60.37
ASCBs	17.54	17.13	18.52	15.63	15.23	16.50	17.69	17.30	16.94	1.10	6.49	-1.37
Average	12.78	12.82	13.39	12.19	12.47	13.53	14.73	15.45				
S.D.	7.18	6.71	7.69	5.36	5.51	5.29	5.09	4.80				
C.V. (%)	56.18	52.34	57.43	43.97	44.19	39.10	34.56	31.07				

Source: Performance Highlights, Various Issues, 1998-99 to 2005-06

Spread as Percentage of Total Assets (X_8):

Table 8 shows fluctuating trend in spread ratio of all bank groups. Old private sector banks have the highest growth in spread level i.e. 34.31 pc as overall private sector banks witnessed the highest growth of 15.58 pc in spread level whereas the growth was the least in foreign banks i.e. 9.32 pc but having the highest level of average spread i.e. 3.48 pc. Variations were the highest in new private sector banks i.e. 17.37 pc as these banks were highly competitive even then this group has the least average spread level (1.90 pc). Nationalized banks have recorded 9.47 pc growth with 2.86 pc average spread during the study period whereas it was the least in new private sector banks i.e. 1.90 pc only.

Table 8: Spread as Percentage of Total Assets – X_8

(Per cent)

Bank Group	1998-99	1999-2000	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	Average	S.D.	C.V. (%)	Overall Growth
G-I	2.64	2.66	2.90	2.74	3.00	3.06	3.02	2.89	2.86	0.16	5.59	9.47
G-II	2.73	2.76	2.79	2.71	2.77	2.83	3.06	3.08	2.84	0.15	5.28	12.82
PSBs (G-I+II)	2.67	2.70	2.86	2.73	2.91	2.98	3.04	2.96	2.86	0.14	4.90	10.86
G-III	2.04	2.33	2.51	2.33	2.45	2.56	2.66	2.74	2.45	0.22	8.98	34.31
G-IV	1.91	1.95	2.14	1.18	1.70	1.98	2.18	2.15	1.90	0.33	17.37	12.57
IPSBs (G-III+IV)	1.99	2.16	2.33	2.19	1.97	2.18	2.33	2.30	2.18	0.14	6.42	15.58
G-V	3.22	3.92	3.63	3.22	3.36	3.60	3.34	3.52	3.48	0.24	6.90	9.32
ASCBs	2.65	2.73	2.85	2.57	2.78	2.89	2.93	2.86	2.78	0.12	4.32	7.92
Average	2.51	2.72	2.79	2.44	2.66	2.81	2.85	2.88				
S.D.	0.54	0.74	0.55	0.77	0.63	0.60	0.45	0.50				
C.V. (%)	21.51	27.21	19.71	31.56	23.68	21.35	15.79	17.36				

Source: Performance Highlights, Various Issues, 1998-99 to 2005-06

Burden as Percentage of Total Assets (X_9):

Table 9 shows fluctuating trend in burden of all bank groups during the study period. Burden as percentage of total assets has increased in case of private sector banks while public sector banks and foreign banks succeeded to bring down the level of burden. Like spread, burden was also grown at the highest rate i.e. 40.13 pc in case of old private sector banks that reflected their poor

performance as increasing burden contributed to decrease in profitability. It is interesting to note that burden has increased at 27.47 pc rate in new private sector banks also but even recorded the lowest level of average burden i.e. 1.03 pc that has shown this group was maintaining balance between its non-interest income and expenditure. Public sector banks have shown 7.05 pc decline even recorded the highest level of average burden i.e. 2.08 pc. Overall, it has increased from 1.85 pc to 1.93 pc during the study period as all scheduled commercial banks witnessed 9.68 pc decline in burden.

Overall, average burden level was still high in public sector banks but still they are trying to bring down their burden by 10.04 pc but private sector banks have shown increase mainly contributed by old private sector banks with 40.13 pc growth, reflected its poor performance.

Table 9: Burden as Percentage of Total Assets – X_9

Bank Group	(Per cent)											
	1998-99	1999-2000	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	Average	S.D.	C.V. (%)	Overall Growth
G-I	2.29	2.12	2.43	1.97	2.01	1.88	2.11	2.06	2.11	0.18	8.53	-10.04
G-II	2.24	1.93	2.18	1.88	1.85	1.81	2.16	2.22	2.03	0.18	8.87	-0.89
PSBs (G-I + II)	2.27	2.05	2.33	1.93	1.95	1.85	2.13	2.11	2.08	0.17	8.17	-7.05
G-III	1.57	1.42	1.81	1.25	1.29	1.40	2.46	2.20	1.68	0.45	26.79	40.13
G-IV	0.91	0.93	1.25	0.72	0.80	1.42	1.01	1.16	1.03	0.24	23.30	27.47
IPSBs (G-III+IV)	1.33	1.20	1.53	0.91	0.98	1.41	1.48	1.43	1.28	0.23	17.97	7.52
G-V	2.24	2.38	2.40	1.75	1.77	1.99	2.05	1.99	2.07	0.25	12.08	-11.16
ASCBs	2.17	1.97	2.24	1.74	1.77	1.78	2.00	1.96	1.95	0.19	9.74	-9.68
Average	1.85	1.76	2.01	1.51	1.54	1.70	1.96	1.93				
S.D.	0.60	0.58	0.49	0.52	0.49	0.27	0.55	0.44				
C.V. (%)	32.43	32.95	24.38	34.44	31.82	15.88	28.06	22.80				

Current Deposits as Percentage of Total Deposits (X_{10}):

Table 10 shows the decreasing trend in a share of current deposits from total deposits in all bank groups except new private sector banks and foreign banks till 2004-05 and then recorded increase but in case of new private sector banks, it has decreased in 2005-06 whereas in case of foreign banks, it has shown increasing trend through out all the years under study. It is observed that average share of current deposits in total deposits was the highest i.e. 24.36 pc in foreign banks and recorded an excellent growth of 72.69 pc. Similarly, private sector banks have shown increase in current deposits' share whereas all public sector banks and overall scheduled commercial banks recorded decrease. Average share of current deposits was the highest in foreign banks i.e. 24.36 pc followed by SBI Group with 15.74 pc average share whereas it was the least in old private sector banks i.e. 10.54 pc. Overall, average current deposits share has increased from 15.16 pc in 1998-99 to 16.97 pc in 2005-06 and variations were also the highest in 2005-06 i.e. 58.04 pc in terms of C.V.

Table 10: Current Deposits as Percentage of Total Deposits – X_{10}

Bank Group	(Per cent)											
	1998-99	1999-2000	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	Average	S.D.	C.V. (%)	Overall Growth
G-I	12.00	11.86	11.09	10.65	10.21	9.78	9.63	10.13	10.67	0.91	8.53	-15.58
G-II	17.89	17.72	16.18	15.17	14.48	14.62	14.09	15.74	15.74	1.45	9.21	-12.02
PSBs (G-I+II)	14.03	13.90	12.94	12.29	11.76	11.49	11.22	12.04	12.46	1.07	8.59	-14.18
G-III	11.93	13.17	10.37	10.09	9.31	9.23	9.80	10.40	10.54	1.36	12.90	-12.82
G-IV	14.28	17.15	14.34	13.81	12.75	18.25	17.52	14.58	15.34	2.01	13.10	2.10
IPSBs (G-III+IV)	12.75	14.87	12.21	12.04	11.23	14.32	14.51	13.29	13.15	1.32	10.04	4.24
G-V	19.70	21.67	20.08	21.10	20.89	27.23	30.18	34.02	24.36	5.42	22.25	72.69
ASCBs	14.24	14.44	13.25	12.73	12.14	12.75	12.68	13.46	13.21	0.80	6.06	-5.48
Average	15.16	16.31	14.41	14.16	13.53	15.82	16.24	16.97				
S.D.	3.51	3.91	3.96	4.42	4.60	7.37	8.45	9.85				
C.V. (%)	23.15	23.97	27.48	31.21	34.00	46.59	52.03	58.04				

Source: Performance Highlights, Various Issues, 1998-99 to 2005-06

Overall, all scheduled commercial banks have shown 13.21 pc average share of current deposits but recorded decline of 5.48 pc which was mainly due to the highest decline in current deposits of foreign banks and public sector banks. There should be more efforts to attract more current deposits because it contributes healthy share in earnings of the banks with negligible cost.

Fixed Deposits as Percentage of Total Deposits (X_{11}):

Table 11 shows declining trend in share of fixed deposits of all bank groups. Foreign banks have recorded the highest decline i.e. 31.79 pc in its share of fixed deposits' share and witnessed 62.98 pc average fixed deposits. Nationalized banks have recorded the least decline i.e. 4.16 pc as overall public sector banks witnessed 5.22 pc decline in its fixed deposits' share in total deposits. Average share of fixed deposits was the highest in old private sector banks i.e. 75.54 pc whereas it was the least i.e. 61.43 pc in SBI Group. Overall, fixed deposits share in total deposits was the highest in private sector banks and foreign banks recorded decline in fixed deposits at the highest rate i.e. 31.79 pc. Overall, average share of fixed deposits has decreased from 71.90 pc to 61.57 pc during the study period whereas variations were the highest in 2005-06 i.e. 14.52 pc.

Table 11: Fixed Deposits as Percentage of Total Deposits – X_{11}

Bank Group	(Per cent)											
	1998-99	1999-2000	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	Average	S.D.	C.V. (%)	Overall Growth
G-I	64.24	64.05	64.60	64.54	63.78	63.24	62.93	61.57	63.62	1.02	1.60	-4.16
G-II	61.17	60.74	63.36	63.49	63.03	60.85	62.21	56.60	61.43	2.25	3.66	-7.47
PSBs (G-I+II)	63.18	62.90	64.15	64.16	63.51	62.40	62.67	59.88	62.86	1.36	2.16	-5.22

G-III	80.56	78.87	75.77	75.21	75.73	74.90	71.97	71.29	75.54	3.11	4.12	-11.51
G-IV	80.99	76.40	76.39	76.87	76.46	67.27	68.86	68.93	74.02	4.96	6.70	-14.89
IPSBs (G-III+IV)	80.71	77.81	76.05	76.08	76.14	70.60	70.07	69.66	74.64	4.06	5.44	-13.69
G-V	72.53	68.84	70.42	67.52	66.14	56.90	52.01	49.47	62.98	8.87	14.08	-31.79
ASCBs	65.58	65.04	66.03	66.02	65.57	63.44	63.43	61.28	64.55	1.68	2.60	-6.56
Average	71.90	69.78	70.11	69.53	69.03	64.63	63.60	61.57				
S.D.	9.11	7.78	6.07	6.16	6.56	6.86	7.66	8.94				
C.V. (%)	12.67	11.15	8.66	8.86	9.50	10.61	12.04	14.52				

Source: Performance Highlights, Various Issues, 1998-99 to 2005-06

Overall, fixed deposits' share was 64.55 pc in all scheduled commercial banks but recorded decline of 6.56 pc. The banks should mobilize fixed deposits at large from the public with some attractive and customer friendly benefits.

Saving Deposits as Percentage of Total Deposits (X_{12}):

Table 12 shows increasing trend in saving deposits' share from total deposits of all bank groups except, foreign banks witnessed decline in 2005-06. Share of saving deposits of new private sector banks reflected an excellent growth i.e. 248.63 pc along with the highest variations i.e. 39.71 pc but the average share of saving deposits was the least (10.93 pc) in this bank group. Foreign banks were following with 98.92 pc growth Overall, average saving deposits have increased from 14.51 pc in 1998-99 to 21.45 pc in 2005-06 but variations were the highest in 1998-99 i.e. 55.69 pc. All scheduled commercial banks recorded 21.97 pc growth in its share of saving deposits whereas average saving deposits were 22.43 pc.

Overall, share of saving deposits was the highest in public sector banks but growth was recorded the highest in new private sector banks i.e. 248.63 pc. Hence, new private sector banks were gaining momentum in saving deposits share with attractive and competitive marketing strategies.

Table 12: Saving Deposits as Percentage of Total Deposits – X_{12}

(Per cent)

Bank Group	1998-99	1999-2000	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	Average	S.D.	C.V. (%)	Overall Growth
G-I	23.76	24.10	24.31	24.81	26.05	26.98	27.37	28.29	25.71	1.70	6.61	19.07
G-II	20.94	21.54	20.46	21.33	22.48	24.53	24.96	27.66	22.99	2.50	10.87	32.09
PSBs (G-I+II)	22.79	23.21	22.91	23.55	24.76	26.11	26.51	28.08	24.74	1.97	7.96	23.21
G-III	14.83	15.22	13.86	14.70	14.96	15.87	16.60	18.30	15.54	1.38	8.88	23.40
G-IV	4.73	6.46	9.27	9.32	10.79	14.48	15.89	16.49	10.93	4.34	39.71	248.63
IPSBs (G-III+IV)	11.31	11.47	11.73	11.87	12.63	15.08	16.17	17.05	13.41	2.32	17.30	50.75
G-V	8.30	9.83	9.50	11.38	12.97	15.87	17.95	16.51	12.79	3.62	28.30	98.92
ASCBs	20.71	21.05	20.72	21.25	22.30	23.81	24.34	25.26	22.43	1.80	8.02	21.97

Average	14.51	15.43	15.48	16.31	17.45	19.55	20.55	21.45	
S.D.	8.08	7.49	6.70	6.58	6.52	5.76	5.24	6.01	
C.V. (%)	55.69	48.54	43.28	40.34	37.36	29.46	25.50	28.02	

Source: Performance Highlights, Various Issues, 1998-99 to 2005-06

Total Credit as Percentage of Total Deposits (X_{13}):

Table 13 shows increasing trend in share of credits from total deposits of public sector banks while it was fluctuating in private and foreign banks. Overall, C-D ratio has improved in all the bank groups during the study period.

Table 13: Total Credit as Percentage of Total Deposits (C-D Ratio) – X_{13}

Bank Group									(Per cent)			
	1998-99	1999-2000	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	Average	S.D.	C.V. (%)	Overall Growth
G-I	44.95	46.74	48.34	51.10	52.32	51.92	57.32	64.69	52.17	6.33	12.13	43.92
G-II	49.44	50.43	48.18	46.87	48.39	50.94	56.31	68.49	52.38	7.11	13.57	38.53
PSBs (G-I+II)	46.50	47.76	48.28	49.57	50.89	51.46	56.90	65.98	52.17	6.42	12.31	41.89
G-III	49.66	50.14	51.87	49.97	54.07	52.83	58.21	63.82	53.82	4.92	9.14	28.51
G-IV	49.38	47.46	47.96	61.93	77.34	70.97	78.39	77.37	63.85	13.94	21.83	56.68
IPSBs (G-III+IV)	49.57	49.04	50.06	53.27	67.07	63.55	70.53	73.19	59.54	10.13	17.01	47.65
G-V	63.07	72.21	72.67	75.39	75.27	75.59	87.18	85.77	75.89	7.69	10.13	35.99
ASCBs	47.83	49.50	49.88	53.69	54.55	54.71	60.66	68.47	54.91	6.80	12.38	43.15
Average	51.30	53.40	53.80	57.05	61.48	60.45	67.48	72.03				
S.D.	6.87	10.64	10.67	11.72	13.71	11.84	14.33	9.37				
C.V. (%)	13.39	19.93	19.83	20.54	22.30	19.59	21.24	13.01				

Source: Performance Highlights, Various Issues, 1998-99 to 2005-06

The growth in C-D ratio was the highest (56.68 pc) in new private sector banks and nationalized banks followed with 43.92 pc growth rate but witnessed the least average C-D ratio i.e. 52.17 pc among all bank groups, whereas old private sector banks witnessed the least growth rate i.e. 28.51 pc. Average C-D ratio was the highest i.e. 75.89 pc in foreign banks. All scheduled commercial banks with 54.91 pc average C-D ratio recorded 43.15 pc growth. The level of credits in deposits was improving in all bank groups as all bank groups have their credit level above 50 pc of their deposits where new private sector banks were putting much efforts and gained momentum share in credit market as foreign banks also have an excellent amount of C-D ratio i.e. 75.89 pc, a sign of their proper credit disbursement policy.

Overall, it is concluded that new private sector banks and foreign banks have better performance in most of the selected factors as spread, profitability, cost, deposits, C-D ratio etc but public sector banks although following these bank groups with improved profitability, priority sector advances, decreasing non-performing assets but still witnessing overall decline in their performance in terms of continues deterioration in profitability.

CORRELATION CO-EFFICIENT AMONG PROFITABILITY AND ITS DETERMINANTS

From the ongoing analysis, it is observed that a majority of the banks have recorded continuous deterioration in their profitability. There are some factors which affect the profitability at large. Hence, there is a need to examine the factors that affect the profitability positively and negatively. 12 prime determinants, studied in the last part, have their impact on profitability either positively or negatively. Here an attempt is made to study the correlation between profitability and these determinants separately so that it is possible to identify factors contributing to profitability or decline.

G-I (Nationalized Banks):

Table 14 shows the co-efficient correlation between profitability of nationalized banks and its selected 12 determinants. Profitability has significant and positive correlation with X_6 (non-interest income as percentage of total income) at 1 pc significant level, X_8 (spread as percentage of total assets) and X_{12} (saving deposits as percentage of total deposits) at 5 pc significant level that means increase in saving deposits, non-interest income and spread lead to increase in profitability. Correlation was significant but negative between profitability and X_4 (net non-performing assets as percentage of net advances) at 5 pc significant level, X_5 (interest income as percentage of total income), X_9 (burden as percentage of total assets) and X_{10} (current deposits as percentage of total deposits) at 1 pc level of significance that means increase in these factors lead decrease in profitability. In case of other factors, it was insignificant.

From this table, it also emerges that few independent variables also have significant correlation with other independent variables. X_2 (rural branches as percentage of total branches) have significant correlation with number of variables like X_3 , X_4 , X_{10} , X_{11} , X_{12} & X_{13} at 1 pc significant level except X_{10} which was significant at 5 pc level and among these X_{12} (saving deposits as percentage of total deposits) has the highest (-0.982) correlation. Similarly, X_3 has significant correlation with X_4 , X_{10} , X_{11} & X_{13} where X_4 (net non-performing assets as percentage of net advances) has the highest correlation (-0.955) that means non-performing assets have the highest impact on priority sector advances. In the same way, X_{13} has significant correlation with X_2 , X_3 , X_4 , X_{11} and X_{12} at 1 pc level and X_{10} at 5 pc significant level, where X_2 (rural branches as percentage of total branches) has high correlation (-0.973).

Hypothesis Testing:

It is evident from table 14 that hypothesis (profitability has insignificant correlation with its selected factors/variables) was rejected as it has significant correlation with X_4 , X_5 , X_6 , X_8 , X_9 , X_{10} and X_{12} .

G-II (SBI Group):

Table 15 exhibits that profitability of G-II is significantly and positively correlated with only X_6 (non-interest income as percentage of total income) at 5 pc significant level whereas significantly but negatively correlated with X_4 , X_5 and X_{10} at 5 pc significant level where correlation with X_4 (net non-performing assets to net advances) was the highest (-0.806). It has positive but insignificant correlation with X_3 , X_8 , X_{12} and X_{13} whereas insignificant and negative correlation with X_2 , X_7 & X_9 . It is observed that profitability of SBI group was affected negatively by number of variables where non-performing assets were affecting the profitability at the highest that contributed to increase in profitability.

Among the independent variables X_2 has significant correlation with X_4 , X_8 , X_{10} and X_{12} where X_4 (net non-performing assets as percentage of net advances) has the highest correlation (-0.967). Similarly, X_3 has significant correlation with X_8 , X_{11} , X_{12} and X_{13} and among these, X_{13} (credit to deposits ratio) has the highest correlation i.e. 0.914. In the same way, X_2 , X_3 , X_4 , X_8 and X_{11} have significant correlation with X_{12} (saving deposits as percentage of total deposits) and X_3 (priority sector advances as percentage of total advances) have shown the highest and positive correlation i.e. 0.892.

Hypothesis Testing:

Table 15 shows that hypothesis regarding the correlation between profitability and selected variables were rejected in some cases as profitability has significant correlation with X_4 , X_5 , X_6 and X_{10} while it has been accepted in case of correlation with other variables because correlation is insignificant.

G-III (Old private sector banks):

Table 16 shows that profitability of old private sector banks was significantly and positively correlated with only one variable i.e. X_6 (non-interest income as percentage of total income) i.e. 0.899 at 1 pc level of significance whereas it has significant but negative correlation with X_5 (-0.899) and X_9 (-0.848) at 1 pc significant level. It is insignificantly in case of other factors that means profitability of old private sector banks was deteriorating because of negative effect of most of the variables like spread, current deposits, saving deposits and credits.

Among the independent variables, X_2 has significant correlation with X_3 , X_4 , X_8 , X_{10} and X_{11} where X_{10} (current deposits as percentage of total deposits) has the highest and positive correlation. Similarly, X_4 has significant correlation with X_7 , X_8 , X_{11} , X_{12} and X_{13} at 1 pc significant level as X_{13} (credit to deposit ratio) witnessed the highest and negative correlation

(-0.889). In the same way X_{13} has significant correlation with X_4 , X_7 , X_8 , X_9 , X_{11} and X_{12} and X_{12} (saving deposits to total deposits) has the highest and positive correlation i.e. 0.892.

Hypothesis Testing:

Table 16 exhibits that hypothesis regarding the correlation between profitability and selected variables has been rejected in case of correlation between profitability and X_5 , X_6 and X_9 as have significant correlation while it was accepted in case of correlation with other variables because correlation is insignificant.

G-IV (New private sector banks):

Table 17 shows that profitability of new private sector banks have not significant correlation even with a single variable but still most of the variables are positively correlated with profitability such as X_3 , X_6 , X_7 , X_8 , X_9 , X_{10} , X_{12} and X_{13} whereas others have negative correlation that means profitability of new private sector banks was not significantly correlated with any of the selected variables.

Among the independent variables, X_3 (priority sector advances to total advances) has a significant correlation with X_4 , X_7 , X_{11} and X_{12} at 5 pc level of significant where X_7 (establishment expenditure to total expenditure) has the highest and positive correlation i.e. 0.860. X_5 (interest income to total income) has significant correlation with X_7 , X_{11} , X_{12} and X_{13} whereas X_{13} has the highest correlation (-0.933). Similarly, X_{11} , X_{12} & X_{13} have significant correlation with number of some other independent variables.

Hypothesis Testing:

From table 17 it is clear that hypothesis for insignificant correlation between profitability and selected variables, has been accepted because it has insignificant correlation with the selected variables.

G-V (Foreign banks):

Table 18 shows that profitability of foreign banks is significantly and positively correlated with X_6 (non-interest income as percentage of total income), X_{12} (saving deposits as percentage of total deposits) at 5 pc level of significant whereas it was significantly but negatively correlated with X_4 (net non-performing assets as percentage of net advances) and X_5 (interest income as percentage of total income) at 5 pc significant level. It was insignificantly correlated with the remaining variable where X_3 , X_7 , X_8 , X_{10} and X_{13} have positive correlation.

Among independent variables, except X_8 & X_9 all other variables have significant correlation at 1 pc significant level with number of other independent variables where X_3 has significant correlation with X_5 , X_6 , X_7 , X_{10} , X_{11} , X_{12} and X_{13} and X_{10} (current deposits to total deposits) has the highest and positive correlation (0.972). X_4 has significant correlation with X_5 , X_6 , X_7 , X_9 , X_{11} and X_{12} and X_5 and X_6 has the highest correlation i.e. 0.905 and -0.905 respectively.

Hypothesis Testing:

Table 18 exhibits that hypothesis has been rejected only in case of correlation between profitability and X_4 , X_5 , X_6 and X_{12} as have significant correlation while it was accepted in case of correlation with other variables.

Overall, profitability of foreign banks was highly affected by X_4 , X_5 , X_6 and X_{12} while other variables have little bit importance in profitability.

REGRESSION ANALYSIS

As correlation analysis shows only positive and negative effect of different variables on profitability but doesn't tell to what extent a particular variable can affect the profitability. Regression analysis helps in this context where R-square is calculated to estimate the extent of impact of independent variables on dependent variable. Table 19 shows that profitability of G-I is highly affected by X_5 (interest income to total income) and X_6 (non-interest income to total income) as X_5 has negative impact of 90 pc and X_6 has positive impact of 90 pc that means with the change of one unit of these variables, profitability will be changed by 90 pc. X_7 (establishment expenditure as percentage of total expenditure) has the least effect but negative as R-square is only 0.246.

In case of SBI group, X_4 (net non-performing assets as percentage of net advances) has the highest effect on its profitability but negative as reflected 0.656 value of R-square whereas X_{11} (fixed deposits to total deposits) was affecting the profitability negatively at the lowest rate i.e. only 5 pc.

Profitability of old private sector banks was highly effected by X_5 (interest income to total income) and X_6 (non-interest income to total income) having 81 pc effect in terms of R-square value (0.808) as X_5 was affecting the profitability negatively and X_6 was affecting it positively. X_8 (spread as percentage of total assets) has the least effect but negative that was only 1 pc.

Profitability of new private sector banks was highly and negatively affected by X_3 (priority sector advances to total advance) but still low that was 0.348 in terms of R-square

whereas it was affected by X_2 (rural branches as percentage of total branches) at the lowest rate i.e. 0.008 that means the profitability of new private sector banks was not affected by these determinants at significant rate.

Profitability of foreign banks was highly but negatively affected by X_5 (interest income to total income) and X_6 (non-interest income to total income) having 0.694 value in terms of R -square as X_5 have negative and X_6 has positive affect on profitability whereas X_8 (Spread as percentage of total assets) has the least but positive effect on profitability.

Table 19: Regression Analysis

Variables	G-I		G-II		G-III		G-IV		G-V	
	r	R ²	r	R ²	r	R ²	r	R ²	r	R ²
X_2	-0.674	0.454	-0.689	0.475	-0.189	0.036	-0.091	0.008	-	-
X_3	0.702	0.493	0.306	0.094	-0.477	0.227	0.590	0.348	0.409	0.167
X_4	-0.786*	0.618	-0.806*	0.656	0.198	0.039	-0.497	0.247	-0.782*	0.612
X_5	-0.949**	0.901	-0.787*	0.619	-0.899**	0.808	-0.453	0.205	-0.833*	0.694
X_6	0.949**	0.901	0.787*	0.619	0.899**	0.808	0.319	0.102	0.832*	0.692
X_7	-0.496	0.246	-0.527	0.278	-0.398	0.158	0.419	0.176	0.662	0.438
X_8	0.783*	0.613	0.423	0.179	-0.109	0.012	0.687	0.472	0.110	0.012
X_9	-0.841**	0.707	-0.597	0.356	-0.848**	0.719	0.492	0.242	-0.686	0.471
X_{10}	-0.874**	0.764	-0.710*	0.504	-0.315	0.099	0.467	0.218	0.552	0.305
X_{11}	-0.536	0.287	-0.222	0.049	0.165	0.027	-0.564	0.318	-0.657	0.432
X_{12}	0.783*	0.613	0.658	0.433	-0.357	0.127	0.497	0.247	0.745*	0.555
X_{13}	0.543	0.295	0.305	0.093	-0.393	0.154	0.517	0.267	0.637	0.406

Source: Computed from Table No. 4.13 to 4.17

Note: **Correlation is Significant at 0.01 level (2-tailed)

*Correlation is Significant at 0.05 level (2-tailed)

Overall, profitability was highly affected by X_5 , X_6 (nationalized banks, old private sector banks and foreign banks) and by X_4 (SBI Group) and X_3 (new private sector banks group) whereas spread and establishment expenditure have correlation with profitability but affected at the lowest rate. Important to note here is that the factors that affect the profitability at the highest have negative effect on it as interest income was one of them. Similarly, net non-performing assets also have negative correlation with profitability in almost all the banks and further contributed in profitability improvement. It reflected the efforts of the bank groups to bring down their non-performing assets level at the lowest. Other variables like establishment expenditure, burden etc. were affecting the profitability negatively and led to deterioration in profitability. Hence, it is concluded from these results that to have excellent profitability performance, banks need to have excellent performance in managing burden and establishment expenditure and to improve the level of their deposits along with best portfolio for investments.

From the foregoing analysis, it may be concluded that new private sector banks have gained momentum in rural branches' share and that of priority sector advances with the highest rate of increase although the average share was the highest in public sector banks. Foreign banks

have recorded the highest decline in non-performing assets, interest income and fixed deposits whereas the highest growth was witnessed in current deposits. But new private sector banks have the lowest level of non-performing assets (2.86 pc) and the highest level of non-interest income (26.04 pc) whereas the highest spread and total credits' share in total deposits was recorded by the foreign banks.

Overall, foreign banks and new private sector banks are gaining dominant positions with improved profitability more particularly due to the highest decline in non-performing assets although having large amount of establishment expenditure. These factors are affecting the profitability of all bank groups significantly where the most dominating factors are interest and non-interest income, non-performing assets and priority sector advances which affect the profitability at the highest rates.

IV

MAJOR ISSUES

- Less interest in fee-based activities by the public sector banks.
- High level of establishment expenditure in public sector banks.
- High level of burden in old private sector banks.
- Decreasing level of current deposits of public sector banks and old private sector banks.
- Decreasing fixed deposits of all bank groups except old private sector banks group.
- Deterioration in profitability of some commercial banks.

POLICY RECOMMENDATIONS

Although a lot of reforms have occurred in Indian banks, there is still a need to modify the policies of public sector banks and old private sector banks. At present, they are facing many internal and external challenges, which are hindering their performance, but these banks can convert the current challenges into opportunities with some modifications in accordance with the globalization and changes in the technology as financial markets, world over have become closely integrated. Customers can access their accounts anywhere anytime. Deregulation and liberalization has opened up new opportunities for banks but at the same time the pressure of competition has led to narrowing spreads, shrinking margins, consolidation and restructuring. In the wind of changes, sweeping across the world, the banks will need to be equipped to handle challenges. Therefore, some suggestions are given to improve the performance of such banks.

Cost Control:

Establishment expenditure which is the second largest item of the total expenditure of banks needs to be monitored regularly. High level of establishment expenditure in public sector banks is observed from the analysis. This is a major cause for reduction in their profitability; it is

mainly because of overstaffing and secondly their improper utilization. This expenditure may be reduced by putting proper control over manpower utilization. Human resources should be utilized properly to get optimum advantage because it is also possible to attain higher business volume with minimum staff, if utilized properly and thus establishment expenditure can be reduced and profitability can be improved for this purpose VRS should be introduced with some modifications.

Diversification of Services:

High level of burden has impacted the profitability of public sector banks and old private sector banks negatively. It is mainly because interest income and expenditure are decreasing continuously due to deregulation of interest rates whereas non-interest and expenditure is increasing because banks are now concentrating more towards fee based activities. But public sector banks and old private sector banks are split and dependent on deposits, advances and other interest bearing activities rather to opt for fee based activities. Hence, they have the highest level of burden and low level of spread. The banks should concentrate more towards diversification of their resources because there are a number of non-banking financial services such as consultancy services, merchant banking, ancillary services etc. which give handsome income to the banks. This is the only competitive strategy that new private sector banks and foreign banks are providing to the customers in innovative ways and facilitate them by providing every comfort money management, ticket reservation anywhere and anytime cash withdrawal, fee deposit and other bill payments etc; that is why they are now the leaders the bank market.

Deposit Mobilizations:

Current and fixed deposits are declining in the banks, which is not a sign of their sound liquidity. There is a need to explore the maximum potential for deposit with some attractive schemes and interest rates. Fixed deposits add to long term finance and make liquidity position sound; secondly, they contribute maximum to the profitability. Even new private sector banks and foreign banks have good share of fixed deposits while these are lower and decreasing in case of public sector banks and foreign banks. Hence, these banks need to put efforts to explore the maximum number of potentials.

Full Computerization:

New private sector banks and foreign banks are performing well with the help of advanced technologies and gaining a momentum in the market. Public sector banks should also require to be computerized their all branches and used latest technologies to serve the customers efficiently, it will help them to survive in the market with handsome income. For this purpose, they need technically experienced and learned staff. Therefore, they should provide training to the existing bank employees for bank technology, and then they can also hire some experts because technical

fault leads frustration which further motivates the people not to change. They should be prepared to adopt technologies in easy way.

Development of Rural Branches:

Public sector banks have the highest number of branches in the rural areas of India, but they all are not performing well, not affecting the profitability at significant rate, but still require to be developed properly with some new and attractive services and by creating employee-friendly environment. Rural area is a major part of India, so it demands development by making the rural branches efficient either through merger/acquisition or by making the individual branches strong enough to give profits rather than losses. For this purpose, rural people should also be made aware about the banking services and their benefits.

Besides all these, public sector banks and old private sector banks or in other sense poor performing banks should make effective efforts for efficient risk management, stress management, knowledge management, customer relationship management, entry in fee-based activities at large scale, concentrate more on retail banking, merchant banking, e-banking services with latest technology etc. These banks should adopt corporate governance along with merger and acquisition of weak banks with some other banks so that they can be made competitive in the local as well as global market. They should make their own competitive strategies in the light of international standards to compete with their counterparts efficiently. Public sector banks are the major and important part of Indian banking industry; hence they need to improve with the help of RBI and government who in turn should free them from regulatory bindings.

FUTURE AGENDA

No study is complete in itself; so the following areas can be explored for further study in this area of research:

- Comprehensive study of comparative profitability behaviour of all individual banks in urban, semi-urban and rural areas.
- Comprehensive study for SWOT analysis for banks with poor performance in profitability.
- Feasibility and viability of e-banks in rural areas and semi-urban areas.
- In-depth study for profitability analysis of banks at branch level.
- Profitability behaviour of banks in the post-merger and acquisition era.

CONCLUSION

India is now Asia's third largest economy and has the world's fourth largest foreign exchange reserves. Technology, competition and benchmarking to the best international practices have to be the driving force of India's development efforts. The country is making rapid strides in all these areas. Technology is getting upgraded rapidly and competition in the market place has become fierce. The vibrant IT industry is contributing immensely by providing information about latest technology and international business practices. Hence, all banks should adopt the latest technology with customer friendly and innovative products and services to explore the global opportunities.

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A NOTE ON NUMERICAL ESTIMATION OF SATO'S TWO-LEVEL CES PRODUCTION FUNCTION

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Abstract

A production function is the technical relationship between the output and the inputs used for turning out the produce manufactured by an efficient firm. A production function may take on various forms. The popular Cobb-Douglas production function assumes unitary and fixed elasticity of substitution between inputs and therefore is very unrealistic. The CES production function is more realistic, but, in view of the Uzawa-McFadden impossibility theorems, it cannot be legitimately used to incorporate more than two inputs. Sato's two-level (or multi-level) functions can suitably be used to circumvent these difficulties. However, Sato's functions are highly nonlinear and require very efficient methods of nonlinear estimation. This paper suggests such a method, which is based on evolutionary computation meta-heuristics such as the Particle Swarm and Differential Evolution optimization, and demonstrates that it works very well to fit the Sato's function.

Keywords: Sato's production function, evolutionary computation, nonlinear optimization, elasticity of substitution

INTRODUCTION

A production function is the technical relationship between the output and the inputs used for turning out the produce manufactured by an efficient firm. The simplest and most popular specification of the said technical relationship is the so-called Cobb-Douglas production function given as $Y = A(X_1^\alpha X_2^\beta)$, where, Y is the output and (X_1, X_2) are the inputs (often labor and capital, respectively) applied to raise the output. Given a sample of data (of $n \geq 4$ size, but better if larger) on Y and (X_1, X_2) , it is often required to fit the function $Y = A(X_1^\alpha X_2^\beta)$ to the data as best as possible and to estimate the parameters $(A, \alpha$ and $\beta)$ of the function. These parameters have a definite meaning. While A is interpreted as the scale parameter, α and β are interpreted as the elasticities of produce (Y) with respect to labor (X_1) and capital (X_2) respectively. In turn, the elasticity of the produce, Y , with respect to any input (say X_i) is defined as $\xi_{YX_i} = (\partial Y / \partial X_i) / (Y / X_i)$

or the ratio of the marginal productivity to the average productivity of the input concerned. Estimation of these parameters is straightforward. A logarithmic transformation of the Cobb-Douglas function, $Y = A(X_1^\alpha X_2^\beta)$, gives us $y = a + \alpha x_1 + \beta x_2$ where $y = \log(Y)$, $a = \log(A)$, $x_1 = \log(X_1)$ and $x_2 = \log(X_2)$. Linear (multiple) regression of y on (x_1, x_2) readily gives us the estimated values of parameters if the sample data satisfy the required conditions of estimation.

Arrow et al. (1961) generalized the Cobb-Douglas production function. This generalized production function is known as the Constant Elasticity of Substitution (CES) production function. The formal specification of CES production function is $Y = A[\delta X_1^{-\rho} + (1-\delta)X_2^{-\rho}]^{-1/\rho}$. In this specification, $0 < \delta < 1$ is called the distribution parameter, $-1 \leq \rho$ is called the substitution parameter and $0 \leq \rho$ is called the returns (to scale) parameter. The elasticity of substitution $\sigma = 1/(1+\rho)$ is a constant, depending on the substitution parameter, ρ . The elasticity of substitution, σ , is, in particular, unity for the Cobb-Douglas production function, when $\rho = 0$. For the L-shaped Leontief production function, where there is no substitution between inputs, $\sigma = 0$ (while ρ is very large). For $-1 \leq \rho < 0$ the elasticity of substitution is larger than unity. Thus, the Cobb-Douglas, the Leontief and the linear production functions are only the special cases of the CES production function for $\rho = 0$, $\rho \rightarrow \infty$ and $\rho = -1$ respectively (Intriligator, 1978).

Since the CES production function is nonlinear and not amenable to any simple transformation so as to make the estimation of its parameters amenable to linear regression analysis, Kmenta approximated the original CES specification by Taylor's expansion (around $\rho = 0$), and linearizing it by dropping the terms involving powers of ρ larger than unity (Kmenta, 1967, 1971). This approximation, known as Kmenta's approximation of the CES production function, is given as:

$$y = a + \rho \delta x_1 + \rho(1-\delta)x_2 - 0.5\rho^2\delta(1-\delta)[x_1 - x_2]^2$$

where, y , a , x_1 and x_2 are $\log(Y)$, $\log(A)$, $\log(X_1)$ and $\log(X_2)$ respectively. The parameters of Kmenta's approximation are amenable to estimation by linear regression analysis. From these estimated parameters one may get back the estimated values of the parameters of the original CES specification. This is not to say that the original CES function cannot be estimated directly (by nonlinear regression). However, due to its simplicity (and some sort of general bias of economists in favour of assuming $\rho \equiv 0$), Kmenta's approximation has received a wide acceptance.

SATO'S GENERALIZATION OF THE CES PRODUCTION FUNCTION:

Uzawa (1962) and McFadden (1962, 1963) proved that if the number of inputs (factors of production) is greater than two, it is impossible to obtain a functional form for a production function that has an arbitrary set of constant elasticities of substitution. Mathematical enunciations of these assertions are known as the impossibility theorems of Uzawa and McFadden. In view of this, Kazuo Sato (1967) generalized the CES production function by nesting the CES at two levels and augmenting the list of inputs to the output. Sato's two-level CES production function may be specified as:

$$Y = A \left[\{\delta_1 X_1^{-\beta_1} + (1-\delta_1) X_2^{-\beta_1}\}^{\beta_1/\beta_2} + \{\delta_2 X_3^{-\beta_2} + (1-\delta_2) X_4^{-\beta_2}\}^{\beta_1/\beta_2} \right]^{-1/\beta}$$

Symbolically, $Y = A[CES_1 + CES_2]^{\beta_1/\beta_2}$. In this specification, CES_1 may be close to the Leontief type (very little substitution between X_1 and X_2) function while CES_2 may be of the Cobb-Douglas type, etc. Then, at the higher level, they may be combined differently. Equally well, one may specify the models as $Y = A[\delta_3 CES_1^{-\beta_3} + (1-\delta_3) CES_2^{-\beta_3}]^{-1/\beta_3}$ and so on.

There are ample empirical evidences that suggest capital-skill complementarity (Griliches, 1969), or the wage differential between skilled and unskilled workers. It requires two types of labor (skilled and unskilled) to be separately dealt with in specifying the production function. To specify such models, the two-level CES production technology with capital, skilled labor and unskilled labor as inputs may be more suitable. Denoting X_1 as the skilled labour, X_2 as the unskilled labor, and X_3 as capital, we may define: $Y_1 = A_1 \{\delta_1 X_1^{-\beta_1} + (1-\delta_1) X_3^{-\beta_1}\}^{-1/\beta_1}$. At the second level, Y_1 may be combined with the unskilled labor, X_2 , to give $Y_2 = A_2 [\delta_2 Y_1^{-\beta_2} + (1-\delta_2) X_2^{-\beta_2}]^{-1/\beta_2}$. By substituting Y_1 into the last equation we get (Papageorgiou and Saam, 2005),

$$Y_2 = A_2 \left[\delta_2 A_1^{-\beta_2} [\delta_1 X_1^{-\beta_1} + (1-\delta_1) X_3^{-\beta_1}]^{\frac{\beta_2}{\beta_1}} + (1-\delta_2) X_2^{-\beta_2} \right]^{-1/\beta_2}$$

Such models cannot be linearized or approximated easily. Therefore, estimation of their parameters necessitates an application of nonlinear methods of optimization.

AN EXAMPLE OF SATO'S TWO-LEVEL CES PRODUCTION FUNCTION AND ITS ESTIMATION:

The data (table-1) on Y have been generated from (X_1, X_2, X_3, X_4) by the model given below.

The sample size, $n = 50$.

$$Y = A \left[\{\delta_1 X_1^{-\beta_1} + (1-\delta_1) X_2^{-\beta_1}\}^{\beta_1/\beta_2} + \{\delta_2 X_3^{-\beta_2} + (1-\delta_2) X_4^{-\beta_2}\}^{\beta_1/\beta_2} \right]^{-1/\beta}$$

where, $A = 200$, $\delta_1 = 0.6$, $\beta_1 = 0.5$, $\delta_2 = 0.3$, $\beta_2 = -0.17$, $\beta = 0.6$. No errors of equation have been introduced. All figures in the table have been rounded off to three places after decimal.

We estimated the parameters of Sato's 2-level production function (given above) by a

number of methods. The loss function, $\sum_{i=1}^{n=50} (Y_i - \hat{Y}_i)^2$, was minimized by five alternative methods, namely, (i) Hooke-Jeeves Pattern Moves (HJPM), (ii) Hooke-Jeeves-Quasi-Newton (HJQN), (iii) Rosenbrock-Quasi-Newton (RQN), (iv) Differential Evolution (DE), and (v) Repulsive Particle Swarm (RPS) methods of optimization. Of the five, the last two methods are population-based stochastic methods. Population-based stochastic methods are often successful at optimizing extremely nonlinear (often multi-modal) objective functions (Mishra, 2006-a and b). The parameters of Sato's 2-level production function so estimated by the said five methods are presented in Table-2.

INTRODUCTION OF ERRORS OF EQUATION AT THE SECOND LEVEL:

For experiment we generated Y from the model specified in the earlier section, using (X_1, X_2, X_3, X_4) presented in Table-3. The parameters are:

$$A = 200, \delta_1 = 0.6, \beta_1 = 0.5, \delta_2 = 0.3, \beta_2 = -0.17, \beta = 0.6$$

We added normally distributed errors $N(0,2)$ to Y (output at the highest level). All data pertaining to this experiment have been presented in table-3.

Once again, we estimated the model by the said five methods of estimation. We observe that all the five methods perform more or less equally well. The estimated parameters have been presented in Table-4.

INTRODUCTION OF ERRORS AS WELL AS OUTLIERS:

Once again we generated Y from the model specified before, using (X_1, X_2, X_3, X_4) presented in Table-5. The parameters are: $A = 200, \delta_1 = 0.6, \beta_1 = 0.5, \delta_2 = 0.3, \beta_2 = -0.17, \beta = 0.6$. We added normally distributed errors $N(0,2)$ to Y (output at the highest level). Additionally we generated five quantities within the range $(0, 500)$ randomly and added to randomly chosen observations on Y . All data pertaining to this experiment have been presented in table-5. It is well known that such perturbations amount to insertion of outliers in the dependent variable and cause a shift in the mean error. Further, such contamination affects the applicability and performance of the least squares method of estimation adversely.

We estimated the model by minimizing the least squares loss function, $\sum_{i=1}^{n=50} (Y_i - \hat{Y}_i)^2$. The results so obtained are presented in Table-6. The effects of presence of outliers in the data are

clearly observable on the estimated values of α , δ_1 , β_1 and β , being away from their true values. However, all the five methods are comparable at minimizing the loss.

Instead of minimizing the loss defined as $\sum_{i=1}^n (Y_i - \hat{Y}_i)^2$, we may minimize the sum of absolute deviations of the expected Y from the observed Y , that is, $\sum_{i=1}^n |Y_i - \hat{Y}_i|$. This is often referred as the Least Absolute Deviation (LAD) estimation. A large number of studies have indicated that the performance of LAD estimator is better than the least squares estimator in presence of outliers in the data (Dasgupta and Mishra, 2004).

There are two well-known algorithms to carry out estimation by minimization of the least absolute deviations of the expected Y from the observed Y . They are: (i) the method of Linear Programming (Charnes et al., 1955, Taylor, 1974), and (ii) the Fair-Schlossmacher algorithm (Fair, 1974; Schlossmacher, 1973). Both of them assume a linear model. However, the Sato's model is extremely nonlinear and therefore, these methods are not applicable to its estimation.

We have used the five methods of optimization (listed before) to carry out the LAD estimation. The results are presented in Table-7. We observe that the Hooke-Jeeves method (hybridized with pattern move as well as Quasi-Newton) does not perform well. The estimated parameters are far away from the true ones. The Rosenbrock-Quasi-Newton method of optimization works quite well. On the other hand, the Differential Evolution and the Repulsive Particle Swarm methods work extremely well and the parameters estimated by them are very close the true ones.

Estimation of service production function: an exercise on real life data:

Lindenberger (2003) defines the output (Q) of German sector "Market-Determined Services" (for the years 1960-1989) in terms of three factors; capital (K), labor (L) and energy (E). He derives energy-dependent relations by specifying technological boundary conditions for the elasticities of production, and then obtains production functions by integration. His functions belong to the LINEX (LINEar EXponential functions) family, derived by Kümmel (1982) and Kümmel et al. (1985). One of the (Lindenberger's) service production functions is defined as:

$Q = a_1 L \exp[a_2(3 - 2(L/K) - (LE/K^2)) + a_3 a_1^2(1 - (L/E))]$, such that the elasticities satisfy the restrictions: $\alpha = 2a_2(L/K)((E/K)+1) \geq 0$; $\gamma = a_3(a_1^2(L/E) - (LE/K^2)) \geq 0$; $\beta = 1 - \alpha - \gamma \geq 0$.

For the data given in Table-8, Lindenberger's production function (as specified above) has been estimated for two sub-periods separately (since Lindenberger observes a structural break in 1977-78). The estimation has been done by two methods of optimization, DE and RPS, and by each method Least Squares (LS) and Least Absolute Deviation (LAD) estimates of the

parameters (a_1 , a_2 and a_3), satisfying restrictions on the elasticity measure (for each year) have been obtained. Results are presented in Table-9. Figure-1 indicates that the structural break might have occurred sometime in 1975 or so.

FITTING OF SATO'S TWO-LEVEL PRODUCTION FUNCTION TO GERMAN SECTOR MARKET-DETERMINED SERVICES:

For various reasons, producers substitute a factor of production for others. However, substitutability of the one factor for the other is bound by technical considerations. Certain factors are complimentary to (rather than substitutes of) each other. In the present case of the German sector "Market-Determined Services", it may be interesting to investigate how the three factors of production (capital, labor and energy) combine with or substitute each other. For this purpose, we fit Sato's production function to the data given in Table-8. We have ignored any structural break pointed out before.

The crux of the problem is, however, to choose the schema of nesting. Nesting is basically an exercise in aggregation and therefore must satisfy the necessary conditions of aggregation so that the aggregate variable qualifies for being used to compute substitution elasticities (Leontief, 1947, Fisher, 1993; Felipe & Fisher, 2001). We observe that the coefficients of correlation $r(K,L) = -0.87$, $r(K,E) = 0.76$ and $r(L,E) = -0.88$ in the data given in Table-8. The partial correlation coefficients are: $r_{KL.E} = -0.6565$; $r_{KE.L} = -0.02440$; $r_{LE.K} = -0.67812$. Thus, capital and energy may be more suitably clubbed together.

However, we carry out nesting in three alternative ways: $M[(K,E),L]$, in which K and E are aggregated in the manner of CES and makes a composite input. We will denote it by $M[(1,3),2]$. Similarly, $M[(K,L),E]$ and $M[(L,E),K]$ would be denoted by $M[(1,2),3]$ and $M[(2,3),1]$ respectively. Further, we will use two models: the one in which $\rho = 1$ and the other in which ρ is free to take on any non-negative value. Thus we have:

$$Q = A \left[\delta_2 [\delta_1 X_a^{-\rho} + (1-\delta_1) X_b^{-\rho}]^{\frac{\rho}{1-\rho}} + (1-\delta_2) X_c^{-\rho} \right]^{\frac{1}{1-\rho}} ; \rho=1$$

$$Q = A \left[\delta_2 [\delta_1 X_a^{-\rho} + (1-\delta_1) X_b^{-\rho}]^{\frac{\rho}{1-\rho}} + (1-\delta_2) X_c^{-\rho} \right]^{\frac{1}{1-\rho}} ; \rho \text{ is free}$$

The symbolic X_a , X_b and X_c will be representing K, L or E as the schema of nesting suggests.

In the manner explained above, we have estimated the parameter of the Two-level Sato functions for Market-Determined Services. All estimations have been done by the LAD procedure and the sum of absolute deviations has been minimized by the RPS and the DE methods. The parameters so estimated are presented in Table-11 (RPS method) and Table-13 (DE method). The estimated output values for different models have been presented in Table-12

and Table-14. Graphical presentations [Fig.-2, Fig.-3 (RPS) and Fig.-4, Fig.-5 (DE)] also have been made. The DE performs slightly better than the RPS.

CONCLUSION:

When we have more than two inputs, fitting of two-level (or multi-level) CES production function or Sato's function would be legitimate and it will also perform better than the fitting of the simple CES function (that may be illegitimate to fit for obtaining elasticities of factor-substitution). It is easy to see that Sato's nested function can easily be generalized for multiple levels in order to deal with large number of inputs.

In real life we do not know the nature and magnitude of contamination of data originating from our survey (or collected from secondary sources) and whether outliers are present in the data or not. Nor can we have a clear idea on a correct nesting schema of different factors of production. Our experiments suggest that in any case the Least Absolute Deviation estimation based on population-based global optimization methods such as the Differential Evolution (Storn and Price, 1995) or the Particle Swarm (Eberhart and Kennedy, 1995) may work better than the more popularly used methods of nonlinear regression. Therefore, estimation of two or multi level CES production function may preferably be carried out by minimization of the sum of absolute deviations and such minimization should be attempted by the methods of global optimization.

Note: The FORTRAN codes of the program based on Differential Evolution and the Repulsive Particle Swarm methods to estimate the Sato's Production function may be downloaded from URL: <http://www.webng.com/economics/satoprog.txt>

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Table-1: Simulated Data of Sato's 2-Level CES Production Function $Y=f(X_1, X_2, X_3, X_4)$

Sl	Y	X_1	X_2	X_3	X_4	Sl	Y	X_1	X_2	X_3	X_4
1	2568.875	26.276	91.892	14.870	62.191	26	4185.272	66.557	76.261	58.552	64.967
2	1769.669	39.317	76.181	3.234	33.776	27	5215.146	62.830	92.276	88.190	98.656
3	3032.155	73.555	37.344	62.064	36.294	28	745.067	98.222	1.433	24.597	34.681
4	3166.279	59.184	28.457	38.090	72.427	29	2022.232	86.719	8.184	68.628	38.115
5	2158.898	91.753	98.675	66.274	9.566	30	1295.326	11.033	23.167	39.700	29.700
6	3486.665	60.934	79.510	28.653	56.322	31	2274.001	20.897	58.079	60.404	39.712
7	3600.447	80.059	73.456	20.206	60.132	32	2186.084	94.634	10.394	10.659	70.407
8	2185.430	78.940	32.452	84.255	13.463	33	1947.648	26.514	25.420	13.892	54.569
9	1897.939	22.477	13.698	79.898	56.104	34	656.971	2.388	23.208	17.753	97.646
10	224.915	17.541	0.306	43.969	61.059	35	3103.832	26.102	77.795	31.857	90.985
11	3793.914	70.638	74.296	10.032	91.525	36	3908.014	59.194	36.302	85.062	83.656
12	1930.118	58.862	29.444	46.911	16.469	37	438.510	36.378	65.362	64.772	0.374
13	2720.323	76.614	11.462	79.242	72.301	38	1370.139	19.296	12.406	0.778	93.011
14	2576.268	20.622	73.028	52.563	58.133	39	2040.781	51.064	69.283	56.126	13.204
15	2350.199	75.726	31.162	5.433	52.141	40	3913.082	74.094	25.726	87.516	93.556
16	1783.949	63.951	14.440	11.079	36.513	41	147.777	73.695	0.165	37.737	24.932
17	1773.103	19.362	87.558	51.086	18.495	42	1057.765	9.961	35.379	22.626	17.345
18	2919.148	51.198	40.730	83.600	35.030	43	178.722	0.434	46.496	75.067	31.943
19	2565.703	57.786	31.442	68.578	28.491	44	1274.565	16.053	8.832	8.511	71.580
20	3362.018	53.743	66.042	12.563	81.003	45	2382.314	52.883	73.080	62.534	17.488
21	2586.172	72.951	8.674	95.490	94.870	46	4558.196	42.121	95.337	92.929	99.543
22	585.069	9.816	5.060	42.021	6.583	47	4536.696	60.895	69.479	68.821	87.620
23	1745.456	61.312	8.621	99.919	21.929	48	1420.395	6.325	49.374	39.318	91.542
24	3495.859	32.301	96.443	87.947	59.694	49	3645.612	95.388	48.448	32.194	57.132
25	4693.787	66.639	62.591	75.796	91.453	50	1352.639	53.045	4.084	47.099	45.842

Table-2: Estimated Parameters of Sato's 2-Level CES Production Function

Method	A	δ_1	β_1	δ_2	β_2	β	Loss
HJPM	199.8385	0.599983	0.499798	0.300019	-0.170107	0.600422	0.2647
HJQN	199.8385	0.599981	0.499787	0.300020	-0.170106	0.600421	0.2653
RQN	200.0087	0.599993	0.499964	0.300001	-0.170012	0.599976	0.0928
DE	200.0000	0.600000	0.500000	0.300000	-0.170000	0.600000	0.4e-11
RPS	200.2410	0.600061	0.500979	0.299943	-0.169380	0.599396	1.0407

Optimization Methods: HJPM=Hooke-Jeeves Pattern Moves; HJQN=Hooke-Jeeves Quasi-Newton; RQN=Rosenbrock Quasi-Newton; DE=Differential Evolution; RPS=Repulsive Particle Swarm.

Table-3: Simulated Data of Sato's 2-Level CES Production Function $Y=f(X_1, X_2, X_3, X_4)$

Sl	Y	X_1	X_2	X_3	X_4	Sl	Y	X_1	X_2	X_3	X_4
1	1903.423	40.640	26.276	91.892	14.870	26	4470.175	91.453	66.557	76.261	58.552
2	1183.128	62.191	39.317	76.181	3.234	27	4726.950	64.967	62.830	92.276	88.190
3	3066.605	33.776	73.555	37.344	62.064	28	1585.638	98.656	98.222	1.433	24.597
4	2448.175	36.294	59.184	28.457	38.090	29	2713.325	34.681	86.719	8.184	68.628
5	4855.468	72.427	91.753	98.675	66.274	30	1658.498	38.115	11.033	23.167	39.700
6	1527.713	9.566	60.934	79.510	28.653	31	2333.070	29.700	20.897	58.079	60.404

7	2689.390	56.322	80.059	73.456	20.206	32	1242.910	39.712	94.634	10.394	10.659
8	4129.596	60.132	78.940	32.452	84.255	33	1613.757	70.407	26.514	25.420	13.892
9	1633.598	13.463	22.477	13.698	79.898	34	774.991	54.569	2.388	23.208	17.753
10	1309.395	56.104	17.541	0.306	43.969	35	2935.125	97.646	26.102	77.795	31.857
11	2025.191	61.059	70.638	74.296	10.032	36	4473.937	90.985	59.194	36.302	85.062
12	3415.342	91.525	58.862	29.444	46.911	37	3845.913	83.656	36.378	65.362	64.772
13	2185.764	16.469	76.614	11.462	79.242	38	79.187	0.374	19.296	12.406	0.778
14	2996.389	72.301	20.622	73.028	52.563	39	4110.150	93.011	51.064	69.283	56.126
15	1222.381	58.133	75.726	31.162	5.433	40	2173.410	13.204	74.094	25.726	87.516
16	1379.316	52.141	63.951	14.440	11.079	41	1497.740	93.556	73.695	0.165	37.737
17	2456.831	36.513	19.362	87.558	51.086	42	1281.619	24.932	9.961	35.379	22.626
18	2485.012	18.495	51.198	40.730	83.600	43	293.653	17.345	0.434	46.496	75.067
19	3016.364	35.030	57.786	31.442	68.578	44	827.824	31.943	16.053	8.832	8.511
20	1724.186	28.491	53.743	66.042	12.563	45	4048.398	71.580	52.883	73.080	62.534
21	3921.063	81.003	72.951	8.674	95.490	46	2591.249	17.488	42.121	95.337	92.929
22	1628.408	94.870	9.816	5.060	42.021	47	4690.477	99.543	60.895	69.479	68.821
23	1378.774	6.583	61.312	8.621	99.919	48	1757.240	87.620	6.325	49.374	39.318
24	2684.667	21.929	32.301	96.443	87.947	49	3442.878	91.542	95.388	48.448	32.194
25	4203.961	59.694	66.639	62.591	75.796	50	2240.162	57.132	53.045	4.084	47.099

Table-4: Estimated Parameters of Sato's 2-Level CES Production Function

Method	A	δ_1	β_1	δ_2	β_2	β	Loss
HJPM	200.6409	0.599964	0.501694	0.299676	-0.169270	0.598371	174.334
HJQN	200.7711	0.599987	0.501787	0.299662	-0.169173	0.598033	173.751
RQN	200.8801	0.600002	0.501856	0.299656	-0.169109	0.597749	173.751
DE	200.8802	0.600002	0.501856	0.299656	-0.169109	0.597749	173.751
RPS	200.9432	0.599936	0.501866	0.299690	-0.169138	0.597576	173.905

Optimization Methods: HJPM=Hooke-Jeeves Pattern Moves; HJQN=Hooke-Jeeves Quasi-Newton; RQN=Rosenbrock Quasi-Newton; DE=Differential Evolution; RPS=Repulsive Particle Swarm.

Table-5: Simulated Data of Sato's 2-Level CES Production Function $Y=f(X_1, X_2, X_3, X_4)$

SI	Y	X_1	X_2	X_3	X_4	SI	Y	X_1	X_2	X_3	X_4
1	3126.284	29.387	65.769	30.135	88.887	26	1355.925	18.340	66.759	35.498	12.155
2	1916.264	62.111	72.682	77.093	8.425	27	1331.975	53.449	11.297	86.738	18.756
3	4250.869	56.711	64.441	76.247	77.518	28	2639.034	31.893	22.555	48.296	86.780
4	4594.667	78.884	75.638	43.873	82.494	29	779.031	86.015	35.068	36.275	2.034
5	479.087	0.111	58.215	48.293	65.823	30	3204.431	85.731	96.080	4.906	64.716
6	2530.694	60.301	69.401	73.697	17.572	31	3441.778	44.140	82.392	97.094	41.035
7	4296.466	42.160	94.811	89.427	83.269	32	3328.444	72.362	64.863	37.914	43.719
8	538.657	94.770	19.194	62.236	0.670	33	1798.501	21.090	33.067	8.593	53.949
9	3591.214	43.897	57.347	49.009	77.931	34	4182.461	46.359	92.613	38.449	97.179
10	1538.131	26.509	57.673	7.457	25.688	35	3371.976	37.037	47.606	52.306	85.382
11	4431.791	87.017	90.906	62.283	55.547	36	2296.028	41.537	80.784	10.873	38.184
12	3553.142	72.734	36.486	64.308	57.471	37	2933.948	31.242	43.795	81.596	95.419
13	4496.723	66.055	79.095	80.072	68.583	38	2877.132	38.151	70.138	77.470	33.580
14	3105.294	90.849	27.841	49.406	45.872	39	842.871	4.247	23.259	1.337	98.684
15	2927.776	30.577	70.609	48.464	55.300	40	4255.249	80.077	92.304	33.129	68.038
16	5620.657	95.627	76.062	95.729	89.821	41	1786.216	10.060	48.025	97.605	53.409

17	2778.937	77.364	55.795	38.494	28.808	42	3356.732	42.004	71.345	50.035	58.110
18	2909.113	26.404	99.156	57.296	51.378	43	99.680	98.346	67.079	17.367	0.486
19	2176.618	92.603	93.211	25.838	16.135	44	1957.756	46.615	75.314	32.355	16.300
20	2387.999	64.265	40.374	63.862	19.804	45	1527.971	6.607	92.937	98.162	52.540
21	2844.089	44.071	86.190	20.500	47.288	46	2088.333	31.781	17.826	20.926	65.119
22	2649.409	99.227	69.774	25.597	25.617	47	608.940	2.378	28.199	47.796	32.986
23	1799.172	23.327	9.406	46.494	94.314	48	547.702	67.748	9.612	47.942	1.149
24	1346.823	47.435	35.783	87.784	4.659	49	3957.006	75.409	42.118	74.026	65.091
25	3553.580	37.893	85.430	71.538	60.364	50	1343.291	24.318	60.084	41.644	9.109

Table-6: Estimated Parameters of Sato's 2-Level CES Production Function

Method	A	δ_1	β_1	δ_2	β_2	β	Loss
HJPM	184.4451	0.581338	0.588389	0.295359	-0.170136	0.643227	533239
HJQN	184.9474	0.581341	0.589104	0.295334	-0.169657	0.641591	533236
RQN	184.9301	0.581341	0.589081	0.295335	-0.169673	0.641647	533236
DE	184.9302	0.581341	0.589081	0.295335	-0.169673	0.641646	533236
RPS	184.9264	0.581395	0.589352	0.295306	-0.169454	0.641656	533236

Optimization Methods: HJPM=Hooke-Jeeves Pattern Moves; HJQN=Hooke-Jeeves Quasi-Newton; RQN=Rosenbrock Quasi-Newton; DE=Differential Evolution; RPS=Repulsive Particle Swarm.

Table-7: Estimated Parameters of Sato's 2-Level CES Production Function

Method	A	δ_1	β_1	δ_2	β_2	β	Loss
HJPM	133.1354	0.599898	0.336873	0.296548	-0.245451	0.925873	2776.879
HJQN	133.1354	0.599898	0.336873	0.296548	-0.245451	0.925873	2776.876
RQN	188.1826	0.599007	0.488200	0.299934	-0.178878	0.633467	1614.677
DE	199.8043	0.599550	0.503443	0.299929	-0.168905	0.600506	1513.135
RPS	199.8776	0.599548	0.504552	0.299900	-0.168845	0.600338	1513.520

Optimization Methods: HJPM=Hooke-Jeeves Pattern Moves; HJQN=Hooke-Jeeves Quasi-Newton; RQN=Rosenbrock Quasi-Newton; DE=Differential Evolution; RPS=Repulsive Particle Swarm.

**Table-8: Output, Capital, Labour and Energy (Indices: Base=1960)
Pertaining to German Sector "Market-Determined Services" - 1960-1989**

Year	Output	Capital	Labour	Energy	Year	Output	Capital	Labour	Energy
1960	1000	1000	1000	1000	1975	1756	2795	843	2118
1961	1058	1082	1001	1061	1976	1840	2908	857	2279
1962	1108	1171	999	1279	1977	1930	3041	843	2244
1963	1149	1265	985	1505	1978	2015	3195	848	2400
1964	1250	1364	1004	1475	1979	2104	3373	853	2517
1965	1320	1478	992	1530	1980	2144	3575	865	2270
1966	1366	1599	988	1566	1981	2138	3778	857	2140
1967	1369	1720	953	1555	1982	2125	3963	856	1994
1968	1414	1824	940	1682	1983	2180	4127	843	2027
1969	1509	1934	926	1930	1984	2250	4308	846	2133
1970	1574	2057	921	1973	1985	2282	4486	834	2248
1971	1655	2195	932	2063	1986	2376	4659	838	2379
1972	1758	2342	925	2250	1987	2465	4837	840	2318
1973	1811	2505	912	2344	1988	2595	5026	861	2273
1974	1781	2675	882	2153	1989	2748	5256	878	2170

Source: Lindenberger, D. http://www.ewi.uni-koeln.de/ewi/content/e266/e283/e281/Ewiwp0302_ger.pdf, 2003. p.20.

Table-9.1: Estimated Parameters of Lindenberger Production Function For Period-1 (1960-1977)									
Least Absolute Deviation Estimation				Ordinary Least Squares Estimation				Coefficient & Elasticity	
Differential Evaluation		R Particle Swarm		Differential Evaluation		R Particle Swarm			
Coefficient	Elasticity	Coefficient	Elasticity	Coefficient	Elasticity	Coefficient	Elasticity		
0.98444153	0.097127	0.984526755	0.097127	1.00398064	0.088150	1.00447289	0.088150	a_1	α
0.24377507	0.507215	0.243766404	0.507216	0.24377507	0.489116	0.24372814	0.489116	a_2	β
1.04982963	0.395657	1.049883080	0.395657	1.04982963	0.422734	1.05016838	0.422734	a_3	γ
R^2 (DE) = 0.939167; R^2 (RPS) = 0.939164				R^2 (DE) = 0.939167; R^2 (RPS) = 0.939156					

Table-9.2: Estimated Parameters of Lindenberger Production Function For Period-2 (1978-1989)									
Least Absolute Deviation Estimation				Ordinary Least Squares Estimation				Coefficient & Elasticity	
Differential Evaluation		R Particle Swarm		Differential Evaluation		R Particle Swarm			
Coefficient	Elasticity	Coefficient	Elasticity	Coefficient	Elasticity	Coefficient	Elasticity		
0.41632090	0.010616	0.41654885	0.010616	0.31333566	0.022155	0.31468959	0.022155	a_1	α
0.67647403	0.913503	0.67626526	0.913503	0.79809593	0.947287	0.79637622	0.947287	a_2	β
0.66626212	0.075880	0.66637632	0.075880	0.59236766	0.030558	0.59324793	0.030558	a_3	γ
R^1 (DE)=0.86724; R^1 (RPS)=0.86727				R^2 (DE)=0.85059; R^2 (RPS)=0.85079					

Table-10: Empirical and Estimated Output, Capital, Labour and Energy (Indices: Base=1960) Pertaining to German Sector "Market-Determined Services" - 1960-1989					
Year	Output (Empirical)	Estimated Output (LAD)		Estimated Output (LS)	
		DE	RPS	DE	RPS
1960	1000.000	984.442	984.527	1003.981	1004.473
1961	1058.000	1061.452	1061.543	1082.519	1083.045
1962	1108.000	1139.257	1139.356	1161.868	1162.449
1963	1149.000	1206.711	1206.817	1230.662	1231.287
1964	1250.000	1287.267	1287.377	1312.816	1313.466
1965	1320.000	1357.279	1357.394	1384.218	1384.894
1966	1366.000	1424.714	1424.832	1452.991	1453.690
1967	1369.000	1461.218	1461.337	1490.220	1490.924
1968	1414.000	1499.578	1499.701	1529.342	1530.067
1969	1509.000	1535.126	1535.253	1565.595	1566.347
1970	1574.000	1574.000	1574.128	1605.241	1606.006
1971	1655.000	1629.414	1629.547	1661.755	1662.544
1972	1758.000	1666.690	1666.825	1699.770	1700.579
1973	1811.000	1694.042	1694.179	1727.666	1728.485
1974	1781.000	1687.491	1687.625	1720.985	1721.784
1975	1756.000	1655.044	1655.174	1687.894	1688.673
1976	1840.000	1697.206	1697.340	1730.892	1731.695
1977	1930.000	1694.822	1694.954	1728.460	1729.257
1978	2015.000	1990.675	1990.834	1948.893	1949.976
1979	2104.000	2060.285	2060.435	2025.229	2026.237
1980	2144.000	2144.000	2144.130	2123.978	2124.806
1981	2138.000	2192.444	2192.551	2187.508	2188.143
1982	2125.000	2232.817	2232.906	2240.367	2240.843
1983	2180.000	2255.816	2255.891	2271.604	2271.969
1984	2250.000	2306.220	2306.288	2326.788	2327.097

1985	2282.000	2330.152	2330.210	2356.872	2357.097
1986	2376.000	2376.000	2376.052	2406.254	2406.438
1987	2465.000	2408.461	2408.503	2445.877	2445.970
1988	2595.000	2473.966	2474.004	2516.432	2516.473
1989	2748.000	2532.341	2532.369	2582.498	2582.450

Table-11: Estimated Parameters of Sato Production Functions with Different Nesting For German Sector "Market-Determined Services" - 1960-1989 (RPS Method)

Model	A	δ_1	β_1	δ_2	β_2	ρ	R^2
M[(1,3), 2]	1.00001036	0.568035245	-0.507113532	0.610262062	-0.82042005	-	0.99065
M[(1,2), 3]	0.9998600	0.47067414	-0.75217065	0.72896991	-0.9983358	-	0.99160
M[(2,3), 1]	1.0001654	0.62247131	-0.99580462	0.63284852	-0.5961938	-	0.99074
M[(1,3), 2]	0.0071629	0.65312869	0.201809927	0.39424369	-0.4885967	1.713434	0.99506
M[(1,2), 3]	0.0113824	0.31307504	-0.38522739	0.86763721	-0.9973683	1.646839	0.99566
M[(2,3), 1]	0.0057898	0.86192909	-0.99083213	0.71398938	-0.1976769	1.744525	0.99582

Note: The Parameters δ and β may not be comparable across rows as they relate to different variables

Table-12: Estimated Output of Sato Production Functions with Different Nesting For German Sector "Market-Determined Services" - 1960-1989 [Estimated by R Particle Swarm]

Year	Empirical	M[(1,3), 2]	M[(1,2), 3]	M[(2,3), 1]	M[(1,3), 2]	M[(1,2), 3]	M[(2,3), 1]
1960	1000.000	1000.010	999.860	1000.165	989.444	992.546	991.374
1961	1058.000	1044.785	1044.765	1045.094	1040.363	1043.029	1043.248
1962	1108.000	1131.181	1133.124	1129.031	1126.527	1128.748	1123.689
1963	1149.000	1214.982	1220.240	1211.901	1200.120	1206.535	1195.342
1964	1250.000	1249.718	1252.507	1247.627	1261.993	1263.460	1260.306
1965	1320.000	1297.818	1300.020	1296.291	1310.126	1311.184	1309.763
1966	1366.000	1346.246	1347.503	1345.362	1365.930	1365.563	1367.360
1967	1369.000	1369.029	1369.004	1369.028	1367.936	1368.619	1370.398
1968	1414.000	1430.892	1431.131	1430.544	1423.436	1424.452	1424.624
1969	1509.000	1524.821	1527.211	1524.364	1506.645	1511.459	1507.885
1970	1574.000	1574.226	1575.395	1574.004	1560.429	1563.271	1562.142
1971	1655.000	1647.154	1647.672	1647.116	1655.387	1655.406	1658.529
1972	1758.000	1739.773	1740.971	1740.378	1749.988	1751.671	1755.952
1973	1811.000	1811.010	1811.019	1811.998	1819.076	1819.596	1826.125
1974	1781.000	1802.297	1797.920	1802.475	1788.850	1783.580	1790.070
1975	1756.000	1812.960	1807.172	1812.984	1758.701	1754.947	1757.169
1976	1840.000	1897.467	1891.426	1897.675	1867.766	1861.265	1868.386
1977	1930.000	1922.835	1915.594	1922.707	1882.671	1874.891	1881.219
1978	2015.000	2014.559	2006.476	2014.593	1991.581	1980.704	1991.914
1979	2104.000	2102.999	2093.846	2103.070	2099.948	2085.202	2101.618
1980	2144.000	2101.322	2092.930	2100.486	2121.600	2105.534	2119.838
1981	2138.000	2119.968	2114.246	2119.363	2132.014	2122.605	2131.382
1982	2125.000	2129.228	2129.008	2129.914	2136.613	2140.506	2142.381
1983	2180.000	2179.929	2180.021	2179.987	2175.303	2180.020	2178.757
1984	2250.000	2265.007	2263.512	2264.048	2279.094	2277.445	2279.520
1985	2282.000	2344.825	2340.959	2342.542	2355.124	2346.962	2350.315
1986	2376.000	2435.379	2429.116	2432.192	2469.445	2452.644	2462.059
1987	2465.000	2468.075	2465.603	2465.019	2506.480	2497.063	2501.169
1988	2595.000	2516.903	2519.203	2514.600	2593.010	2591.066	2594.006
1989	2748.000	2555.749	2566.970	2555.255	2655.236	2672.763	2668.247

Table-13: Estimated Parameters of Sato Production Functions with Different Nesting For German Sector "Market-Determined Services" - 1960-1989 [Estimated by Differential Evolution]							
Model	A	δ_1	β_1	δ_2	β_2	ρ	R^2
M[(1,3), 2]	1.0000000	0.5698514	-0.4866956	0.6098272	-0.8235084	-	0.99060
M[(1,2), 3]	1.0000000	0.4701859	-0.7540159	0.7289937	-1.0000000	-	0.99161
M[(2,3), 1]	1.0000000	0.6230672	-1.0000000	0.6320454	-0.5917516	-	0.99072
M[(1,3), 2]	0.0022075	0.7212857	0.9360296	0.3901159	-0.3497840	1.8806986	0.99503
M[(1,2), 3]	0.0030934	0.3340066	-0.1669982	0.8911314	-1.0000000	1.8313481	0.99629
M[(2,3), 1]	0.0033309	0.8808258	-1.0000000	0.6842986	-0.0296768	1.8217535	0.99619
Note: The Parameters δ and β may not be comparable across rows as they relate to different variables							

Table-14: Estimated Output of Sato Production Functions with Different Nesting For German Sector "Market-Determined Services" - 1960-1989 [Estimated by Differential Evolution]							
Year	Empirical	M[(1,3), 2]	M[(1,2), 3]	M[(2,3), 1]	M[(1,3), 2]	M[(1,2), 3]	M[(2,3), 1]
1960	1000.000	1000.000	1000.000	1000.000	968.265	964.899	972.352
1961	1058.000	1044.767	1044.883	1044.945	1023.365	1020.604	1027.818
1962	1108.000	1130.958	1133.227	1128.811	1108.000	1108.000	1108.000
1963	1149.000	1214.527	1220.333	1211.637	1177.361	1185.956	1178.909
1964	1250.000	1249.445	1252.577	1247.429	1251.237	1253.185	1250.646
1965	1320.000	1297.599	1300.067	1296.136	1303.877	1305.539	1303.931
1966	1366.000	1346.107	1347.527	1345.254	1366.000	1366.000	1366.000
1967	1369.000	1369.000	1369.000	1368.980	1369.000	1369.000	1371.505
1968	1414.000	1430.836	1431.120	1430.505	1423.627	1424.557	1425.467
1969	1509.000	1524.632	1527.208	1524.325	1501.033	1508.321	1505.575
1970	1574.000	1574.118	1575.380	1574.000	1558.615	1563.031	1561.983
1971	1655.000	1647.089	1647.651	1647.138	1660.183	1661.868	1661.569
1972	1758.000	1739.684	1740.955	1740.435	1753.458	1758.000	1758.000
1973	1811.000	1811.000	1811.000	1812.100	1822.986	1825.224	1828.005
1974	1781.000	1802.536	1797.870	1802.609	1795.216	1786.400	1793.562
1975	1756.000	1813.281	1807.119	1813.139	1756.000	1746.479	1756.000
1976	1840.000	1897.798	1891.382	1897.856	1869.023	1856.794	1867.900
1977	1930.000	1923.234	1915.545	1922.894	1882.108	1867.218	1879.671
1978	2015.000	2015.000	2006.437	2014.815	1992.802	1973.958	1989.586
1979	2104.000	2103.497	2093.815	2103.320	2104.000	2080.286	2099.186
1980	2144.000	2101.791	2092.879	2100.660	2133.804	2111.730	2124.435
1981	2138.000	2120.319	2114.200	2119.478	2138.000	2127.949	2135.963
1982	2125.000	2129.330	2128.972	2129.949	2134.079	2147.973	2148.333
1983	2180.000	2180.000	2180.000	2180.000	2164.923	2180.000	2180.000
1984	2250.000	2265.136	2263.503	2264.066	2270.295	2276.746	2278.873
1985	2282.000	2345.044	2340.967	2342.573	2341.242	2336.648	2343.211
1986	2376.000	2435.699	2429.138	2432.246	2458.306	2441.327	2452.704
1987	2465.000	2468.203	2465.641	2465.000	2488.623	2486.283	2491.272
1988	2595.000	2516.803	2519.251	2514.508	2576.768	2592.489	2589.127
1989	2748.000	2555.221	2567.040	2555.042	2630.481	2684.674	2667.436

Fig.-1: Graphical Presentation of Estimated Output of Lindenberg Model

Observed and Estimated German Sector "Market-Determined Services"

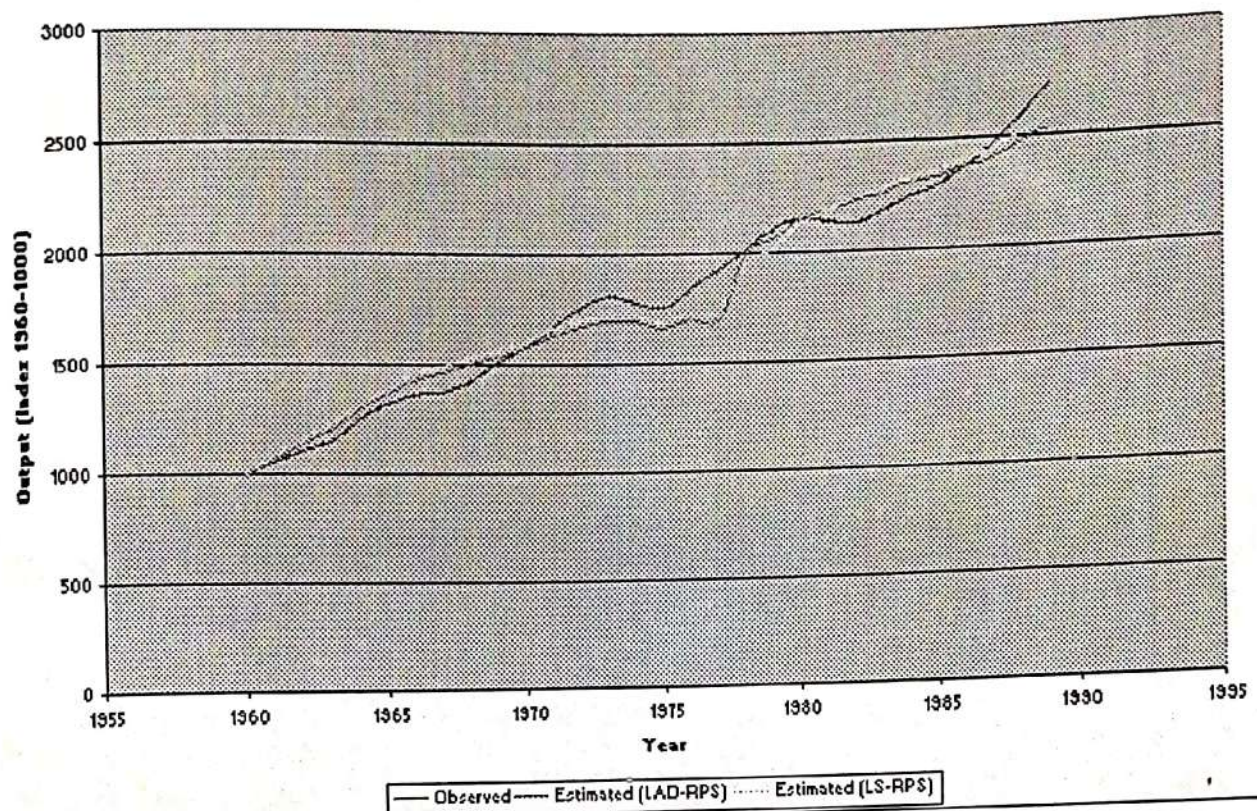


Fig.-2: Estimated Output of Sato Production Functions with Different Nesting For German Sector "Market-Determined Services" - 1960-1989 [Rho=1] [R Particle Swarm]

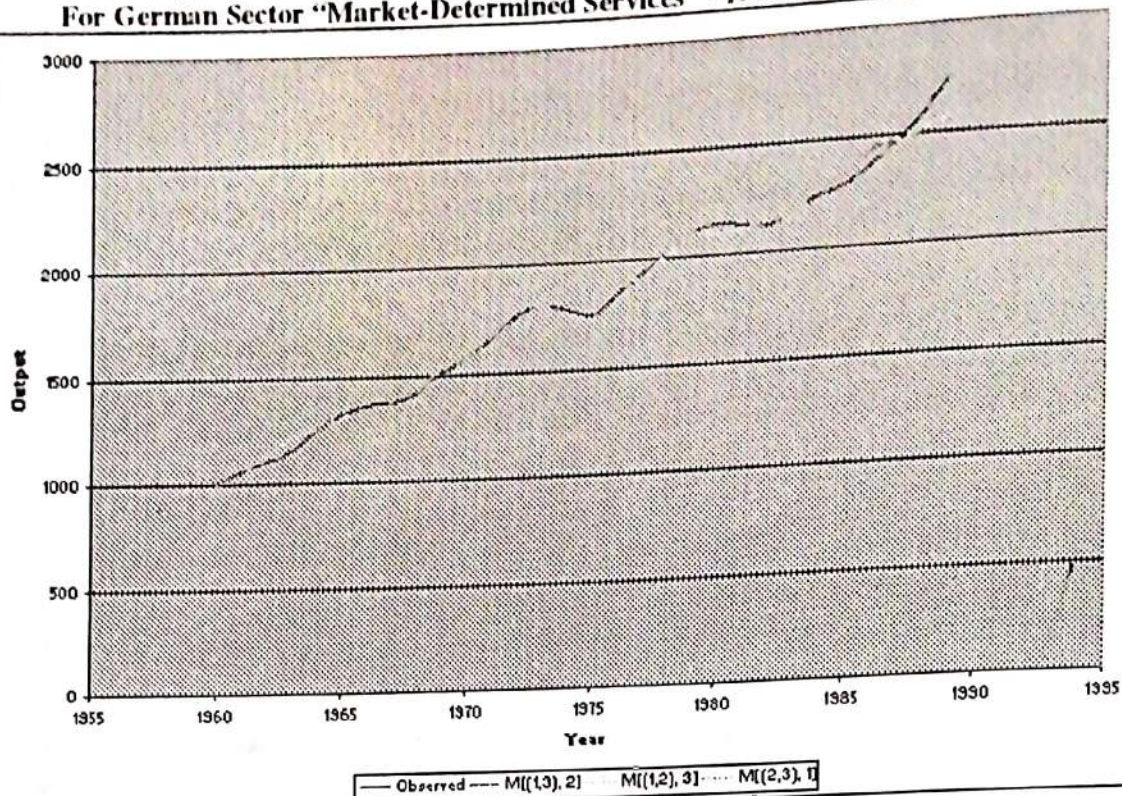


Fig.-3: Estimated Output of Sato Production Functions with Different Nesting For German Sector "Market-Determined Services" - 1960-1989 [Rho=Free] [R Particle Swarm]

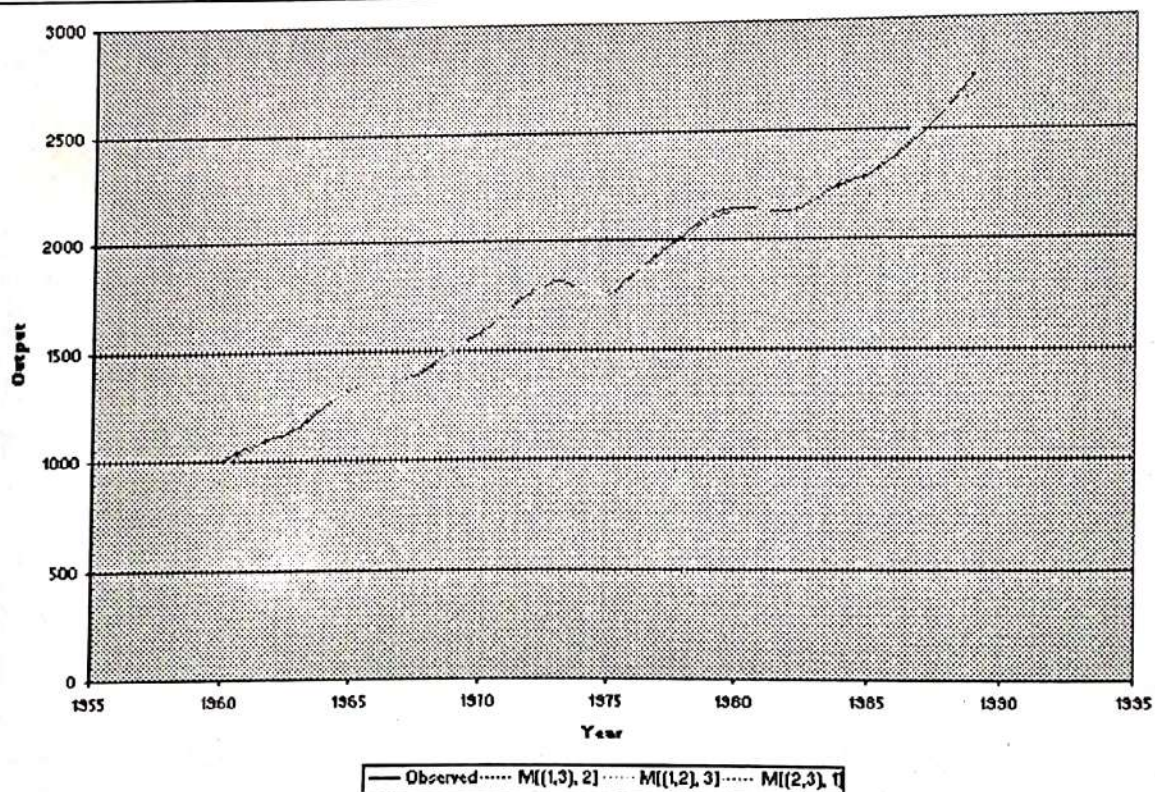


Fig.-4: Estimated Output of Sato Production Functions with Different Nesting For German Sector "Market-Determined Services" - 1960-1989 [Rho=1] [Differential Evolution]

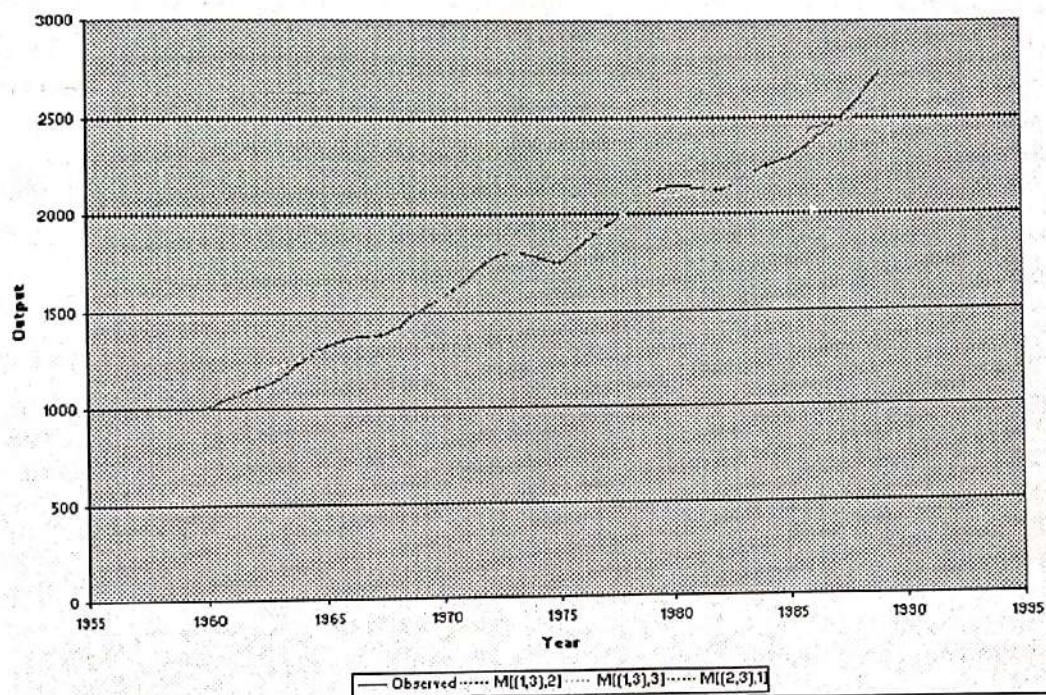
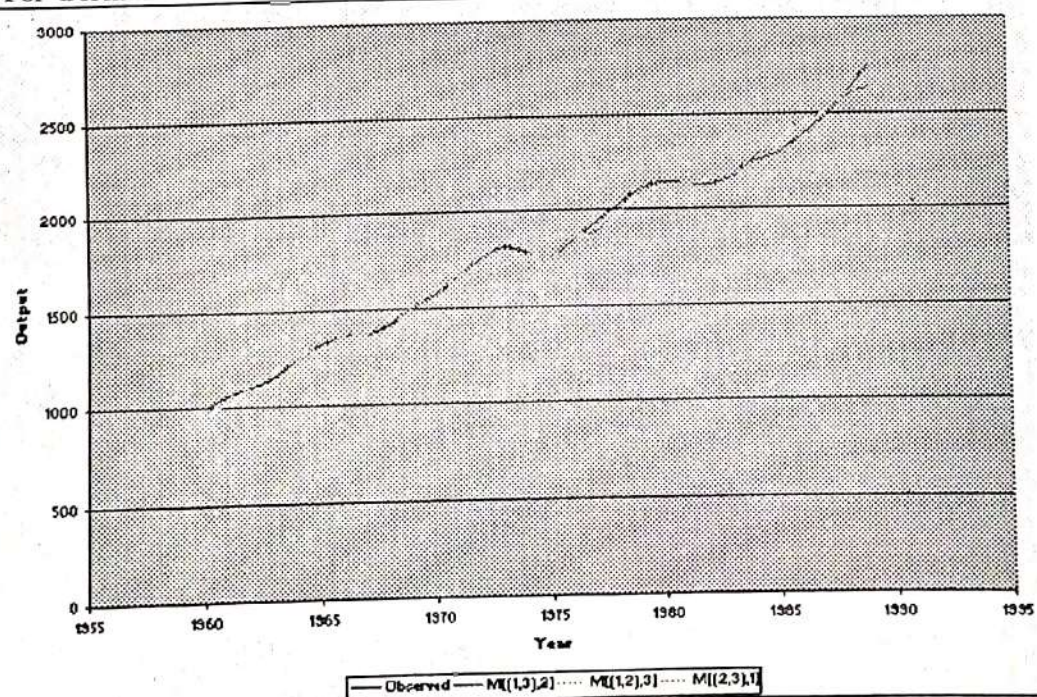


Fig.5: Estimated Output of Sato Production Functions with Different Nesting For German Sector "Market-Determined Services" - 1960-1989 [Rho=Free] [Differential Evolution]



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