CAHIERdeRECHERCHE N°13

Institut de Recherche en Management et Pays Emergents du Groupe ESC PAU

The Groupe ESCPAU Institute for Research in Management and Emerging Countries

décembre**2010**

Préambule

« Ecrire n'est pas l'élément neutre de la Recherche mais au contraire contribue à la révéler. Alors, considérer dès le départ l'écriture comme ressort essentiel du travail à effectuer permettra d'en déployer toute la potentialité formatrice.

Une telle démarche ne va pas de soi. Aussi, il convient de la mettre largement à l'épreuve, d'en expérimenter les effets dans d'autres contextes, d'accompagner sa recherche avec elle et de mettre à profit différentes rencontres possibles autour d'elle, le retour de la part des autres étant essentiel pour savoir ce que l'on a écrit ».

L'écriture produit ou modifie la pensée et ses formes.

Yves REUTER

Composition et présentation du Comité de Lecture

Monsieur **Gérard HIRIGOYEN**

Directeur du Pôle Universitaire en Sciences de Gestion

Directeur de l'Institut de Recherche en Gestion des Organisations

Responsable de l'Equipe «Entreprises Familiales»

Professeur à l'Université Montesquieu - Bordeaux IV

Monsieur **Paul LE CANNU**

Professeur à l'Université de Paris I - Panthéon Sorbonne

Monsieur **Gérard DENIS**

Professeur de l'Université de Pau et des Pays de l'Adour

Monsieur **Bertrand SAPORTA**

Professeur Emérite de Sciences de Gestion à l'Université Montesquieu-Bordeaux IV

Monsieur **Christian PRAT DIT HAURET**

Professeur à l'Université Montesquieu-Bordeaux IV

Monsieur Thierry **POULAIN REHM**

Maître de Conférences à l'Université Montesquieu-Bordeaux IV

Monsieur **ALI YAKHLEF**

Professeur à l'Université de Stockholm

Madame **Anne NELSON**

Professeur en Systèmes d'Informations à High Point University

Sommaire

**Management control's implications
of the exploitation/exploration dilemma:
empirical evidence from a fast-moving
consumer goods company**

Page 5

Anne-Laure Farjaudon & Marion Soulerot

**Les effets de l'intégration régionale
sur le processus de convergence réelle :
étude comparative**

Page 29

Deisting Florent (Docteur)

**University Strategies for e-learning:
Closing the Gap between Policy & Practice**

Page 45

Stephen PLATT

**Bank efficiency measurement using alternative
techniques of frontier analysis: evidence from
India Muneesh Kumar***

Page 61

Muneesh Kumar & Padmasai Arora

Management control's implications of the exploitation/exploration dilemma: empirical evidence from a fast-moving consumer goods company

By Anne-Laure Farjaudon
Université Paris-Dauphine, DRM-CREFIGE

By Marion Soulerot
ESCP**PAU**, IRMAPE

Résumé

Dans cet article nous proposons un modèle de forme d'organisation ambidextre issu de la littérature. La confrontation de ce modèle au cas d'une entreprise de produits de grande consommation permet de valider la pertinence du modèle. Toutefois nous proposons d'inscrire le rôle du contrôleur de gestion au cœur de la problématique d'ambidextérité pour qu'il en soit le « chef d'orchestre ».

Mots clés : Dilemme exploitation/exploration, ambidextérité, contrôleur de gestion

Abstract

In this paper, we suggest a theoretical framework for ambidextrous organization. The relevance of this framework's is tested by the study of the case of a fast moving consumer goods company. However, we suggest to put the management controller role at the core of the ambidexterity logic in order he become the conductor of ambidexterity symphony.

Key words : Exploitation/exploration dilemma, ambidexterity, management controller

Introduction

To optimize the use of existing resources and to find the means to create some new ones is certainly an old dilemma but its resolution nowadays conditions the survival of a lot of companies. The acceleration of the products' life cycles as well as the increased competition in numerous sectors put this problem at the core of the strategic reflection of organizations. It also interests researchers for several decades. The necessity of reconciling these two imperatives is at the origin of the ambidexterity concept, which refers to "the synchronous pursuit of both exploration and exploitation via loosely coupled and differentiated subunits or individuals, each of which specializes in either exploration or exploitation." (Gupta *and Al.* 2006, p. 693). From then on, the question of the implementation of this ambidexterity and the modalities which allow to reconcile exploitation and exploration within the same organization becomes crucial.

On this point, several works bring elements of answer as for the characteristics of the functioning of an ambidextrous organization. A debate essentially centered on the structure emerges from these works recommending a structural dichotomy between the exploitation and the exploration. In our study, we try to synthesize the various researches in the domain by proposing a model of ambidextrous organizational form which we confront then with a case of company.

The fast-moving consumer goods sector seemed to us particularly sensitive to this problem and thus relevant to observe the articulation between the innovation and the launch of products on the market. We thus led there an exploratory study of qualitative nature based on nine interviews. The Globalmarket case's restitution brings an empirical content to works often essentially prescriptive. The study of this case also allows attesting the relevance of the model with regard to the functioning of this organization.

In a first section, we get back to the theoretical construction of the ambidexterity debate. This epistemology of the concept leads us to propose a model of ambidextrous organizational form. After presenting the methodology of the Globalmarket case study, we expose the results in a second section. The third section consists of a critical approach of the proposed model and a discussion of the results in the light of recent works on the management controller's role in the organization.

1. Toward a proposition of an ambidextrous organizational form model

A chronological approach of the exploitation/exploration dilemma's evolution and its progressive focus from a macroeconomic level to an individual one, allows us to redraw the theoretical construction of this dilemma (1.1.). The consideration of this dilemma at different levels of analysis also came along with a progressive enrichment of these notions by extensions in varied problems. These multiple interpretations of the dilemma led to the difficulty of perceiving in a clear way the means to resolve the dilemma (1.2.). Concurrently to this complexification of the debate, the more and more strong necessity of developing collectively the exploitation and the exploration (1.3) indicates the emergence of the ambidexterity concept. The solution proposed to resolve this dilemma remains however essentially structural. A detailed review of works presenting the characteristics of this type of structure leads to the proposition of a model of ambidextrous organizational form (1.4).

1.1. Emergence of the exploitation/exploration dilemma

The dichotomy between exploitation and exploration appears from the beginning 1930's in the works of the economist Schumpeter. He distinguishes two types of attitude that he represents by two economic agents' types: the «pure and simple developers» and the «entrepreneurs» (Schumpeter 1935, p. 118): “We call «company» the execution of new combinations and also its realizations in exploitations and «entrepreneurs», the economic agents whose function is to execute new combinations and which are the active element.” (Schumpeter 1935, p. 106).

In management science, works in strategy shows the emergence of the exploitation/exploration dilemma. Indeed, these two notions constitute the foundation of numerous typologies relative to the strategies of product or market pursued by organizations (Hambrick 1983, Miles et Snow 1978, Miller et Friesen 1978 1982, Miller 1986, Porter 1980).

While the debate on the macroeconomic issues of the dilemma concentrated on the aspects of new products or markets in the 1980's, it is going to be reoriented at the beginning of 1990's towards a more cognitive content of the notions of exploitation and exploration. Indeed, by studying the exploitation/exploration dilemma through an organizational learning approach, March (1991) opened a new way for researches concerning these notions. The exploitation and the exploration are not any more only studied through the prism of the implemented strategies, but also through that of the knowledge held or acquired by the organization. “Exploration includes things captured by terms such as search, variation, risk taking, experimentation, play, flexibility, discovery, innovation. Exploitation includes such things as refinement, choice, production, efficiency, selection, implementation, execution. » (March 1991, p. 71). “The essence of exploitation is the refinement and extension of existing competences, technologies, and paradigms. Its returns are positive, proximate, and predictable. The essence of exploration is experimentation with new alternatives. Its returns are uncertain, distant, and often negative.” (March 1991, p. 85)

From then on, the exploitation and the exploration become fundamental notions to characterize modes of learning (Bierly and Chakrabarty 1996, Grant and Baden-Fuller 2004, Leonard-Barton 1992, Levinthal and March 1993). For example, Bierly and Chakrabarty (1996) wonders about knowledge strategies developed in the American pharmaceutical sector between 1977 and 1991. On the model of strategic matrix, they propose a classification of organizations based on the more or less big propensity they have in the exploitation or in the exploration of knowledge. From a more dynamic point of view, numerous works concern relations between the exploitation/exploration balance in the process of organizational learning and different internal and external variables of the firm. The nature of these relations strictly depends on the theoretical framework mobilized by the authors.

Furthermore, the notions of exploitation and exploration send back to numerous dilemmas frequently evoked in management science. If certain authors wonder specifically about the exploration/exploitation dilemma (Benner and Tushman 2003, March 1991, Winter and Szulanski 2001), some others deal with the same dilemma through the notions of static and dynamic efficiency (Ghemawat and Ricart I Costa 1993), alignment and adaptability (Gibson and Birkinshaw 2004) or evolution and revolution (Tushman and O'Reilly 1996). These notions were alternately studied through the prism of organizational learning (March 1991), of organizational structure (Benner and Tushman 2002 2003, Gibson and Birkinshaw 2004, O' Reilly and Tushman 2004) or through the innovation strategy (Tushman and O' Reilly 1996). These multiple applications of the exploitation and exploration notions illustrate as much the variety of the handled problems as the difficulty resolving the exploitation/exploration dilemma.

1.2. From the difficulty to solve the exploitation/exploration dilemma...

At the same time that the dilemma extended in varied organizational, strategic, technological or cognitive issues, the difficulty of reaching collectively the exploitation and the exploration was raised by numerous authors. Indeed, the profusion of concepts connected to the exploitation/exploration dilemma, inspired for the most part of the text of March (1991), expresses vagueness on the articulation of exploitation and exploration at the organizational level. First of all, the typologies of strategies built on the notions of exploitation and exploration rely on a profoundly dichotomous approach of these two notions, the median way being to exclude (Miller, 1986) unless risking « the sticking in the average way » (Helfer, Kalika and Orsoni 2000, p. 133).

Furthermore, the main conclusion of March (1991) is that the balance between exploitation and exploration is difficult to find. The propensity to exploitation appears as a natural tendency but which turns out destructive on the long term (Denrell and March 2001, March 1991, Miller and Friesen 1982, Lewin *and Al.* 1999). For McNamara and Baden-Fuller (1999), this phenomenon contributes to the emergence of a certain inertia against which it is necessary to fight for maintaining an equal level of exploitation and exploration.

The fact that numerous authors consider the exploitation and the exploration as two exclusive strategies relies on the idea that they are in opposition one of the other one. First of all, the difficulty finding a balance can be structural and cultural as underlined by Bierly and Chakrabarty (1996). This difficulty can also appear at an individual level when the individual is himself in situation of choosing between exploitation of his skills and exploration of new ones (McNamara and Baden-Fuller 1999, Tushman and O' Reilly 1996). Leonard-Barton (1992) makes it a managerial dilemma, by studying this one at the level of projects' managers. For him, the paradox is born in the double dynamics around the core of skills which, being strengthened, restricted the access to the variety of skills at the same time as it arouses this need of variety.

All these works leads Mom *and Al.* (2003) to conclude to the incompatibility of the strategy of exploitation and the strategy of exploration in the same time and space horizon. Finally, the researchers being interested in the exploitation and the exploration considered for a long time that the structural, cultural or managerial characteristics inherent to each of both strategies were incompatible and irreconcilable. Nevertheless, more recently, numerous authors have asserted in the necessity of developing both aspects.

1.3. ... To the necessity to solve the exploitation/exploration dilemma

The question raised by Williamson (1994) summarizes the problem which interests numerous researchers: "Which is primary, the entrepreneurial (value-creating) role of the headquarters unit, or the administrative (loss-preventing) role? Can a headquarters unit simultaneously perform both roles?" (Williamson 1994, p. 374).

Exploitation of the existing resources and exploration of new opportunities are thus two strategies clearly approached in a dichotomous and even paradoxical way. Nevertheless, the notion of balance between these two notions is gradually going to appear in several works.

Indeed, Levinthal and March (1993) raises the imperative to reconcile both ways, but they are only noticing the difficulty obtaining this balance. In the continuation of the works of Levinthal and March (1993), Katila and Ahuja (2002) also draws the attention on the interest to implement both exploitation and exploration. For Volberda (1996), this balance is likened to a "constructive tension", the level of which depends on conditions of competition and on turbulence of the environment. In an approach which relies

on the organizational learning perspective, McGrath (2001) also asserts the necessity of a just balance between search for variance and stability in the skills held by the organization.

For Rivkin and Siggelkow (2003), the exploration and the exploitation characterize two different modes of decision-making. The dilemma consists then in knowing how to search for solutions in a wild array while establishing stability in the decision-making.

So, if the works of Duncan (1976) points out the origin of the ambidexterity concept, it will be necessary to wait for 1990's so that the concept is taken back and developed. Indeed, in the works of Duncan (1976), the notions of exploration and exploitation send back respectively to both stages of the process of strategic innovation: the initiation of the innovation and the implementation of this innovation. The ambidexterity of an organization recovers then from the capacity of its members to implement and to control successively these two processes. The necessity of reconciling the double stake of exploitation and exploration, qualified as "paradoxical demands" (Benner and Tushman 2003, p. 252) or as "paradox of the success" (Tushman and O'Reilly 1996, p. 24), thus initiates a new stage in the theoretical construction of the debate on the dilemma exploitation/exploration.

In opposition to the dichotomous approach, the necessity of the concomitant exploitation of the existing resources with the exploration of new opportunities brings a new dimension to the concept of ambidexterity. Several works demonstrate that reconcile both imperatives improve organizational performance (Bradach 1997, Gibson and Birkinshaw 2004, He and Wong 2004, Rivkin and Siggelkow 2003).

But, since the positive impact of the ambidexterity on the performance is admitted, we should wonder about the factors which influence the degree of ambidexterity of an organization.

1.4. Proposition of an ambidextrous organizational form model

Considering the emergence of the ambidexterity debate at the level of the organization, numerous authors wondered about the internal factors to the organization that have an impact on the balance exploitation/exploration. The study of these works reveals that the structural answer prevails (1.4.1). However, some authors exceed this structural aspect by widening their analysis to the general internal context of the organization (1.4.2). All these researches conduct us to propose an ambidextrous organizational form model.

1.4.1. The structural answer

Works on the notions of exploitation and exploration have directly been oriented to a reflection around the organizational forms appropriate for each of both ways. The most striking distinction in the researches which are led in this domain at the end of 1990's, relies on the existence or not of a continuum between exploitation and exploration. Indeed, two positions oppose. The first one consists in considering exploitation and exploration as two extremities of the same continuum (Ghemawat and Ricart I Costa 1993, Sheramata 2000) whereas the second rely on a strict separation of these two concepts (Gibson and Birkinshaw 2004). This difference of conceptualization involves fundamental repercussions in the apprehension of the dilemma between exploitation and exploration and its organizational implications.

A. The postulate of a continuum between exploitation and exploration

First of all, to reconcile exploitation and exploration in an optic of continuum between these two notions means either proceeding by chronological alternation, or finding a balance halfway from both extremities. So, on the long term, it is possible that some leaders oscillate between a radically innovative strategy and a strategy turned to the optimization of the resources (Ghemawat et Ricart I Costa 1993). Through the study of three organizational characteristics that are the complexity of the tasks, the formalization of the procedures and the centralization of the decision, Duncan (1976) concludes that both stages of the process of innovation have to take place in two types of structure. The stage of initiation requires relative latitude in the execution of tasks to leave free experimentation what supposes a strong complexity. For the same reason, this stage requires a minimum of formalization and centralization. The organic structure, working by adaptation with a network mode of control, authority and communication, better suited to uncertain context (Burns and Stalker 1961) would thus be more adapted. On the other hand, the success of the implementation's stage relies on a weak complexity allied to quite high degrees of formalization and centralization. The mechanical structure, characterized by a strong differentiation of tasks and a very vertical architecture of control, authority and communication, more adapted to a stable environment (Burns and Stalker 1961) would be recommended in this second phase. So, both stages of the process of innovation can take place in two different structures or in the same structure but not in the time. The works of Duncan (1976) thus orient the reflection on the ambidexterity toward a structural issue which must be treated at the organizational level in a sequential or simultaneous way but then in two separate structures. In the continuation of Duncan (1976), Winter and Szulanski (2001) considers that strategic replication for chains of stores leans on two successive phases. The first one requires the exploration of various alternatives before replicating the obtained model in a second time. However, the chronological alternation reaches its limits when the environment becomes more competitive (Volberda 1996) and when it becomes then necessary to find a balance between opposite strengths (Sheramata 2000). Volberda (1996) assimilates the exploitation/exploration dilemma to that of the control/flexibility. He underlines that the competitive intensity and the environment hostility require a structural flexibility to generate the exploration.

Numerous researches on the organizational design so concern the search for a balance between exploitation and exploration. The main answer brought by these works lies in hybrid forms of organization between the mechanical and the organic structure (Brown and Eisenhardt 1997, Galunic and Eisenhardt 2001, Miles and Snow 1978, Sanchez and Mahoney 1996, Volberda 1996). For example, to three types of organization identified by Miles and Snow (1978) corresponds three different organizational structures. The mechanical structure would allow a better optimization of the existing resources whereas to develop a strategy of exploration, thus discovery of new uncertain ways, the organic structure would more be fitted (Miles and Snow 1978, Covin and Slevin 1989). The median way aiming at the ambidextrous compromise would correspond rather to a matrix structure based on a double operational and functional hierarchical linking.

In the same way, the main conclusion of Brown and Eisenhardt (1997) is that among six "business units" in six different firms from the computing industry, those that are better suited to continuous evolutions present common structural specificities. So, in the three most successful firms, managers have set up an hybrid structure between the organic structure and the mechanical structure qualified of "semi-structure" by Brown and Eisenhardt (1997).

Numerous works adopting an approach of the dilemma exploitation/exploration in term of organizational learning also raise the problem of the structure to be implemented to obtain the balance (McGrath 2001, Mom and Al . 2003, Romme 1996, Sanchez and Mahoney 1996). Applied to another content, the ambidexterity dilemma raises the same debate of the structural integration as in the strategic choice approach.

Finally, if the transposition of the exploitation and exploration notions in the field of learning conducted to widen the debate on ambidexterity, the main answer to its internal implementation remains structural.

B. Exploitation and exploration: two paradoxical notions

Rejecting the idea of a continuum between exploitation and exploration, some authors considered that the two different strategies have to be jointly and fully implemented to resolve the dilemma (Adler *and Al.* 1999, Gibson and Birkinshaw 2004). Organizations are not anymore exhorted to reach the same level of exploitation and exploration, but to maximize the level of these two options.

Tushman and O'Reilly (1997) propose a particular organizational structure, called "ambidextrous organization", in which the activities of exploration and the activities of exploitation are made in different business units. Taken back by Benner and Tushman (2003), conclusions of Tushman and O'Reilly (1997) so places the dilemma's resolution at the organizational level, in two differentiated but coexisting structures. The exploratory units are relatively small and decentralized and printed by loose cultures and by flexible processes. On the other hand, the exploitation units are larger and centralized with a strong culture and strictly bounded processes.

To test empirically if the ambidextrous organization is more successful than the others in the resolution of the exploitation/exploration dilemma, Tushman *and Al.* (2004) identify 36 attempts of radical innovation in fifteen different business units on nine industries. Then, they try to link the organizational design to profits obtained by new products on one hand, but also profits of the pre-existent products on the other hand. The ambidextrous organization appears to be the most successful organizational design on each of these two aspects, that is to say it is the best suited to create radical change while optimizing exploitation of the existing activities. These results consolidate those obtained by Bradach (1997), for whom the combination of franchise units and units belonging to a parent company in five restaurant chains, leads to a better resolution of the exploitation/exploration dilemma.

1.4.2. The intraorganizational context

Beyond the purely structural aspects of the ambidexterity debate, some intraorganizational elements can have an influence on the exploitation/exploration balance. Gibson and Birkinshaw (2004) advance an additional kind of ambidexterity called "contextual". Considering each one capacity to opt for an exploration or exploitation behavior, Gibson and Birkinshaw (2004) put the individual at the core of the ambidexterity issue. Some elements then facilitate the creation of a context appropriate to ambidexterity.

If the strategic integration is made at a too low level of the organization, the activities of exploitation risk to be restrained whereas an integration at a too much high level would lead to limit the possibilities of driving effectively radical innovations. So, in order to maintain a not fragmented organization, it seems necessary to integrate "senior managers".

The role of the leaders also appears as an important element. The empirical study of Tushman *and Al.* (2004) demonstrate that the companies which best manage the combination of exploitation and exploration decentralize decisions in a large number of units very close to their market. The risk-taking and the autonomy are facilitated as well as the empowerment of the local actors. In this way, the strategy is not any more planned by a central team but it appears from initiatives and risks taken by some managers (Tushman and O'Reilly 1996). This can only be made under the condition of a strong financial control. In all these companies, the number of hierarchical levels was decreased and the central teams are relatively

restricted. Their main role is to build the strategic vision and to evaluate performance of each of the entities. The integration of “seniors managers” rely on this vision which embraces collectively concerns of the actors of the existing business and those in charge of investigating markets (O'Reilly et Tushman 2004). The vision, expressed by a slogan or a program, is the object of an extensive communication of the leaders beside divisions the most reluctant to the new organization. The role of top management so appears crucial. It even has to present capacities to ambidexterity in his understanding of the new organizational stakes and in his commitment to promote this one. However, if the necessity of developing ambidexterity of the organization emanates from the leader, it is however necessary to create a favourable climate to the emergence of leadership behaviour (Adler *and Al.* 1999). The ambition is carried by a charismatic leader but has to stimulate varied initiatives within the firm (Birkinshaw and Gibson 2004).

According to Birkinshaw and Gibson (2004), the effective creation of an appropriate context to ambidexterity tightly relies on the understanding of stakes at every level in the organization and thus relies on an effective communication with the actors. The quality of the interpersonal relations as well as the resolution of conflicts are two essential elements according to Duncan (1976). Adler *and Al.* (1999) also evoke training, trust and leadership as contextual parameters which would allow to facilitate ambidexterity. To obtain a collective orientation towards the ambidexterity, Tushman and O'Reilly (1996) identify the multiplicity of the organizational cultures as common factor of the studied ambidextrous organizations. Thus, the organizations called “ambidextrous” by Tushman and O'Reilly (1996) have common cultural characteristics. Culture is at the same time widely diffused and printed by local specificities. It also relies on incentive to the autonomy and the risk-taking. The exploitation/exploration balance seems also influenced by the modalities of information broadcasting within the organization (Kyriakopoulos and Moorman 2004, Mom *and Al.* 2003). The direction and the nature of the information exchanges seem so determining.

The ambidexterity concept also raises numerous questions relative to management control. As well as the organizational prescriptions are mostly incompatible between exploitation and exploration, several works demonstrate that the management control system is either suited to exploitation or either fitted to exploration (Simons 1987, 1990, 1995, Li *and Al.* 2005, Frow *and Al.* 2005). The diagnostic control such as formulated by Simons (1995) particularly aims at insuring the exploitation of resources in standard conditions of performance whereas the use of performance measures in an interactive mode facilitates the exploration of new opportunities (Simons 1995). Bisbe and Otley (2004) however argue that Simons (1995) is not clear whether an interactive control get companies more innovative or whether it increases the performance of innovative companies. They so demonstrate that interactive control has a positive impact on the innovation only in weakly innovative companies whereas the effect is negative for strongly innovative companies. On the other hand, the moderating effect of an interactive use of management control systems is verified.

Li *and Al.* (2005) demonstrate that, when an organization uses a financial control to face the complexity of the environment then, the strategic change is inevitably incremental and based on the production's processes improvements. On the contrary, a company that uses a strategic control, close to the interactive mode of Simons (1995), count on innovation and new products' development to introduce a strategic change caused by an evolution of the external environment. Frow *and Al.* (2005) raise the difficulty for managers to comply with a classic budgetary control while maintaining an activity of exploration. In an organization equally turned to exploitation and exploration, the interactive use of management control systems should thus be made only in the exploration units. On the other hand, the diagnostic control should be preferred in the exploitation units.

Characteristics of the functioning of an ambidextrous organization are summarized in the Figure 1.

Figure 1 : Model of an ambidextrous organization

The aim of our research is thus to confront this model stemming from a purely theoretical investigation to an empirical case.

2. Empirical study

The empirical study is based on a qualitative step from the analysis of exploratory interviews. These interviews were realized with various actors within the same company operating in the sector of fast consumer goods company.

2.1 - Methodology

The aim of this study is to understand how the ambidexterity concept is implemented by highlighting the structural and interorganizational elements. This study can be qualified as exploratory as far as very few empirical studies were carried out on the subject. To our knowledge, no empirical research was undertaken in France on the ambidexterity question.

2.1.1 - Collect and data analyze

Data are based on semi-directive interviews with professionals. This choice was driven by the impossibility to implement a quantitative methodology to treat our research question (Mucchielli 1994, Miles et Huberman 1991). Interviews lasted between 45 minutes and 1h30 and were systematically recorded then retranscribed.

2.1.2 - Presentation of the company and the interviews

Globalmarket is one of the world's leading suppliers of fast moving consumer goods with nearly 40 billion euros of turnover. Globalmarket's portfolio includes some of the world's best known brands across foods, home and personal product categories.

The case study deals with one of the brands of the portfolio named Silo, leader on tablets and traditional powders for dishwashers. Silo was created 40 years ago by Globalmarket, following the request of a manufacturer of dishwashers who launched one of the first dishwashers in France and which needed a product to make its machine work. Today, this brand represents the third brand of the home care category and the 8th European brand in terms of turnover. It is present in eleven European countries which constitute as many local companies.

The French local company benefits from a particular status as far as 50 to 60% of the turnover of the Silo brand in Europe is made in France. The development of new products is realized at the European level in an *innovation center*.

To lead our case study, we based our analysis on nine interviews realized with various actors in charge of the Silo brand. Some of them, like the brand manager, only manage the Silo brand, others as the category manager are in charge of the Silo brand as well as other brands of the group. The list of the interviews is presented in Table 1:

Innovation Center		Local company	
Louis	Brand manager	Virginie	Brand manager
Florence	Management controller	Corentin	Category manager
Marie-Claire	Studies manager	Monique	Brand management controller
		Bénédicte	Retailer management controller
		Grégoire	National account manager
		Nathalie	Retailer manager

Table 1 : Presentation of interviews

The main characteristics of the local company and the innovation center are exposed in the following section. A national account manager is responsible for retailers such as Carrefour, Leclerc or Auchan for the home or personal care category. Its main objective is initially to make sure that the brands of the group are available at the retailer for which he is responsible. A retailer manager is responsible for several retailers and has an essential role of coordination. He has to make sure to decline the global agreements in retailers by taking into account the specificities of each.

The management controller function is relatively new at Globalmarket. It was created in response to the current economic context marked by a huge hardening of the markets. Because of this unfavorable context, there is a need for a better understanding of retailers' profitability in order to implement the suitable strategic choices to develop the sales.

The category manager is a specialist of a products category. In dialogue with the person in charge of the brand, he is responsible of defining the assortment policy, the pricing policy, the merchandising policy and the marketing policy.

2.2 - An ambidextrous structure

Within the Globalmarket group, the organization follows a well established dichotomy between the innovation center and the local company.

2.2.1 - Different strategic intentions

• An innovation center turned towards the development of new products

For each products category, an European innovation center is in charge of defining the brand strategy, the creation of innovations and the development of advertisements. For the Silo brand, the innovation center is located in Paris. The advertisements are identical for all the European countries.

There are various types of innovations: the launching of an economic format or a new perfume for the dishwasher products is considered as a minor innovation. The creation of the 3 in 1 tablets for the dishwashers required a management of complexity much larger.

I am supposed to intervene on all levels, from the production of ideas, therefore we see the consumer to see the problems he can have and to find him some solutions. After we make some different qualitative and quantitative tests of concept. (Marie-Claire, Studies manager of Silo brand, Innovation center)

The team of the Silo brand innovation center is restricted: three people work for marketing, one person is in charge of the continuous and ad hoc studies, a person works for the logistics and a person is responsible of the management control of the innovation center.

The studies manager of the innovation center assists the marketing team in the research of new ideas, until the innovations can be sold. The main role of the innovation center is thus to generate new ideas, to create new products and to provide the «product mix» and advertisements to the countries. Countries are supposed to launch new products at the national level. The guarantee's role of the brand strategy also returns to the innovation center.

As the studies manager underlines it, most innovations aim at answering a need for the consumer. With the competition of the store brands, the launch of innovations will make it possible to keep an advantage on these store brands. Indeed, they copy the innovations of national brand goods very fast.

For example, this innovation of the soluble bag for the 3 in 1 tablets of the Silo brand was favorably accommodated by consumers, which resulted in additional brand sales.

Thus it is this kind of innovation [the soluble bag] which makes the difference between the store brands which copy us more and more quickly. (Marie-Claire, Studies manager of Silo brand, Innovation center)

• A local company turned towards the launch of innovations

The main objective of the local company is to define which will be the actions to carry out locally to implement the strategy defined in the innovation center. It is mainly a question of defining the promotional operations to be set up or more specific operations.

Therefore, in June, last year, we define what will be the 3 or 4 things that were inescapable. It was not very different from what the innovation center had given us, but on the other hand, there are things on which the center had empathize much, but we stress more, because locally, we felt the need to do it. While making a local study, one realized that the brand was perceived like a little old-fashioned, rather distant, not funny, serious, but almost negatively, because serious, that can be well, but there, it was boring. thus we decide to add heat and proximity with the brand. That, it was one of the strategic axes we defined. (Virginie, Silo Brand manager, local company)

Although the literature proposes the important role of the structure of exploration in the identification of emergent strategies (Tushman and O' Reilly, 1996), it appears here that the local company contributes to the strategic reflexion on new axes.

Moreover, if advertisement concerns the innovation center responsibility, local marketing is charged to relay these advertisements in the local media.

We have to see how will be launched a new product: with sampling, or with mailing letter-boxes to speak about the new product, with television ads, magazines, radio, etc. The local level manages all public relations.

The local company aims at putting the innovations on the market, its customers are thus of distinct nature: on the one hand the ultimate consumer to whom addresses the product, on the other hand, the retailer, who is the essential intermediary between manufacturer and consumer. (Virginie, Silo Brand manager, local company).

The innovation center is characterized by a strategic intention turns towards the innovation and of the critical tasks related to the conception of new products. The local company is turned towards the satisfaction of its two main customers and its attributes are of operational order.

While referring to the definition of March (1991), the characteristics of the innovation center are related to an exploration structure, whereas the local company seems close to an exploitation structure.

2.2.2 - The system of control

- **The innovation center: a control by “gates”**

Before the launching of an innovation, three successive “gates” must be validated in terms of technical feasibility, financial profitability and attractiveness for the final consumer.

The first gate consists in evaluating the potential of additional sales generated by the idea coming from marketing. In every stage, if the project is not validated on one of the three criteria, it stops and the innovation is not launched.

I will describe you a little. An idea, it is in the head of a marketer. In each gate, there are financial specifications to satisfy. Because a gate corresponds to financial, technical and marketing specifications. If a project is technically realizable but makes us lose money, what the use? You see, at each gate, we become more and more meticulous, until the end, the launch.

At the first gate, the idea is there. The role of the controller, it is to evaluate the potential in sales, the turnover of this project. In other words, how much market share it will make on the European place.

And it is where I really will start to have a precise idea of the potential of the project. In theory, at the first gate, we don't go further than that. Today, there are several projects which died there, because there was not much potential. (Florence, Management controller, Silo brand, Innovation center)

The second stage consists in concretizing a little more the idea. The marketing teams carry out some tests near consumers and validate them by specialized cabinets such as the Nielsen institute. These tests will allow the management controller to a better valuation of the potential sales generated by the new product. At this stage, the aim is to define the incremental sales, i.e. sales due specifically to the product that has been just launched.

At this stage, the manufacturing costs, but especially the launching costs in terms of advertising and promotional operations are analyzed.

At the second gate, we concretize the things. There, marketing worked more and more on the idea; it has a better vision on the final product. With this gate 2, I start also to look at the cost of this product. Now, we start to speak about P&L. We begin to have the costs, not only the production costs, but also the costs of launch. There are two kinds of costs which are located differently in the Globalmarket P&L. There are supply chain production costs which contain the costs of the factory and the advertising costs.

Therefore, before I send the project to the countries, I have to study its gross margin. (Florence, Management controller of the Silo brand, Innovation center)

When the second stage is validated, the innovation center contacts the various countries in order to determine their estimated sales. At the same time, the formula of the new product is validated and prototypes are tested on the production lines. At this third stage, the management controller collects the estimated data on behalf of the various countries and draws up the estimated income statement.

At the third stage we receive volumes of the countries which are interested, I have to value them and I compare with what I put. Meanwhile, we receive all quotations of raw materials, etc. Thus I can rectify my gross margin. Because meanwhile, we know exactly the production cost. .

My role consist in bringing back the information of planning, the supply chain, the marketing, the information of the development in term of formula, of packaging, all that, so that I can establish a transfer price which is purely hypothetical. It is my responsibility to determine it but it is not yet true. A true transfer price, will be the day when the factory starts to do the new product, but the factory does not start to make the product before the gate n°3. (Florence, Management controller of the Silo brand, Innovation center)

- **The local company: a diagnostic control**

The performances of the Silo brand are studied in a daily, weekly and monthly way through the detailed analysis of the turnover and the market shares of the brand. It is indeed a question of determining how the products were sold and to carry out comparisons to the existing system of forecasts. These forecasts predict the level of sales and the profit expected for each brand. In parallel, the market shares provided by the Nielsen studies institute are studied every month. Sold volumes and market shares are also compared; sold volumes correspond to what is sold to retailers, while market shares reflect what consumers buy.

We look at the performance of our brands daily, weekly and monthly. Thus we look at the sold turnover and we analyze it in detail. How was it sold? Is it in promotion or not? I go towards them since the turnover comes from me. Afterwards, we look at market shares that Nielsen gives us every month. We see our internal sales and our external sales. We try to see whether flows are coherent. (Monique, Brand management controller, local company)

Innovation centers also follow market shares and results, but from a rather macroeconomic point of view. It is also necessary to compare sales with market trends. The market knowledge falls mainly to the marketing teams, but it can sometimes happen to call external cabinets such as Nielsen for more specific studies (resolution of a particular problem or price study). Margins are also quarterly followed, since there is not much change from one forecast to another. It is necessary to study the budgets, especially the advertising budgets which represent important amounts, but also the promotional budgets. The main stake is to be the most proactive possible for such expenses. The management controller supports marketers to elaborate their budgets. They must be coherent in order to establish the link between the objectives in terms of market shares growth and the planned investments.

I printed you our scorecard. In fact, we define some criteria which are followed every month: the reduction rate, the money given to the trade, the turnover, the growth. This is rather financial aspects. Then, there are all the aspects which are more external, therefore the performance on the market, the market growth, the brand market share. (Virginie, Silo Brand manager, local company)

The local team of the Silo brand works in the form of “business team”. Each business team gathers a person of marketing, logistics, management control and a category manager. The management controller occupies a true function of conductor.

In the business team, one works hand in hand. We all have the same objective; my objective is to make the brands grow, to achieve the goals in terms of profit and turnover growth. Two goals should be achieved. Marketing has the same objectives that me, moreover they have objectives of market shares etc., I have other objectives. The basic objective is common; therefore we go in the same direction.

We try to establish a true relation of confidence, transparency, we are not responsible of their budget, it is their budget and we help them to manage their expenditure. It's a question of maturity in the organization. We try to plan the best, i.e. at the beginning of the year we have our budgetary objectives and we try to see with the marketers how to spend the budget. We does not say them «here are 10 million, do what you want and we see again each other at the end of the year». Therefore, we work together to be sure that the budget is good, to help them and from time to time, to ask questions. If our purpose is to develop Silo tablets and all our money is spent on Silo powder, it will be difficult to develop Silo tablets. (Monique, Silo brand management controller, local company)

The important role of the management controller is recognized by the Silo brand manager.

Management control is a central function, there, I have a management controller who was not there during 15 days and I felt it! They are entirely engaged in the team, they are really part of the business. (Virginie, Silo Brand manager, local company)

2.3 - A delicate balance between exploitation and exploration

The first part highlights the difficulties raised by the dilemma between exploitation of existing resources and exploration of new ones. One of the answers brought to this dilemma consists in adopting an ambidextrous structure characterised by two distinct entities adapted respectively to the exploitation and exploration (Benner and Tushman 2003). By distinguishing the development activities within an innovation center from the marketing activities within a local company, Globalmarket tries to avoid the difficulties of the exploitation/exploration dilemma.

However, the two entities are not completely independent: they are obliged to work collectively, which is not without raising difficulties. If the innovation center is responsible for the development of European advertising campaigns, countries are then in charge of buying of advertising spaces. Because of this ambiguity between the development of advertising and its diffusion, there are regularly some tensions between the two entities, as the studies manager underlines it:

It is not always joyful the relations with the countries, there can have important tensions. Last year, there were important tensions with Holland because they wanted a special ad, but we are supposed to make the same ads for European countries! (Marie-Claire, Studies manager of Silo brand, Innovation center)

To reduce the tensions between the innovation center and the local company, a healthy communication founded on solids interpersonal relations appears necessary. Thus, the innovation center brand manager and the brand manager of the local company exchange regularly.

I call Virginie [Silo Brand manager, local company] every day, even several times per day. I think that it is a great force because that enables us to have a very good communication in the two directions. That enables us to simplify many problems which could traditionally occur between an IC [Innovation center] and the countries. The communication does not go inevitably from oneself enters both (Louis, Brand manager, Innovation Center)

In some cases, the situation can become worse and the local company can not follow the recommendations from the innovation center. The case occurred about the advertising on the soluble bag. The innovation center had recommended to diffuse the 30 seconds advertising and then to diffuse the 15 seconds advertising. However, one country refused, which is not without raising difficulties, the innovation center fearing that the sales objectives are not achieved.

If a country says «I m going to diffuse the 15 seconds », then, we have a discussion and things are not always clear. I am going to press so that they put of the 30 seconds, but in final, I do not have any control on their media budget. That has already happened with a country where they launched the 15 seconds ad, we had a row with the Belgian marketing director, but in final, it is their media budget, thus I cannot force them to use the 30 seconds. (Louis, Silo brand manager, innovation center)

Finally, if the implementation of an ambidextrous structure makes it possible to solve the dilemma between exploitation and exploration, the implementation of this cohabitation relays on a delicate balance regularly called into question by conflicts.

3. Discussion

Results of the Globalmarket case study enable us to discuss the relevance and the limits of the model suggested from the literature review (3.1.). The criticism of the model and the description of the management controller role lead us to propose a new model for the ambidexterity question.

3.1 - Relevance and limits of the model suggested

The objective of our research is to study the practical methods of the implementation of ambidexterity. Indeed, if the exploitation/exploration dilemma is the object of an abundant literature, few works bring an empirical demonstration. The description of the case study allows us to answer our research question. In particular, Globalmarket provides an illustration of resolution of the exploitation/exploration dilemma with the adoption of a structural dichotomy as recommended by Tushman et O'Reilly (1997). The study of this case leads us to find most of the characteristic elements of the exploitation and exploration units identified in the proposed model.

The confrontation to reality of the model elaborated from a synthesis of the literature brings an empirical validation which strengthens its relevance. However, the Globalmarket case study highlights specificities which enable us to moderate the initial model on two dimensions: the characteristics of each entity (team, exploitation and exploration) and the relations between them. On the one hand, the relative distant attitude of the central team in the case Globalmarket is far from the important role that this one is supposed to play. If the central team is supposed to elaborate a strategic vision, its integration is done on a high level in the organization.

The interpersonal relations between actors from the innovation center and the local company are thus controlled without the intervention of the central team. As regards prescriptive literature, this imperfect system seems nevertheless to function.

In addition, whereas the literature presents the exploration structure as the exclusive place of emergence of strategies, the local company in charge of the exploitation also contributes to the identification of new strategic axes.

Its role of marketing places the local company close to the realities of the market and the consumer expectations. This proximity makes it possible for the local company to help the innovation center in the diffusion of new ideas.

Finally, the ambidexterity model finds a resonance with the practices observed in the Globalmarket case. This confrontation of a purely theoretical framework to an organisational reality leads us to qualify the apparent rigidity of the model suggested.

3.2 - The management controller, «conductor» of ambidexterity

In the Globalmarket case, our results reveal the difficulty in implementing the structural dichotomy recommended by Tushman and O'Reilly (1996). In practice, this scission of the exploitation and exploration activities generates some conflicts also highlighted by Eminent (2005): "All authors note that these hybrids generate tensions for individuals, the organization lets them resolve these contradictions by organizing ambivalence (double authority, contradictory objectives...)." (Eminent 2005, p. 10).

Most authors recommend managing conflicts through the adoption of a control system specific to the ambidextrous structures. The control system of Globalmarket seems to validate the characteristics identified in our model.

While the literature hides the actors who make this system live, the management controllers seem in the heart of the ambidexterity question. In the Globalmarket case, the management controller is the major interlocutor within each entity of exploitation and exploration. In the innovation center, its mission primarily consists in collecting, coordinating and communicating information to allow decision-making. Its ex-

ante influence on the launch of new products is real and determining. Thus, its prerogatives correspond to the objectives finalization (Bouquin 2006). The management controller is also a major actor of the functioning of the local company. In this entity, he carries on an activity mainly centered on a budgetary control and an operational follow-up based on scorecards. Thus, he intervenes in the ex-post performance evaluation of the entity. Its mission corresponds to the activities of piloting and post-evaluation (Bouquin 2006).

Thus, the Globalmarket case validates the characteristics of the control system defined in our model. Our empirical study makes it possible to emerge the central role of the management controller within each entity. Its implication in the ambidexterity question confers to him a role of «business partner» as proposed in the typology established by Lambert (2005). Because of its essential role, we suggest to enrich the model initially presented while placing the management control at the center of the ambidexterity question. Thus, he would become the true director of a central team, an exploitation entity and an exploration entity.

Figure 1 : Model of an ambidextrous organization

Conclusion

The objective of our research is to describe and to understand how an ambidextrous organization works. The first stage of our article consists in elaborating an ambidextrous model stemming from the literature. The proposed model shows a structural dichotomy between the unit of exploitation and exploration, which are coordinated by a central team.

The model also allows to characterize each entity on various criteria and on the nature of the relations which they maintain.

The second step of our research consists in confronting this model to an empirical case study. This second step contributes to bring empirical contents to studies to often prescriptive and theoretical. The Globalmarket case study leads us to validate the relevance of the model but also to raise some limits. In particular, it allows to highlight the major role of the management controller.

Indeed, he appears as a major actor in both the exploitation and exploration unit. The result of this study completes the model issued from the literature. Beyond his role of «business partner» within each entity, the management controller should be in the center of the ambidextrous organization. Moreover, he becomes the conductor of the ambidexterity question.

Finally, our research deals with a single case study from which we elaborate some propositions that should be tested in order to validate the model suggested. Moreover, according to Lambert (2005), we could test our study in different sectors in order to identify if there is a contingency relation between the model and the sector.

Bibliographie

- ADLER P.S., GOLDOFTAS B., LEVINE D.I., (1999)**, « Flexibility Versus Efficiency? A Case Study of Model Changeovers in the Toyota Production System », *Organization Science*, Vol. 10, Iss. 1, pp. 43-68
- BENNER M.J., TUSHMAN M.L. (2002)**, « Process Management and Technological Innovation: A Longitudinal Study of the Photography and Paint Industries », *Administrative Science Quarterly*, Vol. 47, pp. 676-706
- BENNER M.J., TUSHMAN M.L. (2003)**, « Exploitation, Exploration, and Process Management : the Productivity dilemma revisited », *Academy of Management Review*, Vol. 23, Iss. 2, pp. 238-256
- BIERLY P., CHAKRABARTY A., (1996)**, « Generic Knowledge Strategies in the U.S. Pharmaceutical Industry », *Strategic Management Journal*, Vol. 17, Special Issue, pp. 123-135
- BISBE J.A., OTLEY D., (2004)**, « The Effects of the Interactive Use of Management Control Systems on Product Innovation », *Accounting, Organizations and Society*, Vol. 29, pp. 709-737
- BOUQUIN H., (2006)**, *Comptabilité de Gestion*, 4ème édition, Economica
- BRADACH J.L., (1997)**, « Using the Plural Form in the Management of Restaurant Chains », *Administrative Science Quarterly*, Vol. 42, pp. 276-303
- BROWN S.L., EISENHARDT K.M., (1997)**, « The Art of Continuous Change: Linking Complexity Theory, Time-paced Evolution and in Relentlessly Shifting Organizations », *Administrative Science Quarterly*, Vol. 42, pp. 1-34
- BURNS T., STALKER G.M., (1961)**, *The Management of Innovation*, 1994, Oxford University Press
- COVIN J.G., SLEVIN D.P., (1989)**, « Strategic Management of Small Firms in Hostile and Benign Environments », *Strategic Management Journal*, Vol. 10, Iss. 1, pp. 75-87
- DENRELL J., MARCH J.G., (2001)**, « Adaptation as Information Restriction: The Hot Stove Effect », *Organization Science*, Vol. 12, Iss. 5, pp. 523-538
- DUNCAN R.B., (1976)**, « The ambidextrous organization: Designing dual structures for innovation », in KILMAN R.H., PONDY L.R., SLEVIN D.P., *The Management of Organization Design*, North-Holland, Vol. 1, pp. 167-188
- EMINET A., (2005)**, « Le contrôle dans les organisations hybrides : le cas du management par projet », *Cahier de recherche EM Lyon*, septembre 2005, pp. 2-21
- FROW N., MARGINSON D., OGDEN S., (2005)**, « Encouraging Strategic Behaviour While Maintaining Management Control: Multi-Functional Project Teams, Budgets, and the Negotiation of Shared Accountabilities in Contemporary Enterprises », *Management Accounting Research*, Vol. 16, pp. 269-292
- GALUNIC D.C., EISENHARDT K.M., (2001)**, « Architectural Innovation and Modular Corporate Forms », *Academy of Management Journal*, Vol. 44, Iss. 5, pp. 1229-1249
- GHEMAWAT P., RICART I COSTA J.E., (1993)**, « The Organizational Tension between Static and Dynamic Efficiency », *Strategic Management Journal*, Vol. 14, Special Issue, pp. 59-73
- GIBSON C.B., BIRKINSHAW J., (2004)**, « The Antecedents, Consequences and Mediating Role of Organizational Ambidexterity », *Academy of Management Journal*, Vol. 47, Iss. 2, pp. 209-226
- GRANT R.M., BADEN-FULLER C., (2004)**, « A Knowledge Accessing Theory of Strategic Alliances », *Journal of Management Studies*, Vol. 41, Iss. 1, pp. 61-84
- GUPTA A.K., SMITH K.G., SHALLEY C.E., (2006)**, « The interplay between exploration and exploitation », *Academy of Management Journal*, Vol. 49, Iss. 4, pp. 693-706
- HAMBRICK D.C., (1983)**, « An Empirical Typology of Mature Industrial-Product Environments' », *Academy of Management Journal*, Vol. 26, Iss. 2, pp. 213-230
- HE Z.L., WONG P.K., (2004)**, « Exploration vs. Exploitation: An Empirical Test of the Ambidexterity Hypothesis », *Organization Science*, Vol. 15, Iss. 4, pp. 481-494
- HELPER J.P., KALIKA M., ORSINI J., (2000)**, *Management : stratégie et organisation*, 3ème édition, Vuibert
- KATILA R., AHUJA G., (2002)**, « Something Old, Something New: A Longitudinal Study of Search Behavior and New Product Introduction », *Academy of Management Journal*, Vol. 45, Iss. 6, pp. 1183-1194
- KYRIAKOPOULOS K., MOORMAN C., (2004)**, « Tradeoffs in Marketing Exploitation and Exploration Strategies: The Overlooked Role of Market Orientation », *International Journal of Research in Marketing*, Vol. 21, pp. 219-240
- LEONARD-BARTON D., (1992)**, « Core Capabilities and Core Rigidities: A Paradox in Managing New Product Development », *Strategic Management Journal*, Vol. 13, pp. 111-125
- LEVINTHAL D.A., MARCH J.G., (1993)**, « The Myopia of Learning », *Strategic Management Journal*, Vol. 14, Special Issue, pp. 95-112
-

- LEWIN A.Y., LONG C.P., CARROLL T.N., (1999),** « The Coevolution of New Organizational Forms », *Organization Science*, Vol. 10, Iss. 5, pp. 535-550
- LI Y., LI L., LIU Y., WANG L., (2005),** « Linking Management Control System with Product Development and Process Decisions to Cope with Environment Complexity », *International Journal of Production Research*, Vol. 43, Iss. 12, pp. 2577-2591
- MARCH J.G., (1991),** « Exploration and Exploitation in Organizational Learning », *Organization Science*, Vol. 2, Iss. 1, pp. 71-87
- McGRATH R.G., (2001),** « Exploratory Learning, Innovative Capacity and Managerial Oversight », *Academy of Management Journal*, Vol. 44, Iss. 1, pp. 118-131
- MCMAMARA P., BADEN-FULLER C.,** « Lessons from the Celltech Case: Balancing knowledge Exploration and Exploitation in Organizational Renewal », *British Journal of Management*, Vol. 10, pp. 291-307
- MILES M.B., HUBERMAN A.M., (1991),** *Analyse des données qualitatives : recueil de nouvelles méthodes*, De Boeck Université
- MILES R.E., SNOW C.C., (1978),** *Organizational Strategy, Structure, and Process*, McGraw-Hill
- MILLER D., (1986),** « Configurations of Strategy and Structure: Towards a Synthesis », *Strategic Management Journal*, Vol. 7, Iss. 3, pp. 233-249
- MILLER D., FRIESEN P.H., (1978),** « Archetypes of strategy formulation », *Management Science*, Vol. 24, Iss. 9, pp. 921-933
- MILLER D., FRIESEN P.H., (1982),** « Innovation in Conservative and Entrepreneurial Firms: Two Models of Strategic Momentum », *Strategic Management Journal*, Vol. 3, pp. 1-25
- MOM T.J.M., VAN DEN BOSCH F.A.J., VOLBERDA H.W., (2003),** « Managing concurrently The Processes Of Knowledge Exploration And Exploitation: The Influence Of Knowledge Exchange Determinants And The Introduction Of An Intranet », DRUID Summer Conference 2003, Copenhagen
- MUCCHIELLI A., (1994),** *Les méthodes qualitatives*, 2ème édition, PUF
- O'REILLY C.A., TUSHMAN M.L., (2004),** « The Ambidextrous Organization », *Harvard Business Review*, pp. 74-81
- PORTER M.E., (1980),** *Competitive Strategy*, Free Press
- RIVKIN J.W., SIGGELKOW N., (2003),** « Balancing Search and Stability: Interdependencies Among Elements of Organizational Design », *Management Science*, Vol. 49, Iss. 3, pp. 290-311
- ROMME A.G.L., (1996),** « A Note on the Hierarchy-Team Debate », *Strategic Management Journal*, Vol. 17, Iss. 5, pp. 411-417
- SANCHEZ R., MAHONEY J.T., (1996),** « Modularity, Flexibility, and Knowledge Management in Product and Organization Design », *Strategic Management Journal*, Vol. 17, Special Issue, p. 63-76
- SCHUMPETER J., (1935),** *Théorie de l'évolution économique*, 1999, Dalloz
- SHERAMATA W.A.,** « Centrifugal and Centripetal Forces in Radical New Product Development Under Time Pressure », *Academy of Management Review*, Vol. 25, Iss. 2, pp 389-408
- SIMONS R., (1987),** « Accounting Control Systems and Business Strategy : an Empirical Analysis », *Accounting, Organizations and Society*, Vol. 12, Iss. 4, pp. 357-374
- SIMONS R., (1990),** « The Role of Management Control Systems in Creating Competitive Advantage: New Perspectives », *Accounting, Organizations and Society*, Vol. 15, Iss. 1-2, pp. 127-143
- SIMONS R., (1995),** *Levers of Control*, Harvard Business School Press
- TUSHMAN M.L., O'REILLY C.A., (1996),** « Ambidextrous Organizations : Managing Evolutionary and Revolutionary Change », *California Management Review*, Vol. 38, Iss. 4, pp. 8-30
- TUSHMAN M.L., O'REILLY C.A., (1997),** *Winning Through Innovation: A Practical Guide to Leading Organizational Change and Renewal*, Harvard Business School Press
- TUSHMAN M.L., SMITH W.K., WOOD R.C., WESTERMAN G., O'REILLY C.A., (2004),** « Innovation Streams and Ambidextrous Organization Designs », Working paper, 63p.
- VOLBERDA H.W., (1996),** « Toward the Flexible Form: How to Remain Vital in Hypercompetitive Environments », *Organization Science*, Vol. 7, Iss. 4, pp. 359-374
- WILLIAMSON O.E., (1994),** « Strategizing, Economizing, and Economic Organization », in RUMELT R.P., SCHENDEL D.E., TEECE D.J., *Fundamental Issues in Strategy*, Harvard Business School Press, pp. 361-401
- WINTER S.G., SZULANSKI G., (2001),** « Replication as Strategy », *Organization Science*, Vol. 12, Iss. 6, pp. 730-743

Les effets de l'intégration régionale sur le processus de convergence réelle : étude comparative

By Deisting Florent (Docteur)
IRMAPE, ESC**PAU**

Abstract

This article proposes an analysis compared by the implications of the policies of regional integration about the convergence or the divergence of developing countries with regard to countries reference of each zone, in East Asia on the one hand and in the Mediterranean area on the other hand. The concept of globalization is already specified, however, we can notice that countries consider the globalization in a different way according to their geographical area and especially their culture. Indeed, Asian countries conceive the globalization only on multilateral way, that is why until very recently, no country of East Asia took part into preferential agreements. Multilateralism way chosen by the Asian countries did not have negative effects about the development of an intra-zone trade, favourable to a dynamics of convergence of incomes. By contrast (on an opposite way) Mediterranean countries, in the lineage of the European Union, have controlled their commercial / trade policies with the participation in several preferential agreements. The most remarkable among of all agreements is the protocol of Barcelona, which must lead to the creation of one free trade area by 2010 between the European Union and 12 countries of the Mediterranean area. We can see that in spite of an institutionalization of the commercial links between Mediterranean countries, the business intra zone remains weak or strongly dependent on a single partner: the European Union. While in East Asia we can observe a dynamics of real convergence which develops, in the Mediterranean area, the correction is more and more puffing.

Introduction

L'intégration régionale peut, si elle est bien menée, devenir un facteur déterminant au service de la relance et de la croissance à long terme des pays africains. C'est ce qui ressort d'une série d'exposés présentés lors de la Conférence économique africaine qui s'est tenue du 27 au 29 octobre 2010 à Tunis.

Cet article propose une analyse des implications des politiques d'intégration économique sur la convergence ou la divergence des pays en développement selon leurs zones d'appartenance. Depuis le début des années quatre-vingt-dix, nous sommes dans une période de mondialisation libérale, grâce au renouveau des expériences d'intégration régionale dans les zones en développement. Ces pratiques regroupent plusieurs formes, allant de la simple coopération sectorielles à l'union économique étroite. Ce retour en grâce du régionalisme peut s'interpréter soit comme une réponse au sentiment d'homogénéisation lié à la mondialisation, soit comme une exigence nécessaire à un meilleur rapprochement des pays en développement dans l'économie mondiale par une harmonisation des normes permettant une libéralisation multilatérale.

La mesure de l'effet de l'intégration entre nations s'est initialement basée sur une analyse en termes de création et de détournement de flux commerciaux (Viner, 1950)¹. La création de trafic accroît le bien-être en raison d'une substitution de la production nationale par des importations des pays partenaires à plus faibles coûts et d'une hausse de l'offre globale. A contrario, le détournement de trafic diminue le bien-être car les importations intra zone remplace des importations moins coûteuses du reste du monde.

Venables (2003), montre que l'AIR est performant en termes de convergence des niveaux de vie des pays membres, dans la mesure où il compte des pays à revenus élevés et des pays à revenus faibles. Ces derniers obtiendraient des gains de revenu en bénéficiant de la création de commerce. Or depuis quelques années, nous observons une augmentation importante du nombre d'accords régionaux entre des pays du Sud. C'est le cas, notamment, du Mercosur, des pays de la région MENA et des pays d'Asie du Sud et de l'Est qui ont retenu notre attention dans pour cette étude. Ce présent article participe au débat sur l'impact des AIR sur les régimes de croissance et la réalisation de processus de convergence entre les pays membres de différents AIR.

Sur le plan théorique, la libéralisation des échanges et des facteurs de production, en renforçant les interdépendances entre les économies, conduirait à la convergence économique, autrement dit, à l'égalisation à long terme du taux de croissance du revenu ou de la production par tête de différents pays ou régions. Dans la pratique, au sein des accords commerciaux régionaux, l'adoption d'un ensemble de politiques propres (diminution des barrières douanières, harmonisation fiscale,...) devrait permettre la mobilité des facteurs qui doit conduire une plus grande uniformisation de l'espace régional en question. Aussi, certaines alliances complètent les mesures politiques par l'introduction de « critères de convergence » (les ratios dette/PIB, déficit budgétaire/PIB, inflation, ...).

Cette étude s'inscrit dans une démarche comparative sur l'intégration régionale en Asie du Sud et de l'Est², entre les pays de la région MENA³ et entre les pays du Mercosur⁴. En effet, il paraît pertinent d'étudier en parallèle l'évolution de ces trois zones, dans la mesure où, il apparaît des différences de stratégies d'intégration au commerce importantes. La croissance de l'Asie du Sud et de l'Est sur plus de trois décennies a été un phénomène remarquable, alors même que l'institutionnalisation de l'intégration est faible. Les économies asiatiques ont privilégiées pour le développement une politique commerciale de valorisation des exportations, tout en maintenant un protectionnisme certain sur leur marché intérieur. Après la Seconde Guerre mondiale, l'Amérique Latine a essayé une stratégie économique tout à fait différente de celle de l'Asie du Sud et de l'Est, à savoir une substitution aux importations et une politique d'industrialisation de l'économie forte. Enfin, les pays de la région MENA ont favorisé les rapprochements à travers de nombreux accords, tout en maintenant des relations quasi-exclusives avec les économies de l'Union Européenne et les Etats-Unis.

(1) Il y a création de trafic lorsque l'adhésion à un Accord d'Intégration Régionale (AIR) accroît les échanges au sein de la zone sans réduire les flux commerciaux entre les pays membres et le reste du monde. Il y a détournement de commerce lorsqu'un accroissement du volume des échanges intra zone se fait au dépend du commerce avec le reste du monde.

(2) Cambodge, Chine, Corée du Sud, Hong-Kong, Indonésie, Philippines, Malaisie, Myanmar, Thaïlande, Singapour et Vietnam.

(3) MENA (Middle East and North Africa) : Algérie, Arabie Saoudite, Bahreïn, Egypte, Iran, Israël, Jordanie, Koweït, Maroc, Syrie, Tunisie et Turquie.

(4) Mercosur : Argentine, Bolivie, Brésil, Chili, Colombie, Equateur, Pérou, Uruguay et Venezuela. Le Paraguay a du être enlevé en l'absence de données sur la période.

A travers ses différences de stratégies, nous proposons d'étudier l'impact des relations commerciales intra zone sur la convergence des économies membres de chacune des régions retenues.

Nous présenterons tout d'abord un état des lieux de l'intégration régionale dans chacune des zones de références. Dans une deuxième partie, nous exposerons la réalité du phénomène de convergence pour chacune des régions entre 1950 et 2009. La troisième partie permettra de lier l'intégration régionale et la croissance à travers un modèle de convergence conditionnelle. Enfin, la conclusion reviendra sur les principaux résultats et proposera des pistes de recherches pour affiner les conclusions.

1. Etat des lieux de l'integration regionale

La nomenclature du commerce internationale est de nos jours pluri-scalaire, dans le sens où l'on observe un grand nombre de niveau, allant des accords multilatéraux (GATT, puis OMC) à l'échelle mondiale, régionaux au sens géographique, caractérisé par la proximité géographique des partenaires (Union Européenne, NAFTA, MERCOSUR, etc.) ou encore bilatéraux avec les signatures, de plus en plus nombreuses ces dernières années, d'accords entre deux partenaires, de niveaux différents (Accords Nord-Sud) ou pas (Accords Sud-Sud). Cette multitude d'accords préférentiels a permis à Jagdish Bhagwati la comparaison avec du *spaghetti bowl*.

Cette multiplication des types d'accords n'est pas nouvelle, en effet, le GATT prévoyait dès sa signature la possibilité d'une exception à la clause de la Nation la plus favorisée (clause NPF), en permettant la signature d'accords de libre-échange ou d'union douanière (article XXIV de l'accord).

L'objet de cette section est d'examiner les particularités de nos trois zones d'intégration sud-sud, à travers certains indicateurs tels que le poids économique, le taux d'ouverture, la répartition des échanges par partenaires, etc. en effet, toute volonté de comprendre davantage la dynamique de convergence ou de divergence réelle de ces pays exige au préalable, de mieux cerner les traits majeurs caractérisant les économies de ces trois zones en développement.

1.1 - Une vision du commerce différente

Les trois zones de références que l'on a retenues présente des comportements différents face aux échanges de biens et services. L'Asie du Sud et de l'Est est restée très longtemps en dehors du mouvement de signature d'accords commerciaux préférentiels, hormis la signature de l'ASEAN en 1967 (naissance d'une zone de libre-échange en 1992 avec l'Asean Free Trade Area). Les pays d'Asie se sont positionnés dans le cadre du système commercial multilatéral. Pour renforcer cette idée, dès le 1er janvier 1995, la plupart des économies asiatiques sont devenues membres de l'OMC (Brunei, Corée du Sud, Hong-Kong, Indonésie, Japon, Macao, Malaisie, Myanmar, Philippines, Singapour et Thaïlande, puis la Chine en 2001, Taipei en 2002, le Cambodge en 2004 et le Vietnam en 2007. Ainsi, a début du 21ème siècle, les pays d'Asie du Sud et de l'Est sont parfaitement intégrés dans le système commercial multilatéral, mais quasi-absent des accords préférentiels. Selon les travaux de l'Asean Development Bank Institute (Kawai et Wignaraja, 2007), en 2000 on recensait 3 accords de libre-échange pour les pays d'Asie du Sud et de l'Est, contre 36 en 2007. De même, en 2000 un accord est en négociation et 41 en 2007.

Les pays de la région MENA ont développé un régime d'intégration très politisé, avec à la base la signature de nombreux accords de deux types : Sud-Sud et Nord-Sud. Les accords Sud-Sud avaient essentiellement pour objectifs l'amélioration du bien-être, le renforcement des liens qui unissent les peuples des Etats membres, la réalisation ascendante de la libre circulation des personnes, des services, des marchandises et des capitaux et enfin l'adoption d'une politique économique commune visant à promouvoir

le développement économique et social des Etats membres. On dénombre principalement trois grands accords de coopération entre les pays de cette région, à savoir la Grande Zone Arabe de Libre-Echange (GZALE : 18 des 22 pays de la Ligue Arabe), l'Union du Maghreb Arabe (UMA : Maroc, Tunisie et Algérie) et le Conseil de Coopération du Golfe (CCG : Bahreïn, le Koweït et l'Arabie Saoudite, notamment). Les accords Nord-Sud (Euromed, l'accord de Barcelone, etc.) sont motivés par l'opportunité d'accès à des marchés importants (Union Européenne, Etats-Unis, essentiellement), mais également par la mise en place de procédure d'assistance financière communautaire, comme le programme MEDA et la Facilité euro-méditerranéenne d'investissement et de partenariat (FEMIP).

L'Amérique du Sud est une région traditionnellement portée sur le commerce extérieur. Dès les 15ème et 16ème siècles, on fait état d'une relation étroite entre l'Espagne et ce que l'on appelait alors le Nouveau Monde (Compagnon, 2005). La création du Mercosur en 1991 provient d'une volonté commune de renforcer les relations commerciales intra-bloc. Entre 1990 et 1997, le taux moyen de taxation des importations entre les pays d'Amérique du Sud est passé de 60% à 15% environ. Aujourd'hui, les pays d'Amérique du Sud multiplient les accords régionaux et sous-régionaux. En 2000, on dénombrait pas moins de 61 accords intra pour seulement 5 accords avec des pays tiers. Depuis, il y eu plus de signature d'accords avec des pays extérieurs à la région que d'accords intra (CEPAL, 2006)⁵.

Les processus d'intégration régionale diffèrent entre les trois zones de l'étude. Pour autant les performances en matière d'échanges de biens et services entre les pays d'une même zone sont-ils proportionnels au nombre d'accords en vigueur entre ces pays.

1.2 - La structure des flux commerciaux

Les trois régions retenues dans l'étude ne représente pas des poids lourds du commerce mondial (Tableau 1), par rapport aux Etats-Unis, à l'Union Européenne et au Japon qui réalise à eux trois plus des deux tiers des échanges dans le monde. Cependant, il convient de noter le poids croissant pris par les économies d'Asie du Sud et de l'Est depuis 1980, ainsi que la volatilité de la région MENA. Cette dernière peut être expliquée par une dépendance forte de ces économies vis-à-vis des hydrocarbures.

Tableau 1 : Poids de chacune des régions dans le commerce mondial

	1980	1985	1990	1995	2000	2005	2009
MERCOSUR	3,17%	2,56%	2,00%	2,53%	2,40%	2,49%	3,04%
MENA	6,33%	4,46%	3,39%	2,75%	2,84%	3,81%	4,47%
Asie du Sud et de l'Est	2,55%	2,75%	3,66%	5,67%	5,37%	5,13%	5,17%

Si les pays de l'échantillon restent des poids léger dans le commerce international, il n'en demeure pas moins qu'ils sont de plus en plus ouvert sur le monde (Tableau 2). Le taux d'ouverture d'une économie, qui mesure la place que tient le reste du monde dans l'économie d'un pays, permet d'évaluer le niveau de la contrainte extérieur qui pèse sur le pays. Le tableau 4 montre que les pays d'Asie du Sud et de l'Est sont extrêmement ouvert aux échanges internationaux, ce qui vient confirmer la présentation de la vision du commerce pour ces économies. Paradoxalement, les pays du Mercosur, qui affichaient des ambitions importantes lors de la signature de l'accord en 1991 obtiennent des résultats très mesurés. De la même manière, l'intégration régionale portée par de nombreux accords dans la région MENA semble ne pas donner entière satisfaction et maintient, dans une certaine mesure, les économies dans une relative autarcie, même si le taux d'ouverture de cette zone est supérieur à la moyenne observée pour le monde.

(5) On compte en 2006, 51 accords intra-régional et 17 accords extra-régional

Tableau 2 : Taux d'ouverture

	1980	1985	1990	1995	2000	2005	2009
MERCOSUR	26,8%	21,6%	17,6%	19,2%	24,0%	33,0%	34,9%
MENA	54,9%	45,4%	44,3%	44,0%	47,0%	61,6%	68,3%
Asie du Sud et de l'Est	90,4%	81,0%	112,7%	129,3%	161,8%	177,1%	169,9%
Monde	34,8%	30,9%	32,0%	35,0%	41,1%	47,2%	53,5%

Enfin, le point de départ de notre étude réside dans l'efficacité de l'intégration régionale et cela peut être appréhendé dans un premier temps par la description de la répartition des échanges par principaux partenaires (Tableau 3). Les pays d'Asie du Sud et de l'Est partent de l'hypothèse que les accords formels ne sont le garant de l'effectivité d'une intégration économique et réciproquement (Regnault, 2008). On peut constater pour les pays asiatiques une forte division du travail qui se retrouve matérialisée par des flux commerciaux régionaux intenses. Les exportations intra-zone pour les pays d'Asie du Sud et de l'Est représente 24,6% des exportations totales de la zone et même 42% si l'on ajoute le commerce avec le Japon. Le constat est le même pour les importations. L'intégration régionale est beaucoup moins marquée pour les pays du Mercosur, pour qui les Etats-Unis restent le premier partenaire (27,4% des exportations et 22,7% des importations) et surtout pour les pays de la région MENA, pour qui les flux commerciaux sont essentiellement dirigés vers l'Union Européenne (32% des exportations et 43% des importations).

Le constat d'un tel paradoxe a mis en évidence une analyse de l'intégration *de facto*, par opposition à l'intégration *de jure*. C'est-à-dire que l'on oppose une intégration commerciale qui se fait en dehors de tout cadre formel d'accords de libre-échange avec une intégration qui est le fruit de la mise en œuvre d'accords inter étatiques. Les analyses précédentes peuvent être expliquées par un certain nombre d'éléments. Tout d'abord, l'intégration *de facto* observée en Asie du Sud et de l'Est résulte des stratégies des firmes. En effet, le commerce international se fait entre voisins dans la mesure où il existe des complémentarités entre les pays proches géographiquement et que ces complémentarités sont entretenues par les stratégies des acteurs économiques. De ce point de vue, l'on pense que *keiretsu*⁶ japonais (Boulanger, 2006) qui ont joué un rôle important dans l'intégration *de facto*, en allant produire ou en faisant produire dans plusieurs pays de la zone. A l'inverse les économies de la région MENA sont caractérisées par d'importantes similitudes et n'ont pas bénéficié de la part des pays de l'Union Européenne, de l'aubaine offerte par les *keiretsu*. Les entreprises européennes délocalisant essentiellement des produits en fin de vie ou à faible valeur ajoutée. L'intégration entre les pays du Mercosur ne répond pas aux explications précédentes. Tout d'abord, l'existence de liens historiques entre certains pays membres et les pays de l'Union Européenne est une des explications avancées. De même, la spécialisation de certaines économies en fonction de leurs ressources naturelles, confèrent une certaine orientation aux échanges (cf. les exportations de pétrole du Venezuela). Mais surtout, les résultats modestes de l'intégration régionale proviennent d'insuffisances inhérentes au Mercosur : un système de règlement des différends peu efficace, une transposition des normes accordés par les accords lente, une faible institutionnalisation, une absence de collaboration, une bureaucratie excessive, des normes trop variées, etc. (Artigas, 2007.)

Tableau 3 : Répartition des échanges par principaux partenaires en 2009

	Union Européenne	Japon	Etats-Unis	Intra-zone	Reste du Monde
Exportations Mercosur	19,0%	3,7%	27,4%	21,0%	28,8%
Exportations MENA	32,4%	10,3%	12,2%	5,6%	39,6%
Exportations Asie du Sud et de l'Est	14,3%	10,5%	17,4%	24,6%	33,2%
Importations Mercosur	22,3%	3,8%	22,7%	26,2%	25,0%
Importations MENA	42,9%	4,6%	8,9%	7,2%	36,4%
Importations Asie du Sud et de l'Est	11,2%	15,9%	13,3%	23,3%	36,3%

(6) Les keiretsu sont des conglomérats, formés d'une multitude d'entreprises diverses, généralement liées entre elles par des liens financiers tissés à partir d'une banque. Cette banque dispose d'un contrôle important sur les entreprises du keiretsu, agissant comme une entité de surveillance et un prêteur de court-terme. Ces groupes disposent de sociétés de commerce, les sogo shosha, qui prospectent les marchés mondiaux. Les keiretsu s'appuient sur des réseaux de PME très dynamiques, sous-traitantes et parfois familiales.

2. Concepts de convergence et methodologie

Il existe plusieurs types de convergence et chacun impliquent différents tests. Les premiers travaux ont été axés sur des régressions en coupe transversale (approche traditionnelle), tandis que des travaux plus récents se sont concentrés sur la dynamique de la répartition des revenus. Ces méthodologies sont très bien décrites dans des recherches antérieures, ainsi il convient ici de ne les présenter que brièvement (voir Islam, 2003).

2.1 - Approche traditionnelle : β - et σ -convergence

y_{it} est le Produit Intérieur Brut réel par habitant pour l'économie i ($i = 1, \dots, N$), $\log(y_{i,t_0+T}/y_{i,t_0})/T$ est pour l'économie i le taux de croissance moyen du PIB par habitant entre t_0 et t_0+T , et $\log(y_{i,t_0})$ est le logarithme pour l'économie i du PIB par habitant à la période t_0 . Si nous estimons la régression univariée en coupe transversale suivante

$$\frac{1}{T} \log(y_{i,t_0+T} / y_{i,t_0}) = \alpha - b \log(y_{i,t_0}) + \varepsilon_{i,t_0,t_0+T}, \quad (1)$$

et que nous montrons que $b > 0$, nous pouvons dire qu'il existe une β -convergence absolue⁸ des PIB par habitant de notre échantillon. Cependant, ceci ne nous fournit aucune information au sujet de la dispersion du revenu. Par conséquent, il convient de considérer la variance du logarithme du revenu :

$$\sigma_t^2 = \frac{1}{N} \sum_{i=1}^N [\log(y_{i,t}) - \mu_t]^2, \quad (2)$$

où μ_t est la moyenne de $\log(y_{i,t})$. Noté que σ^2 peut être croissant même si $b > 0$. En outre, la β -convergence est une condition nécessaire mais non suffisante pour la σ -convergence.

Dans les graphiques 1 à 9, nous pouvons analyser la présence de la β -convergence entre les pays de nos trois zones respectives pour trois périodes. Sur l'axe horizontal, nous présentons le logarithme du PIB par habitant en 1950, 1970 et en 1990. Sur l'axe vertical, nous montrons le taux de croissance moyen entre chaque année de référence et 2009.

Une simple observation apporte plusieurs informations. S'agissant des pays d'Asie du Sud et de l'Est, il n'y a pas de processus de convergence global sur l'ensemble de la période d'étude, par contre il semble qu'il y ait une accélération sur les 20 dernières années. Les pays de notre échantillon du Sud et de l'Est de la méditerranée semble converger vers un niveau de PIB par habitant commun. Enfin, la β -convergence absolue observée entre 1950 et 2009 pour les pays du Mercosur, disparaît sur la dernière période pour laisser place à un processus de divergence. Les graphiques 10 à 12, confirment les observations précédentes en mettant en évidence des évolutions des dispersions des PIB par habitant différentes entre les zones, mais aussi non constantes.

(7) Où $0 < b < 1$, $b = \left(\frac{1 - e^{-\beta T}}{T} \right)$, ε , est le terme d'erreur avec des propriétés standard

(8) Sala-i-Martin (1990), Barro et Sala-i-Martin (1991, 1995) et Mankiw, Romer et Weil (1992) ont introduit le concept de convergence conditionnelle en incluant des variables additionnelles dans le terme de droite de la régression en coupe transversale.

2.2 - Approche de la dynamique de la distribution

Dans l'approche dynamique de la distribution, les chaînes de Markov permettent d'estimer les lois de probabilité des distributions. La mobilité intra-distribution peut être approchée par la stochastique de kernel et par les matrices de probabilité de transition. La probabilité de transition représente un modèle discret, alors que la stochastique de kernel est sa version continue. Le PIB par habitant observé pour chacune des économies est normalisé au niveau du PIB par habitant moyen de chacune des zones de l'étude. Les dynamiques de la distribution des revenus (F) peuvent être modélisées par un processus $AR(k)$,

$$F_{t+k} = M(F_t), \quad (3)$$

où F_t est la distribution en coupe au temps t , et F_{t+k} la même au temps $t+k$. M est la matrice de transition de F_t sur F_{t+k} . Le but est de trouver M qui détermine l'évolution de la distribution.

2.2.1 - Matrice de Probabilité de transition

Le nombre d'états choisis par le chercheur est arbitraire cependant, et les différents ensembles de discrétion peuvent mener à différents résultats (Bandyopadhyay, 2003 ; Bulli, 2001). Nous choisissons également une décomposition de quatre-quartile de la distribution, telle que chaque quartile explique 25% par habitant du PIB. Par exemple, (0.Q1) représente le quartile des revenus par habitant inférieurs. Dans le tableau 3, nous incluons l'évolution de la répartition des revenus entre différents états et la distribution ergodique pour les 16 économies liées à chaque période. Les données rapportent la proportion d'équilibre d'économies tombant dans les quatre états relatifs l'un des de revenu.

La matrice de probabilité de transition divise la distribution initial des revenus en intervalles discrets, appelés les « états de revenu ». Nous mesurons les dynamiques de transition des économies d'un intervalle de classe à l'autre, de la période t à la période $t+k$, pour $k \geq 1$. En tenant compte du nombre d'observations, nous avons retenu $k = 5$. Ces transitions sont exprimées en fréquence et peuvent être interprétées comme des probabilités de transition qui indiquent le pourcentage qu'a une économie de rester dans son état initial ou de migrer vers un autre état qui peut être supérieur ou inférieur, en matière de revenu. Dans une perspective de long terme, la matrice de transition permet d'approcher l'état d'équilibre (ou l'ergodicité) du système. L'ergodicité montre la réaction de la distribution sur le long terme si la dynamique perdure. Dans l'application de méthode des matrices de transition de Markov, il y a un point central qu'il convient d'évoquer. Le nombre d'états choisis par le chercheur est arbitraire et différents découpages peuvent conduire à des résultats différents (Bandyopadhyay, 2003 ; Bulli, 2001). Nous avons choisi une décomposition de la distribution en quartile, tel que chaque quartile représente 25% du PIB par tête. Par exemple $[0, Q_1]$ représente le quartile des revenus par habitant les plus faibles. Dans les tableaux 4 à 6, nous présentons les évolutions des répartitions des revenus entre différents états et les distributions ergodiques pour chacun des pays des trois zones étudiées à chaque période. Les colonnes donnent le pourcentage de pays appartenant à une classe et qui conserve le même revenu moyen ou qui changent de quartile cinq ans après.

Il apparaît à travers ce tableau qu'il n'y a pas de processus de convergence globale pour les pays de la zone Asie du Sud et de l'Est. L'équilibre de la distribution montre clairement un pic à l'extrémité, c'est-à-dire pour les plus bas revenus. La distribution ergodique affiche une certaine mobilité au milieu de la distribution, c'est-à-dire pour les valeurs hors de la diagonale de la matrice de transition. On peut parler de phénomène de polarisation. S'agissant des pays de la zone MENA, la mobilité est plus forte, même si là encore le mouvement est essentiellement dans les classes du milieu. On ne peut toujours pas parler de processus de convergence globale. Enfin, il apparaît une mobilité encore plus importante entre les pays du Mercosur, quelque soit la classe initiale. En effet, le vecteur ergodique montre que la probabilité d'atteindre une classe supérieure est relativement élevée dans les quatre intervalles de revenus. Ceci signifie qu'il ne peut y avoir de processus de convergence globale même à long terme. Cela vient appuyer l'existence de phénomène de polarisation.

Tableau 4 : Matrice de transition – Asie du Sud et de l'Est

Dév, en t+5	Déviation du PIB moyen en t			
	$[0-Qr1[$	$[Qr1-Qr2[$	$[Qr2-Qr3[$	$[Qr3-max]$
$[0-Qr1[$	0,9503546	0,1719745	0,0000000	0,0000000
$[Qr1-Qr2[$	0,0496454	0,7834395	0,1032258	0,0000000
$[Qr2-Qr3[$	0,0000000	0,0445960	0,8580645	0,0416667
$[Qr3-max]$	0,0000000	0,0000000	0,0387097	0,9583333
Ergodicité	0,6518766	0,1881829	0,0812812	0,0786593

Tableau 5 : Matrice de transition – MENA

Dév, en t+5	Déviation du PIB moyen en t			
	<i>[0-Qr1[</i>	<i>[Qr1-Qr2[</i>	<i>[Qr2-Qr3[</i>	<i>[Qr3-max]</i>
<i>[0-Qr1[</i>	0,7071823	0,1144578	0,0065359	0,0000000
<i>[Qr1-Qr2[</i>	0,2872928	0,5662651	0,1164706	0,0062893
<i>[Qr2-Qr3[</i>	0,0055249	0,3192771	0,7516340	0,0503145
<i>[Qr3-max]</i>	0,0000000	0,0000000	0,1241730	0,9433962
Ergodicité	0,0498233	0,1124860	0,2622784	0,5754124

Tableau 6 : Matrice de transition – Mercosur

Dév, en t+5	Déviation du PIB moyen en t			
	<i>[0-Qr1[</i>	<i>[Qr1-Qr2[</i>	<i>[Qr2-Qr3[</i>	<i>[Qr3-max]</i>
<i>[0-Qr1[</i>	0,8359375	0,0991736	0,0000000	0,0000000
<i>[Qr1-Qr2[</i>	0,1640625	0,7355372	0,1322314	0,0000000
<i>[Qr2-Qr3[</i>	0,0000000	0,1652893	0,7272727	0,1544715
<i>[Qr3-max]</i>	0,0000000	0,0000000	0,1404959	0,8455285
Ergodicité	0,1514475	0,2505390	0,3131738	0,2848397

Une analyse de la distribution des PIB par tête en temps continu va permettre de préciser et de confirmer ces résultats. La matrice de transition devient alors une stochastique de kernel.

2.2.2 - Stochastique de kernel

Nous n'allons plus considérer des états disjoints, mais une distribution qui va être estimée pour un grand nombre de classes. Cela s'apparente, ainsi, à une fonction de densité de probabilité. La stochastique de kernel mesure des probabilités de transition avec une grille plus fine et la fonction sera représentée par une surface en trois dimensions qui s'interprète comme la possibilité pour une économie de passer vers un rang supérieur ou inférieur, entre les périodes t et $t+k$. L'axe des abscisses représente les écarts par rapports à la moyenne en $t+k$, et sur l'axe des ordonnées nous retrouvons les écarts à la période t . Sur l'axe z , on obtient le tracé de la fonction de densité de transition liée à la stochastique de kernel. Il existe de nombreuses méthodes pour estimer la stochastique de kernel.

Hyndman, Bashtannyk et Grunwald (1996) proposent des modifications par rapport à l'approche traditionnelle des kernel conditionnelles (Nadaraya-Watson, 1964) en utilisant deux nouvelles méthodes pour représenter les densités conditionnelles, notamment les régions à hautes densités (HDR).

Dans cette représentation proposée par Hyndman et al. (1996), les pays les plus riches sont situés sur la partie haute du graphique et les plus pauvres en bas. Pour chaque pays, on a un découpage en quatre classes (25%, 50%, 75% et 90%). La classe des 25% étant la plus sombre et celle des 90% la plus claire sur la représentation graphique. Si les classes 25% et 50% coupent la diagonale des 45 degrés, alors on conclut que le revenu par tête du pays considéré n'a pas connu d'amélioration relative conduisant à un processus de convergence. Pour analyser la dynamique à l'intérieur de la distribution et la convergence sur l'ensemble d'une période les HRD sont très utiles (Arbia, Basile et Piras, 2006) ; Basile, 2006, 2007).

Sur le graphique 13, nous pouvons observer l'estimation des densités de kernel pour une période de transition de 5 ans. S'agissant des pays d'Asie du Sud et de l'Est, il y a une persistance de la situation. Entre deux périodes, on n'observe pas d'amélioration globale de la situation, hormis la formation d'un club de convergence pour des pays à revenu intermédiaire. La situation des pays de la région MENA est différente. En effet, on observe un processus de persistance concernant les pays les plus pauvres et la formation d'un club de convergence entre les pays à revenus intermédiaires. Enfin, les pays les plus riches ont vu dans l'ensemble leur revenu par tête relatif décliner. De la même manière, les évolutions des pays du Mercosur se situent essentiellement dans les pays à revenus intermédiaires (formation d'un club) et entre les pays les plus riches (club de convergence).

Graphique 13 : Régions de haute densité (HDR) de la dynamique du revenu relatif entre les pays d'Asie du Sud et de l'Est (a), les pays MENA (b) et les pays du Mercosur (c)

Cependant, même si l'apparition de clubs de convergence peut être montrée et décrite par la stochastique de kernel, elle ne peut pas être expliquée directement. En prolongeant la stochastique de kernel nous allons essayer d'identifier les facteurs qui peuvent induire ces rapprochements, et plus particulièrement les particularités d'intégrations régionales de chacune des régions de cette étude.

3. La convergence conditionnelle

L'approche traditionnelle de convergence conditionnelle consiste à ajouter des variables explicatives dans le terme de droite de l'équation de régression. Cela est justifié par l'intuition qui veut que ces variables devraient affecter à long terme les possibilités de croissance (Quah, 1995, p.22). De la même manière, parce que nous allons étudier la répartition des revenus, nous construisons des distributions conditionnelles.

Si on considère Y représente les observations du PIB par tête, la variable non conditionnée (au sens de Quah) (y) sera obtenue en rapportant le PIB par tête de chacun des pays à la moyenne de l'échantillon

($\hat{Y}$), soit $y = Y/\hat{Y}$ et la variable conditionnée est définie par $Y/\gamma = \hat{y}$, avec γ le terme qui conditionne.

Il existe deux principales méthodes pour analyser la relation entre le commerce et la croissance (Baldwin, 2003). Dans notre étude nous retiendrons principalement l'impact direct des flux commerciaux et plus précisément les flux bilatéraux entre les pays de chacune des zones.

La théorie économique identifie des canaux de transmission entre le commerce et la croissance économique (Frankel et Romer, 1999). Chuang (1998), Helpman et al. (1997) montre le rôle important joué par les flux commerciaux sur l'étude de la croissance. Par conséquent, nous considérons l'intensité des échanges entre les pays de chacune des trois zones, à savoir le commerce intra zone, comme un facteur important de l'analyse de la croissance économique.

Pour les pays dans chacune des trois zones, le commerce avec les partenaires de la zone joue un rôle important. Même si des clubs de convergence apparaissent, on peut supposer que le commerce présente une influence importante en fonction de l'intensité du commerce intra zone pour chacune des économies. Nous avons besoin d'une mesure de l'intensité du commerce bilatéral ou bien un indice du commerce bilatéral, qui peut être défini comme

$BTI_{i,j} = \frac{xm_{i,j}}{(xm_{i,z}) + (xm_{j,z})}$, où $xm_{i,j}$ représente les échanges (exportations et importations) entre le pays i et j , et $xm_{i,z}$ ($xm_{j,z}$) est le total du commerce du pays i avec la zone d'appartenance (Asie du Sud et de l'Est, MENA, Mercosur).

Pour chaque pays, nous avons créé un graphique de l'intensité du commerce bilatéral (Voir Annexe). La plupart des pays de chacune des zones maintiennent des relations commerciales privilégiées avec certains partenaires, ce que nous retrouvons dans la composition des groupes :

- **Pays d'Asie du Sud et de l'Est :**

- Chine, Corée du Sud, Hong-Kong, Indonésie, Malaisie, Philippines, Singapour, Thaïlande
- Cambodge, Myanmar, Vietnam

- **Pays de la région MENA :**

- Arabie Saoudite, Bahreïn, Iran, Jordanie, Koweït, Syrie
- Algérie, Egypte, Israël, Maroc, Tunisie, Turquie

- **Pays du Mercosur :**

- Argentine, Brésil, Chili, Uruguay
- Bolivie, Colombie, Equateur, Pérou, Venezuela

Les graphiques 14 à 16 présentent les résultats de la dynamique des revenus par tête conditionnés par l'intensité des échanges bilatéraux dans chacune des zones. Le graphique 14(a) montre qu'il existe une certaine relation entre la variable conditionnelle et la variable non conditionnelle. En effet, la plupart des valeurs de notre échantillon se situe au-dessous de la diagonale représentant l'absence de relation entre les deux variables. Le décalage s'accroît pour la partie la plus élevée de la distribution. L'intensité des échanges bilatéraux entre les pays d'Asie du Sud et de l'Est, retenu comme variable de conditionnement, a une influence sur la dynamique des revenus par habitants. Le graphique 14(b) représente la dynamique

de la variable conditionnelle à 5 ans. Il apparaît que la distribution diffère très peu de la distribution inconditionnelle (graphique 13(a)). Par conséquent, l'intensité des échanges influence certains pays mais ne fournit pas une variable explicative à la formation de clubs de convergence.

On peut avancer les mêmes conclusions pour les deux autres zones de notre étude (Graphiques 15 et 16). En effet, il semble qu'il y ait une relation entre l'intensité des échanges bilatéraux au sein des zones, pour autant, l'influence en terme de processus de convergence n'est pas évidente pour l'ensemble des économies des différentes zones. L'absence de convergence absolue et la formation de clubs de convergence semble devoir être expliqué par un autre facteur que l'intensité des échanges bilatéraux et donc l'avancée de l'intégration régionale de chacune des zones de l'étude.

Graphique 14 : Régions à haute densité (HDR) inconditionnelle/conditionnelle (a) et dynamique de la distribution conditionnelle (b) du revenu relatif des pays d'Asie du Sud et de l'Est

Graphique 15 : Régions à haute densité (HDR) inconditionnelle/conditionnelle (a) et dynamique de la distribution conditionnelle (b) du revenu relatif des pays de la région MENA

**Graphique 16 : Régions à haute densité (HDR) inconditionnelle/conditionnelle (a)
et dynamique de la distribution conditionnelle (b) du revenu relatif des pays du Mercosur**

Conclusion

Le commerce international est une source de croissance indéniable pour les pays développés, mais également pour les pays en développement. La multiplication de stratégie commerciale régionale s'effectue dans un contexte de négociations multilatérales bloquées au sein de l'Organisation Mondiale du Commerce. L'intégration régionale, en plus de favoriser des échanges de proximité, doit permettre de réduire les écarts de niveau de vie entre les nations parties prenantes de l'accord. Cependant, on a pu constater que les trois zones en développement de l'étude ne présentent pas le même comportement stratégique, en matière d'échanges de biens et de services. On a pu intégrer ces différences en mesurant les flux bilatéraux existant entre les pays de chacune des régions. En fin de compte il semble que les échanges bilatéraux ne puissent pas expliquer les différences de processus de croissance que l'on observe entre ces trois zones économiques.

Bibliographie

ARBIA, G., BASILE, R. and G. PIRAS (2006), "Analyzing Intra-Distribution Dynamics: A Reappraisal", ERS conference papers, European Regional Science Association.

BALDWIN, R.E. (2003), "Openness and Growth: What's the Empirical Relationship?", *NBER Working Paper*, 9578.

BANDYOPADHYAY, S. (2003), "Convergence Club Empirics: Some Dynamics and Explanations of Unequal Growth across Indian States", London School of Economics, Discussion paper, March.

BARRO, R. J. and X. SALA-I-MARTIN (1991), "Convergence Across States and Regions", *Brookings Papers on Economic Activity*, n°1, pp. 107-182.

BARRO, R. J. and X. SALA-I-MARTIN (1995), *Economic Growth*, New-York, McGraw- Hill.

BASILE, R. (2006), "Intra-Distribution Dynamics of Regional Per Capita Income in Europe: Evidence from Alternative Conditional Density Estimators", Paper presented at the 53rd North American meetings of the RSAI, November, Toronto.

BASILE, R. (2007), "Productivity Polarization across Regions in Europe", Institute for Studies and Economic Analyses, Rome.

BOULANGER E. (2006), A la conquête de la Chine, la nouvelle expansion des réseaux de production des keiretsu, in *Deblock et Renault*, 121-38.

BULLI, S. (2001), "Distribution Dynamics and Cross-Country Convergence: A New Approach", *Scottish Journal of Political Economy*, vol. 48, no. 2, pp. 226-243.

CHUANG, Y. (1998), "Learning by Doing, the Technology Gap, and Growth", *International Economic Review*, vol. 39, no. 3, pp. 697-721.

FRANKEL, J.A. and ROMER, D. (1999), "Does Trade Cause Growth?", *The American Economic Review*, vol. 89, no. 3, pp. 379-399.

HELPMAN E., DIXIT A. et GROSSMAN G.M. (1997), Common Agency and Coordination: General Theory and Application to Government Policy Making, *Journal of Political Economy*, University of Chicago Press, vol. 105(4), pages 752-69, August.

HYNDMAN, R.J., BASHTANNYK, D.M. and, G.K. GRUNWALD, (1996), "Estimating and Visualizing Conditional Densities", *Journal of Computational and Graphical Statistics*, vol. 5, no. 4, pp. 315-336.

ISLAM, N. (2003), "What Have We Learnt from the Convergence Debate?", *Journal of Economic Surveys*, vol. 17, no. 3, pp. 309-362.

KAWAI M., WIGNAJARA G. (2007), ASEAN+3 or ASEAN+6: wich way foreward? *Asian Development Bank Institute*, Discussion paper 77.

MANKIW, N G., ROMER D. and WEIL D. N. (1992), "A Contribution the Empirics of Economics Growth", *Quarterly Journal of Economics*, vol. 107, no. 2, pp. 407-37.

NADARAYA E.A. (1964), On estimating regression, *Theory of Probability and its Applications*, 9 (1), p. 141-142.

QUAH, D. T. (1995), "Convergence Empirics across Economies with (Some) Capital Mobility", London School of Economics, Center for Economic Performance, discussion paper no. 257.

REGNAULT H. (2008), Multilatéralisme et accords préférentiels : la fin de l'exception asiatique, *Monde en développement*, vol 36-2008/4-n°144.

SALA-I-MARTIN, (1990), *On Growth and States*, PhD thesis, Harvard University, Cambridge, M.A.

VENABLES, A. J. (2003), "Winners and Losers from Regional Integration Agreements", *Economic Journal*, vol. 113, pp. 747-61.

VINER J. (1950), The Custom Union Issue, *New York: Carnegie Endowment for International Peace*.

University Strategies for e-learning: Closing the Gap between Policy & Practice in the UK

By Stephen PLATT
 ESCPAU, Grande Ecole Programme Director

This Paper was written in 2009 as part of the Institute of Education
(University of London) MBA Programme in Higher Education Management.

Introduction

The pressures on Universities to adopt a strategic approach to using technology for learning and teaching (L&T) have been increasing since the 1992 MacFarlane Report (Lisewski, 2004) within a context of mainly policy-driven pressures. These political and economical drivers (Graham, 2007) include; management or managerial responses to Higher Education (HE) competition in a rapidly changing global environment (Lisewski, 2004; Salmon, 2005; Hanson, 2009), flexible modes of delivery as responses to the challenges posed by diversity (McNaught and Kennedy, 2000; Kirkwood, 2009) and the resulting diversity-efficiency dilemma (Waslander, 2007), customer satisfaction, market demand and demands for greater accountability (Hanson, 2009), or the benefits to the nation's industry through an improved graduate skill set (McPherson and Nunes, 2006).

Although many institutions have already incorporated e-learning into their institutional strategies rather than leaving it up to enthusiastic individuals (Hanson, 2009) or relying on uncoordinated approaches (Russell, 2008), there has been a general lack of success stories so far in the HE sector (Hedberg, 2006; Graham, 2007; Kirkwood, 2009; Russell, 2008). Most Higher Education Institutions (HEIs) are 'still struggling to engage a significant percentage of students and staff in e-learning' (Salmon, 2005), there is a 'great variability in terms of diffusion' (Nichols, 2008) and 'poorly developed and/or implemented e-learning policy' with most staff 'unable to define how policy and practices were connected in relation to e-learning' (Mansvelt et al, 2009).

This has contributed to the HEFCE Strategy for e-learning (2009) reiterating its policy-driven call (HEFCE Strategy for e-learning, 2005) for institutions to take a strategic approach to the use of technology. However, given that most Universities have been unsuccessfully following this directive, the issue is therefore whether institutions should indeed take a strategic approach.

Using Porter's (1996) 'What is Strategy?' framework, this paper discusses what is meant by a strategic approach and whether it is important to have one in the particular context of the use of technology for learning and teaching in a HEI. It analyses published work on the implementation of technology-enhanced teaching and learning strategies in HEIs and discusses how case study examples in the literature can inform practice on the challenges facing the HE sector. Examples are used from institutions in the UK, Europe, Australia and New Zealand.

It is argued that a strategic approach to the use of technology for L&T is desirable, yet difficult to achieve, since in addition to the challenge of formulating an e-learning strategy that is not flawed (Carroll and Mui, 2008), there are factors linked to the complexity of HEIs (Barnett, 2000; Lisewski, 2004) that make the implementation of an e-learning strategy difficult. In particular, it will be suggested that the organisational and institutional aspects of e-learning implementation are particular challenges (McPherson and Nunes, 2006).

In practice, changing the way thousands of teachers teach, learners learn, innovation is promoted and sustainable change in traditional institutions is achieved across hundreds of disciplines is a demanding endeavour that will not be achieved by learning technologies alone. It involves art, craft and science as well as technology. (Salmon, 2006).

Strategic Approach

In 'What is Strategy?' (1996), Porter suggests that strategic positioning involves organisations asking three fundamental questions about: 1) how they can actually pursue a different set of activities with regard to their competitors, and how these activities will deliver a unique mix of value, 2) whether these activities fit and are aligned with each other so as to be mutually reinforcing, and 3) what trade-offs and choices the institution should make in order to carry out the activities in the best possible way. It stands to reason that if a University is to allocate its valuable and increasingly scarce financial, human, time and infrastructure resources to e-learning *activities* - whether it be for internal or external / policy-driven reasons (Macias and Richter, 2009) -, then there ought to be considerable and sustainable (Nichols, 2007) benefits to the institution.

Much of the published work covering the strategic aspects of ICT for L&T tends to focus mainly on issues of implementation, suggesting that e-learning is perhaps largely viewed as a solution looking for a 'problem'. However, before considering the undoubtedly difficult challenges of implementation as one of the main reasons for the lack of success stories so far in e-learning in Universities, it should first be asked whether the strategies that Universities are actually implementing might be fundamentally flawed at the design stage (Carroll and Mui, 2008; Russell, 2009), if indeed they really have a strategy at all (Graham, 2007; Hanson, 2009; Lisewski, 2004; Mansvelt et al, 2009; Nichols, 2008).

For each of the three parts of Porter's (1996) framework for strategy, a short definition will be given. This will be followed by an analysis of how a strategic approach to the use of technology for L&T based on the framework might be beneficial to an institution, and finally some of the main obstacles that HEIs would face in the implementation stage.

1. Value creation through differentiation

'Competitive strategy is about being different. It means deliberately choosing a different set of activities to deliver a unique mix of value' (Porter, 1996). Porter also explains that in contrast to operational efficiency, which means 'performing similar activities better than rivals perform them', strategic positioning means 'performing different activities from rivals or performing similar activities in different ways'.

1.1 - Needs-Based Positioning

As an activity, e-learning is part of a wider L&T strategy, where for HEIs 'the key criteria for success remain success in the core business of teaching and research' (Shattock 2003: 28). It is therefore a reinforcing element enabling the L&T strategy to deliver unique value to the final customer, perceived in this case to be the student as a 'user' of education rather than a recipient of learning (Macias and Richter, 2009).

Achieving successful value creation through undertaking L&T activities differently to competitors requires the institution to have a keen understanding of the needs of its own students and a strong demand-driven focus on educational outcomes. In the case of e-learning, an approach of this kind will have the advantage of helping to make it clear to staff and students why they are undertaking it (Kirkwood, 2009). However, such a pedagogical focus runs contrary to the logic of the policy-driven strategic approach advocated by the HEFCE (2005; 2009) and its technological determinism criticised by the Glenaffric interim report (2008: 13-14). Indeed, outside the HE sector, bets on the wrong technology and technology dependent strategies has been identified as one of the 7 most common causes of strategy failure in companies (Carroll and Mui, 2008). Technology for competitive advantage is perhaps even more of a risky bet in a HE context, since the 'ever shifting nature' of technological change (Hedberg, 2006) is clearly opposed to the generalised inertia and resistance to change of 'bottom-heavy' institutions (Shattock, 2003: 154) often outpaced by local initiatives when institutional strategies are formulated quicker than they can be implemented (Macias and Richter, 2009).

This is not to say that the pedagogical challenge raised by e-learning is a lesser one. It challenges individual academic identity and presence (Hanson, 2009) and has the particularity of making (weak) teaching practices 'explicit and visible' (Kirkwood, 2009). This may not necessarily be of the individual academics responsibility in cases where institutions and departments have failed to support and reward innovative teaching (Kirkwood, 2009; Mansvelt et al, 2009: 240). It is made even more complicated by the fact that managerial perceptions of context and values will be expressed differently depending on the type of University (White, 2007), as in figure 1 below. But pedagogy has the merit of potentially uniting academics around the common theme of educational outcomes, even if collaboration and coordination do not always come easily in Universities and academics will not happily adhere to a top-down corporate vision without

the chance for discussion (McPherson and Nunes, 2006): above all 'it is the lack of discussion on the use of e-learning to improve pedagogy that causes considerable unease among academics' (Graham, 2007).

Figure 1: Comparison of typical managerial perceptions of context and values expressed in different institutions (White, 2007)

On the strategic challenge of understanding what the student needs or wants, Watson (2000: 7) regrets that students and their interests are often absent from institutional decision-taking, and Waslander (2007), suggests ironically that the pressures put on institutions by Governments to place individual student needs at the centre results in a diversity-efficiency dilemma that 'may cause many schools to adopt practices students never asked for'.

A further difficulty with the needs-based positioning advocated by Porter (1996) is that different categories of students in different categories of schools exist, for whom e-learning might work differently or might not work at all. 'Differences in needs will not translate into meaningful positions unless the best set of activities to satisfy them also differs. If that were not the case, every competitor could meet those same needs and there would be nothing unique or valuable about that positioning'. This causes two fundamental potential problems for institutions: firstly, there is a problem of scalability since no one solution will fit all (no matter how hard one tries), meaning that if Universities aim to satisfy all students this will be a huge strain on resources; and secondly, by trying to do this institutions run the risk of severely undermining their own competitive advantage.

However, there are clearly merits to a demand-driven strategic focus on e-learning as it encourages an institutional learning approach to pedagogical innovation (Davila et al, 2006: 209-216). London Metropolitan University (Cook et al, 2007) is an example of how a University incorporated the notion of learning into the implementation of an e-learning strategy by embedding the student voice in the innovation process. It was reported that this opened the institution up to new demand-driven ideas and contributed to a better understanding by staff (and students) on what the final user had to say, involved taking educated risks lead by the values of the students, was resource sensitive and favoured the incremental innovation that generally sits well within the culture of a University (Shattock, 2003: 29). Finally, it was also an important contributor to the sustainability of the programme as it enabled staff to keep up with changing student expectations and use of technology. Embedding the final user into the design process relates to issues of fit, alignment and sustainability dealt with later in this paper, and reflects Watson's comments on student and staff values being 'the greatest source of, and barrier to, change and innovation (2000: 66).

1.2 - Resource-based View

Much of the literature on e-learning in HE deals with the challenges faced by academics - although surprisingly little on non-academics -, and the difficulties faced by managers in dealing with this. A strategic approach focussing on value creation and differentiation is therefore of interest, since it sits well with a resource-based view of strategy such as that deployed at the University of Leicester (Salmon, 2005; Salmon et al, 2008). It is in its resources that the unique value of an institution mainly lies, and through which it can hope to be sustainably different since those resources will be hard to imitate.

The Massachusetts Institute of Technology (MIT) OpenCourseWare is a case in point. Looking from a product / process perspective, if the strategic advantage of the institution were to lie in the content (or product) of its courses, then these would not have been made freely available online. The real value ingredient for differentiation lies in the intangibles of L&T interactions (the process) and is not easily imitated. If competitors could simply copy any market position then they would not have put all of their e-learning content online. As the OpenCourseWare site says:

- OCW is not an MIT education.
- OCW does not grant degrees or certificates.
- OCW does not provide access to MIT faculty.
- Materials may not reflect entire content of the course.

However, one of the risks for overstretched and under-resourced Universities is that they have pedagogically weak scenarios (Kirkwood, 2009: 108). It is difficult for an institution to create value through something it is not good at.

This immediately raises a number of resource-linked questions, especially concerning professional development. Whereas the tendency has been for some institutions to deal above all with improving faculty's technical skills (Mansvelt et al, 2009), the University of Leicester, for example, has opted for e-learning professional development that is 'pedagogically driven' and 'rooted in disciplinary practice' (Salmon et al, 2008) by using a 'course design intervention' approach with a focus on pedagogy and which reassures academics that they are keeping control over their discipline. From a strategy point of view, professional development that focuses on pedagogy and is discipline-based makes sense because it looks to create value through the quality of its L&T activities.

Demands on academic time is a major obstacle to sustainable embedding of technology in L&T, since 'teaching competes with research and administrative duties' as mentioned in the study of the University of Leicester's e-learning programme (Salmon et al, 2008). Another example is the University of Southampton (White, 2007), where a successful 3-year project faded out as soon as funding was withdrawn, the main reason being that in a research-intensive institution academics were quick to make choices about which activities to not follow due to workload constraints. This is a reminder that change in HEIs is very much resource driven / dependent (Bamber et al, 2009: 186-187).

Finally, to retain and motivate the best resources in the institution in order to assure competitive advantage, appropriate reward systems will need to be in place as core capabilities have the property of quickly becoming core liabilities if they are not managed well.

1.3 - Organisational Issues

E-learning practice may be hindered or helped by institutional context, including culture, structure and systems, and even institutions with similar implementation strategies will get entirely different results due to the particular cultures of individual disciplines and the power structures within Schools (Nichols, 2008).

At the same time, even within the same institution, how technology is used and valued will vary greatly between teachers (Kirkwood, 2009). Figures 2 and 3 below show how different staff can have different technology adoption rates and needs related to e-learning projects. White's (2007) failed attempts at the University of Southampton in 'crossing the chasm to the mainstream' illustrates the risk of projects going no further than innovators or early adopters and never reaching the stage of institution wide value creation.

For Clark (2004: 88), University Departments can also take on these roles and as such strongly influence the uneven spread of innovation. For example, Science & Technology would be early adopters and the Humanities laggards, although there is probably a certain financial logic to this too.

Figure 2: Phases of technology take-up.
Adapted from McNaught and Kennedy (2000) and Davila et al (2006:126)

Early adopters	Mainstream
Like radical change	Like gradual change
Visionary	Pragmatic
Project oriented	Process oriented
Risk takers	Risk averse
Willing to experiment	Need proven uses
Self sufficient	Need support
Relate horizontally	Relate vertically

Figure 3: The differing needs of early adopters versus the mainstream (White, 2007)

2. Fit and alignment

For Porter (1996), strategic positioning choices are not only about what and how an institution performs e-learning activities, but also how they relate to other activities to gain sustainable competitive advantage. 'Strategy is about combining activities so that they complement each other', since 'Overall advantage or disadvantage results from all a company's activities not only a few', and 'Strategic fit among many activities is fundamental not only to competitive advantage but also to the sustainability of that advantage. It is harder for a rival to match an array of interlocked activities'.

2.1 - Collaboration, Coordination and Complementarities

For Shattock (2003: 25), 'Managing universities is a holistic process in which all the interlocking elements need to work together'. The integration of decisions and actions across many independent subunits should therefore encourage collaboration and coordination between staff members.

It is generally stated in the literature that academics have a strong disciplinary focus (Becher and Trowler, 2001: 1, Salmon et al, 2008), making it a challenge to achieve the levels of fit and alignment that will contribute to creating sustainable competitive advantage. However, Clark (2004: 86), reporting on the case of Chalmers University of Technology in Sweden, suggests that younger scholars are now challenging this widely accepted academic characteristic due to their higher loyalty towards projects than to either departments or institutions. This sort of attitude shift is clearly of potential benefit to the practice of pedagogical innovations such as e-learning as it indeed facilitates both collaboration and coordination of activities, especially within the younger generation of academics who are increasingly likely themselves to have already had first-hand experience of e-learning as learners. Furthermore, evidence from the University of Leicester suggested that collaboration between academics during their *CARPE DIEM* e-learning workshops was perceived -almost worryingly- as a 'valued change' (Salmon et al, 2008).

At the Royal Melbourne Institute of Technology (RMIT) in Australia, considerable funding amounting to \$A50 million was provided over a three year period to develop an Information Technology strategy to support the e-learning element of the institution's L&T strategy. This is an example of technology for the service of pedagogy rather than the tail of technological determinism wagging the educational outcome's dog.

At Oxford Brookes University, e-learning champions in each of the institution's eight academic schools were appointed (mostly early adopters) and subsequently asked to input to institutional strategy. As far as fit and alignment are concerned, this is a potentially powerful approach, since it creates a purposeful dialogue between top-down policy-driven strategic guidelines and the reality of academic practice. E-learning supported at School level as in the case of Oxford Brookes, also contributed to the sustainability of projects since it naturally involved more students and staff compared to isolated individual innovation (Sharpe et al, 2008).

The advantage of a strategic approach to e-learning is that it therefore encourages activities across the University to work in a coordinated fashion to achieve fit and alignment of key organisational complementarities, whereas traditionally efforts would have been managed separately and coordinated strategies lacking (Russell, 2009). Since complementarities are interdependent activities, without coordination of these activities then established L&T reasserts itself because teachers 'stay local' exposing the institution to the risk of not benefitting from any advances made in new learning technologies, and therefore wasting resources.

A further advantage of engaging staff in collaborative and coordinated projects is that it is a more collegial approach compared to the top-down prescription of strategic projects where it could be felt that e-learning was being done to them (Nichols, 2008). Also since tacit knowledge is shared only when people work together (Edmondson et al, 2003 in Russell, 2009), this once again raises the issue of sustainability of gains made in L&T.

2.2 - Alignment at all Levels

However, it is not simply a question of fit and alignment across activities as suggested in Porter (1996) and White (2007). It also requires alignment between different levels of the organisation to achieve a shared vision (Saunders, 2009: 93), alignment with organisational views (McPherson and Nunes, 2006) and also alignment with previous practices and sets of values (Trowler, 2009: 48). In particular, this last point resonates with Watson on the inescapable nature of an institution's history (2000: 39).

2.3 - Sustainability

E-learning must fit with all the activities of the institution if it is to add value and reinforce the differentiating elements of the overall vision. In terms of competitive advantage, strategic vision is the hardest thing for competitors to imitate because it involves a unique combination of activities in comparison to single best practices that have become easier to imitate, due for example to the use of consultants by organisations, benchmarking and outsourcing to the same third parties facilitating the spread of best practices from one client to the next (Porter, 1996). Imitation and homogeneity have become the norm, weakening competitive positions by making them less sustainable. This contrasts sharply with Clark's mantra that 'complex universities operating in complex environments require complex differentiated solutions. One hundred universities require 100 solutions' (2004: 183). The public part of the nature of Universities (Watson, 2000: 36) is an obvious disadvantage here. Shattock (2003: 30-31) suggests that although many corporate approaches to strategic management fit well with university culture, very few institutions have adopted these structures, which is a genuine barrier to effective strategic positioning, because of mainly what he calls 'a strongly top-down, non-participative, non-empowering style of management'. Fit and alignment cannot therefore be achieved without a commitment to collegiality and participation by senior management.

In Mansvelt *et al*'s (2009) study of e-learning strategies in five UK institutions, one of the major complaints from University staff was that 'infrastructure, policy, technological assistance and staff expertise were often poorly aligned causing them both confusion and frustration'. For Nichols (2008), if e-learning is not strategic it is not sustainable and it should be 'suitable for and sustainable within a given institution', and 'unless a state of institutional sustainability is achieved, it is likely that e-learning activity will in the long-term be limited to enthusiasts'.

Although the complex, challenging and changing nature of HEIs means that sustainability is likely to be a rather 'shifting achievement' (Nichols, 2008), a strategic approach that aims for fit and alignment is a good one for institutions faced with decreased funding and increased accountability, because if it can be done effectively it leads to lower costs and a more efficient use of valuable resources.

2.4 - Standardization

For Kirkwood (2009), as far as government policies and strategies are concerned, 'it has not always been obvious precisely how ICT was intended to support teaching and learning and a number of different agendas have been prominent in various contexts'. Indeed, learning technologies are embedded alongside a wide range of 'other processes that shape the university such as its regional, national and global context and the implementation of government policies such as widening access and participation, employer engagement, research and internationalisation' Macias and Richter (2009). HEIs are left to deal with what could be described as a solution looking for a problem among a wide and 'inescapable agenda' (Watson, 2000: 49).

The wider the agenda, the harder it is for an institution to find a fit that gives true competitive advantage and value through differentiation. The combination of State intervention and Institutions' inability to say 'no' inevitably results in standardization and almost automatic weakening of competitive strategic positions for all but the most entrepreneurial of Universities. This is captured nicely by (Shattock, 2003: 27),

'The funding council's priorities as demonstrated by its funding allocations must necessarily be the institution's own even though the allocations are designed to meet system-wide priorities rather than the priorities of any single institution'.

This point is developed further in the following section on trade-offs and choices.

3. Trade-offs and choices

'A sustainable strategic position requires trade-offs. A trade-off means that more of a thing necessitates less of another'. In addition, 'Trade-offs create the need for choice and purposefully limit what a company offers'. In brief, 'The essence of strategy is choosing what not to do'. (Porter, 1996).

3.1 - The State

Strategic positioning is desirable because it requires a tailored set of activities (Porter, 1996), which in turn requires expert resources that actively contribute to value creation. However, this causes strategic tensions for University managers in a context of reduced funding, pressure to follow a wide and 'inescapable agenda' (Watson, 2000: 49) and increased public accountability.

Given that one of the main preoccupations of external agencies' push for e-learning is cost-cutting (Marshall, 2008) it is paradoxical that the activity itself is so resource-intensive. Consequently, there is a potential risk of stifling innovation and ultimately harming an institution's competitive position. Furthermore, it is clear that e-learning alone cannot cope with the diversity-efficiency dilemma (Waslander, 2007) generated by the Government.

The HEFCE's policy-driven pressures to 'achieve the sector-wide strategies and aims they have set' (Macias and Richter, 2009) are pushing HEIs to attempt to 'compete in several ways at once', (Porter, 1996), and leads them to 'think that they can win in all of the markets all of the time' (Watson, 2000: 29).

The consequences from a strategic and organisational point of view are enormous. The messages sent to the market and to the institution itself are confusing and can have a negative impact on focus and motivation (Porter, 1996).

In such an unclear context for strategic positioning, the added impact of cuts in funding on financial stability has disastrous consequences for academic progress (Shattock 2003: 44), upon which an institution's competitive advantage should be built. The sector's concerns about this are clearly illustrated in the University of Leeds risk matrix in figure 4 below. Not only is this situation making differentiation an almost impossible strategic challenge, but it is also running the risk of Universities becoming mediocre at what they were initially good at and falling into a 'growth trap' (Porter, 1996) that further weakens their competitive position.

Figure 4: Risk Matrix taken from University of Leeds Annual Report and Accounts 2008/09

As far as e-learning is concerned, it therefore becomes important for Universities to ask fundamental questions about whether e-learning is very necessary for the type of institution they are (White, 2007). Choices will not be the same for research intensive compared to teaching focused universities. It is about doing the right thing for the right institution. For example, at the micro-level of e-learning, this could mean that 'not all disciplines and their subjects could be learnt and taught comfortably via a virtual environment' (Macias and Richter 2009: 14). Fortunately the choice for HEIs will rarely be a binary "e-learning vs. face to face learning" choice. Indeed, most HEIs have wisely followed a blended learning track, although there are examples of institutions with strong e-learning presences such as the University of Ulster. The risk for such institutions is to over emphasize their e-learning position and thus confuse potential students.

3.2 - Tailored Activities

The second trade-off mentioned by Porter concerns activities and is an important one for HEIs. Presuming that a University already has a strategic position 'Different types of activities require different product configurations, different equipment, different employee behaviour, different skills and different management systems' (Porter, 1996), making up a bundle of tailored activities. Although e-learning is fundamentally the same 'activity' as traditional learning, it is very different in terms of the resources required to do it successfully and requires additional and new resources and skills (Graham, 2007). These will inevitably come from the same sources due to the tightening of the HEFCE funding noose, and a strategic approach would involve managers making resource allocation decisions in order to reinforce the positioning chosen. However trade-offs in favour of e-learning means doing less of something else, which given the policy pressures of the HEFCE is not likely, or doing more with the same. The latter choice brings strategic and operational risks to institutions in that they will underdesign, destroy value and potentially harm their reputation and image.

3.3 - Positive Momentum & Leadership

Finally, trade-offs are necessary since they send clear and consistent messages to staff about organizational priorities, as long as leadership commitment is backed up by appropriate resource allocation decisions (Davila et al, (2006: 257). This is reflected in comments gathered from staff at Anglia Ruskin University (Macias & Richter, 2009), that technology-enhanced learning 'should have explicit values that would make it attractive to both staff and students'.

Making well calculated trade-offs means avoiding major risks and wasting increasingly scarce and valuable financial and human resources (Davila et al, 2006: 90). It is also important to realize that the real costs of e-learning will kick in at a later stage and not to ignore the transaction costs of innovation. These are likely to be often invisible to Funding Councils.

It will be necessary to protect the institution by not over extending, which means being able to quickly identify too much risk. This is facilitated by having sufficiently robust leadership systems that asks the important question of 'why' the institution is undertaking e-learning activities from the outset and to be continually asking it during the change process Davila et al, (2006).

A final and perhaps more personal difficulty for HE leaders making strategic choices and trade-offs, is that the impact of their decisions may not be seen within the life-time of their tenure. For example, at London Metropolitan University after 6 years in *attempting* to reach a tipping point in a mature e-learning project, their substantial investments are *starting* to have an impact (Cook et al, 2007). It wouldn't appear that there are many quick wins for managers to be had as regards e-learning. The temptation could be indeed to go for high impact systemic change and results. However, the reality is that at best only pockets of change seem to be initially achievable as in the case of Oxford Brookes University (Sharpe et al, 2006). The adapted version of the Bureau VERITAS "trois horizons" model in figure 5 for the introduction of new technology is likely to be the most appropriate. However, it may hurt senior managers to invest so much for initially such little return and accept that much of the success behind innovation is in their ability to make long-term strategic decisions (about choices, for example) and then let the project go according to institution, discipline and individual academic contexts.

Figure 5: The three horizons of e-learning projects. Adapted from Roulleaux Dugage (2007: 212).

Conclusion

The major conclusion to be drawn from this paper is that the weight of State policy-driven pressures on academic innovation in University L&T strategies is a very real threat to the competitiveness of UK HEIs, as illustrated by the case of e-learning. HEFCE's calls to deal with diversity in parallel with decreased funding and increased public accountability has lead to a diversity-efficiency dilemma that e-learning on its own can't solve.

There have been few examples of success stories in Universities, and any that do exist are limited to isolated pockets of excellence.

However, the HEFCE is not entirely to blame for the current state of HE e-learning in the UK, and it has been suggested in this paper that given the challenge of strategic positioning, flawed strategy design is one possible reason. Skilful strategic positioning that focuses on value creation and differentiation, alignment and fit with the other activities of the institution and effective trade-off decisions are certainly keys that would open up the door to successful strategy implementation. However the reality of University cultures, structures and contexts (including the role of the HEFCE) makes this an extremely challenging task.

In particular, it was noted that focuses on technology rather than pedagogy prevented institutions taking a demand-driven approach to their strategies, but where this did happen there were often excellent results. Equally, it was suggested that since the ultimate differentiating factor of an institution would lie in its expert staff resources, a resource-driven strategic approach would be beneficial. This would emphasize coordination and collaboration across departments with a view to sustainably embedding e-learning practices in the institution.

Finally, it was proposed that a major test for institutions in designing and implementing their e-learning strategies was their ability to make trade-offs and choices in spite of policy and financial pressures, and that this would primarily involve asking the question of why or how they should practice e-learning and then be able to decide on what the priorities were for the strategic vision of their organisation.

References

- Barnett, R. (2000).** *Realizing the university in an age of supercomplexity*. Buckingham, UK: Society for Research into Higher Education and Open University Press.
- Becher, T., Trowler, P.R. (2001).** *Academic Tribes and Territories*. 2nd ed. Buckingham, UK: Society for Research into Higher Education and Open University Press.
- Carroll, P.B., Mui, C. (2008).** "7 Ways to Fail Big" *Harvard Business Review*, September.
- Clark, B.R. (2004).** *Sustaining Change in Universities. Continuities in case studies and concepts*. Maidenhead, UK: Open University Press.
- Cook, J., Holley, D., Andrew, D. (2007).** *A stakeholder approach to implementing e-learning in a university*. British Journal of Educational Technology, 38 (5), 784-794.
- Davila, T., Epstein, M.J., Shelton, R. (2006).** *Making Innovation Work*. New Jersey, USA: Wharton School Publishing.
- Edmondson, A.C., Winslow, A.B., Bohmer, R.M.J., Pisano, G.P. (2003).** Learning how and learning what: Effects of tacit and codified knowledge on performance improvement following technology adoption. *Decision Sciences*, 34 (2), 197-223.
- Glenaffric Ltd. (2008).** *Review of the 2005 HEFCE Strategy for e-Learning. A report to HEFCE by Glenaffric Ltd.* Retrieved 23 October 2009, from http://www.hefce.ac.uk/pubs/rereports/2008/rd20_08/
- Graham, D. (2007).** *PESTE Factors in Developing a Framework for E-learning*. E-Learning, 4 (2), 194-201.
- Hanson, J. (2009).** *Displaced but not replaced: the impact of e-learning on academic identities in higher education*. Teaching in Higher Education, 14 (5), 553-564.
- Hedberg, J.G. (2006).** *E-learning futures? Speculations for a time yet to come*. Studies in Continuing Education, 28 (2), 171-183.
- Higher Education Funding Council for England (2005).** *HEFCE Strategy for E-learning*. Retrieved 23 October 2009, from http://www.hefce.ac.uk/pubs/hefce/2005/05_12/
- Higher Education Funding Council for England (2009).** *Enhancing learning and teaching through the use of technology. A Revised Approach to HEFCE's Strategy for E-learning*. Retrieved 23 October 2009, from http://www.hefce.ac.uk/pubs/hefce/2009/09_12/
- Kirkwood, A, Price, L. (2005).** *Learners and learning in the twenty-first century: what do we know about students' attitudes towards and experiences of information and communication technologies that will help us design courses?* Studies in Higher Education, 30 (3), 257-274.
- Kirkwood, A. (2009).** *E-learning: you don't always get what you hope for*. Technology, Pedagogy and Education, 18 (2), 107-121.
- Lisewski, B. (2004).** *Implementing a learning technology strategy: top-down strategy meets bottom-up culture*. ALT-J, 12 (2), 175-188.
- Macias Rivera, B., Richter, U.M. (2009).** *Which interests count? The university under pressure to keep abreast of national developments in technology-enhanced learning*. ELiSS, 1 (3). Retrieved 23 October 2009, from <http://www.eliss.org.uk/CurrentIssue/Papers/tabid/214/Default.aspx>
- Mansvelt, J., Suddaby, G., O'Hara, D., Gilbert, A. (2009).** *Professional development: assuring quality in e-learning policy and practice*. Quality Assurance in Education, 17 (3), 233-249.
- Marshall, S.J., Mitchell, G. (2007).** *Benchmarking International E-learning Capability with the E-Learning Maturity Model*. In Proceedings of EDUCAUSE in Australasia 2007, 29 April - 2 May 2007, Melbourne, Australia. Retrieved 23 December 2009, from http://www.caudit.edu.au/educauseaustralasia07/authors_papers/Marshall-103.pdf
- Marshall, S. J. (2008).** *What are the key factors that lead to effective adoption and support of e-learning by institutions?* In Proceedings of HERDSA 2008 (Rotorua, New Zealand, HERDSA). Retrieved 23 December 2009, from <http://www.herdsa.org.au/wp-content/uploads/conference/2008/media/Marshall.pdf>
- Massachusetts Institute of Technology (MIT) Open Course Ware.** Accessed 23 October 2009, at <http://ocw.mit.edu/OcwWeb/web/home/home/index.htm>
- McNaught, C., Kennedy, P. (2000).** *Staff development at RMIT: Bottom-up work serviced by top-down investment and policy*. ALT-J, 8 (1), 4-18.
- McPherson, M., Nunes, M.B. (2006).** *Organisational issues for e-learning. Critical success factors as identified by HE practitioners*. International Journal of Educational Management, 20 (7), 542-558.

- Meister-Scheytt, C., Scheytt, T. (2005).** The Complexity of Change in Universities. *Higher Education Quarterly*, 59 (1), 76-99.
- Nichols, M. (2008).** Institutional perspectives: The challenges of e-learning diffusion. *British Journal of Educational Technology*, 39 (4), 598-609.
- Porter, M.E. (1996).** "What is Strategy?" *Harvard Business Review*, November-December.
- Porter, M.E. (2008).** "The Five Competitive Forces that Shape Strategy?" *Harvard Business Review*, January.
- Roulleaux-Dugage, M. (2008).** *Organisation 2.0. Le knowledge management nouvelle génération*. Paris, France: Eyrolles Editions d'Organisation.
- Russell, C. (2009).** A systemic framework for managing e-learning adoption in campus universities: individual strategies in context. *ALT-J*, 17 (1), 3-19.
- Salmon, G. (2005).** Flying not flapping: a strategic framework for e-learning and pedagogical innovation in higher education institutions. *ALT-J*, 13 (3), 201-218.
- Salmon, G., Jones, S., Armellini, A. (2008).** Building institutional capability in e-learning design. *ALT-J*, 16 (2), 95-109.
- Saunders, M. (2009).** Theme 2 Commentary. In Bamber, V., Trowler, P., Saunders, M., Knight, P. (Eds.) *Enhancing Learning, Teaching, Assessment and Curriculum in Higher Education* (93-99). Maidenhead, UK: Open University Press.
- Saunders, M., Bamber, V., Trowler, P. (2009).** Making practical sense of enhancing learning, teaching, assessment and curriculum. In Bamber, V., Trowler, P., Saunders, M., Knight, P. (Eds.) *Enhancing Learning, Teaching, Assessment and Curriculum in Higher Education* (183-195). Maidenhead, UK: Open University Press.
- Sharpe, R., Benfield, G., Francis, R. (2006).** Implementing a university e-learning strategy: levers for change within academic schools. *ALT-J*, 14 (2), 135-151.
- Shattock, M. (2003).** *Managing Successful Universities*. Maidenhead, UK: Open University Press.
- Trowler, P. (2009).** Theme 1 Commentary. In Bamber, V., Trowler, P., Saunders, M., Knight, P. (Eds.) *Enhancing Learning, Teaching, Assessment and Curriculum in Higher Education* (48-54). Maidenhead, UK: Open University Press.
- Waslander, S. (2007).** Mass customization in schools: strategies Dutch Secondary schools pursue to cope with the diversity-efficiency dilemma. *Journal of Educational Policy*, 22 (4), 363-382.
- Watson, D. (2000).** *Managing Strategy*. Buckingham, UK: Open University Press.
- Watson, D. (2009).** The dark side of institutional research. *Perspectives: Policy and Practice in Higher Education*, 13 (3), 71-75.
- White, S. (2007).** Critical success factors for e-learning and institutional change – some organizational perspectives on campus-wide e-learning. *British Journal of Educational Technology*, 38 (5), 840-850.

Bank efficiency measurement using alternative techniques of frontier analysis: evidence from India

By

Muneesh Kumar*

Department of Financial Studies, University of Delhi,
& ESCPAU

&

Padmasai Arora

Department of Commerce, Keshav Mahavidyalaya,
University of Delhi,

*Corresponding author

Abstract

Banks need to target enhanced levels of efficiency in order to survive and grow in the present economic conditions. A quantitative assessment of the efficiency of banks in an economy proves to be crucial for formulating strategies for efficiency enhancements. The alternative techniques of efficiency measurement in banks are distinct in terms of construct and approach and thus may offer different results. The difference in the results may be considerable in the case of banking systems in emerging economies. This paper examines the efficiency in the Indian banking sector during the post reforms period 1991–1992 to 2006–2007 using two popular Frontier analysis techniques, namely data envelopment analysis (DEA) and stochastic frontier analysis (SFA), as alternative techniques of efficiency measurement. The paper offers evidence in support of conflicting results provided by the two techniques, though both indicate efficiency gains in the period of study.

Keywords: Indian banking; efficiency; stochastic frontier analysis; SFA; data envelopment analysis; DEA; frontier analysis and translog production function; India.

Reference to this paper should be made as follows: Kumar, M. and Arora, P. (xxxx) 'Bank efficiency measurement using alternative techniques of frontier analysis: evidence from India', *Afro-Asian Journal of Finance and Accounting*, Vol. X, No. Y, pp.000–000.

Biographical notes: Muneesh Kumar is a Professor at the Department of Financial Studies, University of Delhi (India). He is also the Director of the NCDEX DFS Center for Research in Commodity Markets. He has been the Dean in the Faculty of Business at University of Delhi. His responsibilities include teaching banking and information systems related courses to students of the Masters in Finance and Control (MFC) programme, and supervising research. In addition to his research in the area of banking and information systems, he has published several articles in international journals and presented papers in several international conferences. He has authored two books and co-edited three books.

Padmasai Arora is an Assistant Professor in the Department of Commerce, Keshav Mahavidyalaya, University of Delhi. She completed her doctoral research in the Department of Financial Studies, University of Delhi, South Campus. Her primary responsibilities include teaching finance and accounting related courses to undergraduate students at Keshav Mahavidyalaya, University of Delhi (India).

1. Introduction

Banks perform four economic functions in the process of intermediation namely, liability-asset transformation, size transformation, maturity transformation and risk transformation (Rangarajan, 1998). For this, they use scarce economic resources and hence, like any other economic entity, ought to optimise their input-output mix. Banks that reach the optimal input-output combination are called efficient banks. However, some banks use more inputs or produce less output (than warranted), giving rise to inefficiency. In order to address the problem of sub-optimality, efficiency measurement becomes indispensable.

Various efficiency measurement methods have been employed to measure efficiency in banks. Analysts and researchers have in the past used cost ratios to examine efficiency in banks. Cost ratios define efficiency in terms of spending on overhead, such as plant and bank personnel, relative to the amount of financial services provided by the bank with emphasis on cost cutting. However, reduced spending on labour, materials, or plant is no guarantee that a bank is being run efficiently, and high levels of spending on these items does not necessarily signal inefficiency. Moreover, excessive cost cutting may be detrimental for the banks as it may in fact, damage service quality, portfolio quality and earnings (DeYoung, 1997). There is also a high possibility that in the process of achieving the prescribed levels of cost ratios or 'efficiency', the banks might end up working at sub-optimal scale of operations resulting in an irrational allocation of resources thus, defeating the *raison d'être* of efficiency measurement.

Alternately, efficiency can be measured in terms of realised deviations from an idealised frontier isoquant as suggested by Farrell (1957), thus, making the empirical estimation of frontier function a prerequisite for efficiency measurement. There are numerous parametric and non-parametric techniques available for frontier estimation.¹

The two most popular techniques of constructing frontiers are data envelopment analysis (DEA) and stochastic Frontier analysis (SFA). The former constructs the frontier from the observed input-output ratios and involves mathematical programming. The latter defines the frontier through a functional form estimated using econometric methods. The two techniques are distinct in terms of construct and approach. In addition, the pace and impact of reforms in banking in emerging economies has been significantly different than those experienced by developed economies. There is, thus, a possibility of the two techniques giving differing results for the same data. A review of studies conducted in the past on bank efficiency shows that very few have made any serious attempt to investigate the appropriateness of the technique selected for measuring efficiency.

Majority of the studies pick up a technique of measurement at random and follow a simplistic analytical construct to justify the choice of technique. Important policy decisions are dependent on such measurement therefore, making it crucial to ascertain the appropriateness of the technique employed. Which of the two techniques is more appropriate for measuring changes in input-output relationship and hence, considered a more appropriate technique of efficiency measurement? The present paper attempts to seek an answer to this question based on evidence from Indian banking sector during the post reform period (1991–1992 to 2006–2007). The existence of limited empirical evidence about efficiency measurements using alternative techniques, particularly on Indian banking sector, and the amazing persistence of debate regarding the choice of measurement technique provide the major motivations for this study.

This paper makes two main contributions to the literature. First, as far as we are aware, there seems to be no study on bank efficiency measurement that first checks the appropriateness of the technique of measurement. This paper uses a new framework of investigating efficiency which involves two steps:

1. deliberate selection of the measurement technique
2. measuring efficiency.

(1) Ferrier and Lovell (1990) provide an excellent introduction to this literature.

Second, we try to validate our findings through economic reasoning, where earlier studies have failed to a large extent. To overcome these limitations, this study examines the efficiency of banks in India using two vastly used techniques namely, DEA and SFA.

After pondering on the suitability of the two techniques based on theoretical reasoning and empirical evidence, we selected DEA for measuring efficiency in the Indian banking sector. Also, instead of merely measuring and listing the results of efficiency movements, we substantiate them with other economic indicators.

This paper proceeds as follows. Section 2 provides an introduction to Indian banking sector, a conceptual framework of the concept of efficiency, literature review and methodology followed for measuring efficiency. In Section 3, efficiency measures are estimated for Indian banking sector using the two techniques of frontier analysis namely, DEA (non-parametric techniques) and SFA (parametric) for the period 1991–1992 to 2006–2007 and comparisons are made of the two techniques on the basis of the results so obtained. Section 4 presents the interpretation of efficiency changes experienced in Indian banking since 1991–1992 based on DEA efficiency scores.

2. Indian banking, efficiency, literature review and methodology

2.1 - Indian banking: a background

Post-independence, India went for a mixed economy giving public sector the dominant role in the economy. The aim was to become a self-sufficient welfare state. More than 40 years of 'protectionist' policies led to the creation of 'white elephants' in the public sector. Moreover, lack of 'real' competition led to the decline in the standards of production of goods and services. Banking, an important constituent of the financial system also faced the brunt of 'inward looking' policies. The infamous system of licensing, administered interest rates and excessive regulation stifled competition and prevented the Indian banking sector from rapid growth. It was in early nineties that Indian banks were gradually exposed to the rigours of domestic (new Indian private banks) and international (foreign) competition in both deposit and credit markets. The fall of 'protective' banking environment in early nineties thus, marked the emergence of 'market driven' banking in India.

Reforms have transformed the Indian banking environment in a number of ways. The noticeable changes include market-driven interest rate regime, opening of banking sector to private domestic players and foreign banks, and more transparency in accounting practices and financial reporting including prudential norms for asset classification and provisioning norms. But all these changes did not take place suddenly. These changes were spread out over a decade. In fact, the post reform period in Indian banking can be divided into two phases namely, Phase 1 (1991–1992 to 1997–1998) and Phase 2 (1998–1999 to 2006–2007). The first phase consisted of curative measures while the second phase involved preventive measures. The curative measures in Phase 2 included laying down of various norms relating to capital adequacy, asset classification, provisioning and risk management besides stricter supervision. The thrust of the preventive measures was on privatisation of banks and more stringent implementation of norms introduced in Phase 1. The underlying objective of the reforms in both the phases was to improve the efficiency of the banking system. The need to improve efficiency is considered all the more important because in the coming years, there would be greater presence of international players in Indian banking sector and some of the Indian banks would become global players (Indian Banks' Association Report, Banking Industry Vision 2010).

2.2 - Efficiency: a conceptual framework

Economists use the term efficiency in terms of usage of resources or inputs and often call it Pareto-optimality, or pareto-efficiency.² Simply stated, efficiency refers to the avoidance of wastage of resources. 'Economic' efficiency is attained if certain conditions are fulfilled. These conditions are identified in terms of 'productive' efficiency and 'allocative' efficiency (Lipsey, 1995). It is often observed that 'productive' efficiency ensures that any bundle of goods and services is produced at the lowest possible resource cost while 'allocative' efficiency ensures that the bundle of goods produced is an efficient one. Taken differently in the macro context, in terms of the production possibility curve (PPC), 'productive' efficiency ensures that the economy is on, rather than inside the PPC. 'Allocative' efficiency on the other hand, ensures that the economy is at a point on the curve that is optimal.

'Productive' efficiency requires that the output of any one commodity ensures the lowest possible opportunity cost in terms of the foregone outputs of other commodities. It can be achieved if two specific conditions are satisfied. They are:

1. each firm should be on, rather than above, its relevant cost curve
2. all firms must have the same level of marginal cost (MC).

An economy in which output is produced under conditions of perfect competition is said to be 'allocatively' efficient. This concept of efficiency, however, cannot be incorporated directly into a study of the banking sector as a whole or that of an individual bank. It is so because the available bank data is neither calculated nor predicted in terms of the theory of marginalism.

The modern approach to efficiency focuses on 'technical efficiency'. Technical efficiency refers to the ability to minimise input use in the production of a given output vector, or the ability to obtain maximum output from a given input vector, (Kumbhakar and Lovell, 2000). And failure to achieve the best possible output levels and/or usage of an excessive amount of inputs is termed as 'technical inefficiency'. Technical efficiency is a purely physical notion that can be measured without recourse to price information and without having to impose a behavioural objective on the producer (bank) and is appropriate for studying the efficiency of a service industry like banking. It can be evaluated with the help of frontier analysis. This involves efficiency computations relative to a 'frontier'. The 'efficient' frontier analysis removes the limitations of the ratio analysis (conventional treatment) and provides more appropriate scores of efficiency. The concept of efficiency is based on inputs and outputs. Therefore, to measure efficiency in banks, one must know inputs and outputs of banks. There is still no single definition of inputs and outputs of the banking firm. Table 1 provides a brief summary of the inputs and outputs used by various researchers in their endeavour at measuring efficiency in banks.

(2) This definition of efficiency was developed by the great Italian economist Vilfredo Pareto (1848–1923) who pioneered the study of efficiency of economic units.

Table 1: Summary of banking inputs and outputs applied by previous authors

Inputs	Outputs	Authors	Method	Study
Labour, machine, material, buildings	Demand deposits, time deposits, short-term loans, long-term loans, other services	Berg et al. (1992)	DEA	Technical efficiency (Norway)
Number of full time equivalent employees, fixed assets and premises & time deposits, saving deposits, demand deposits and other borrowed funds	Real estate loans, commercial and industrial loans, consumer loans, demand deposits and securities	Elyasiani et al. (1994)	Association model performance	Association between production and
Number of full time employees excluding temporary and members of B.O.D., premises and real estate, (deposits, CDs, call money, bills sold, borrowed money, foreign exchange)	Interest receipts on loans, and discounts and interest on bills purchased, revenues from investmentbusiness activities ofbanks	Fukuyama (1995)	Nonparametric Frontier Approach	Efficiency and productivity growth (Japan)
Capital (as a book value of machinery and equipment)	Total deposits, total loans, number of branches, guarantees given to customers	Bukh et al (1995)	DEA	Efficiency (Nordic)
Labour and physical capital	Loans and advances, fixed deposits, current deposits, and investments	Kumbhakar and Bhattacharya (1996)	SFA	TFP (India)
Interest expenses on deposits expenses on federal funds purchased and repurchased in domestic offices, salaries, furniture, buildings, and equipment and total deposits	Income on federal funds sold, allowances for loan losses, loans, net of unearned income	Brockett et al. (1997)	DEA	Performance (USA)
Labour and other materials	Deposits and loans overdrafts	Mendes and Rebelo (1999)	SFA	Productive efficiency, technological change and productivity
Number of employees, book value of physical assets, (demand deposits, time deposits, saving deposits, purchased funds)	Real estate, commercial and industrial instalment loans, payment liquidity and safe keeping	Al-Obaidan (1999)	Nonparametric	Economic Gain
Financial cost, operating cost	Interest and collected fees, stock and bond portfolio	Pastor (2002)	DEA	Efficiency and risk management (Spain)
Model 1 Staff employed, no. of bank branches current deposits, time deposits,	Model 1 Loan interest revenue, investment interest revenue, non-income interest revenue	Chen (2002)	DEA	Efficiency (Taiwan)
Model 2 Deposit interest expense, other interest expense, noninterest expense	Model 2 Portfolio investment, loan services	Chen (2002)	DEA	Efficiency (Taiwan)
Model 3 Staff employed, current deposits, time deposits, bank branches	Model 3 loan services, investment on government securities, investment on public and private enterprises and non-interest revenues	Chen (2002)	DEA	Efficiency (Taiwan)

Table 1: Summary of banking inputs and outputs applied by previous authors (continued)

Inputs		Outputs		Authors	Method	Study
Labour, machine, material, buildings		Demand deposits, time deposits, short-term loans, long-term loans, other services		Berg et al. (1992)	DEA	Technical efficiency (Norway)
Model 1	Fixed assets, number of employees	Model 1	Loans, liquid assets and investments, other income, deposits	Drake (2001)	DEA	Efficiency and productivity change (UK)
Model 2	Fixed assets, number of employees	Model 2	Loans, liquid assets and investments other income			

2.3 - Literature review

There is a vast pool of literature on bank efficiency around the world. These studies examine banking efficiency from numerous diverse perspectives such as effects of ownership, competition, mergers, bank failures and deregulation on efficiency in banks.

Two elements of literature that relate to the present study are: studies conducted on developing economies and efficiency measurement techniques employed by various studies.

1. As far as the issue of bank efficiency studies in developing economies is concerned, such literature is sparse. A survey by Berger and Humphrey (1997) of bank efficiency measures by region showed that only 3.5% of the studies were performed in developing countries, Paxton (2006). A more recent study by Kwan (2003) re-emphasised that banking efficiency research for US banks has been extensive as compared to that in developing countries which have been studied to a less extent.

Such few studies include those by Taylor et al. (1997) for Mexico, Al-Faraj et al. (1993) for Saudi Arabia, Zaim (1995), Isik and Hassan (2000, 2003), Denizer et al. (2000) for Turkey, Gilbert and Wilson (1998), Hao et al. (2001) for Korea, Kumbhakar and Lozerno-Vivas (2004) for Spain, Hardy and Patti (2001), Patti and Hardy (2005) for Pakistan, and Williams and Nguyen (2005) for emerging economies. Majority of these studies examined the impact of deregulation on public sector banks vis-à-vis private banks and foreign banks. Results from application of efficiency analysis suggests that deregulation of financials can either improve or worsen efficiency. It depends on industry conditions prior to deregulation, Kwan (2003), Herberholz (2002), and Menkhoff and Suwanaporn (2003). Indian banking has also undergone sweeping changes due to the forces of deregulation introduced in the early 1990s. Studies that have appeared in recent times, examine the effect of deregulation on efficiency. Prominent among them are those by Sarkar et al. (1998), Srivastava (1999), Sathye (2003), Bhaumik and Dimova (2004), Das et al. (2004), Bhaumik and Piesse (2004), Chakrabarti and Chawla (2005), Das and Ghosh (2006), Chatterjee (2006) and Mahesh and Rajeev (2007).

2. On the basis of efficiency measurement techniques, literature can be divided into three types:
 - a. studies that have used SFA
 - b. studies that have used DEA
 - c. studies that have used both the techniques.

Some of the prominent studies that have used SFA technique are the ones by Ferrier and Lovell (1990), Elyasiani et al. (1994), Kaparakis et al. (1994) and Zardkoohi and Kolari (1994) among others. Besides SFA, the other popular technique used to measure efficiency in banking

is DEA. In Sherman and Gold (1985) in their pioneering work applied DEA to banking and they evaluated the efficiency of a single cross-section of 14 branches of a US savings bank. Since then, DEA technique has been employed by numerous researchers to study bank efficiency. Some recent studies employing DEA methodology are Debasiah (2006), Halkos and Salamouris (2001), Jemric and Vujcic (2002), and Ozkan-Gunay and Tektas (2006), among others. The third type of methodology used is the use of both SFA and DEA on the same data set. There have also been only a handful of studies comparing the results of efficiency measurements using multiple techniques to test the robustness of the efficiency scores. Various efficiency techniques do not always yield consistent results.

Maindiratta et al. (1984) and Bowlin et al. (1985) were among the first to employ parametric and non-parametric techniques on artificial data and concluded that the results varied widely. Ferrier and Lovell (1990) were the first ones to use the two techniques to measure cost efficiency of 575 US banks for the year 1984. They found efficiency scores of the two techniques were not correlated significantly. Higher efficiency scores were obtained using with DEA (80%) compared to SFA (74%). The cost efficiency of Swiss banks was analysed by Sheldon (1994) for the period 1987 to 1991 using both DEA and SFA. He also found that results from DEA indicated higher average degree of cost efficiency than SFA. He too reported that there is no significant correlation between the efficiency scores obtained by the two techniques. A study by Fiorento et al. (2006) also reported that efficiency rankings across methodologies and samples shows only limited evidence that both techniques rank banks similarly. Bauer et al. (1998) also reported inconsistency in the results obtained from different techniques. They concluded that there is no single correct approach to specify the efficient frontier. Studies by Resti (1997), Casu and Giradone (2002) and Weill (2004) however, concluded that DEA and SFA results do not differ significantly. A study by Fiorento et al. (2006) on the cost efficiency of universal banks in Germany using SFA and DEA for the period 1993 to 2004 extended earlier findings which report differences between parametric and non-parametric efficiency scores. In India, Shanmugam and Lakshmanasamy (2002) utilised three approaches namely, non-parametric, stochastic frontier function and random coefficient approach to measure the efficiency of domestic banks but for a single year 1999.

A review of recent literature shows that earlier studies on bank efficiency on Indian banking suffer from a number of limitations:

- a.** As Indian banks are passing through a transition and measurement of efficiency for a single year can be misleading. It is therefore, desirable that the period of study is long enough to be able to distinctly trace the changes in efficiency levels.
- b.** Majority of the earlier studies failed to use a multi-input multi-output model for estimation and used multi-input and single output model specification³. Even a recent study by Mahesh and Rajeev (2007) estimated the impact of liberalisation on efficiency of Indian banks using a single output translog specification and constructed three separate output efficiency frontiers. This issue can be dealt with by using the concept of distance functions that is capable of addressing the problem of multiple outputs of banking industry. The present study makes use of distance functions and incorporates multiple outputs of banks in the translog production function model specification to measure efficiency.
- c.** More importantly, most of the earlier studies used a single technique for the measurement of efficiency whereas it has been observed that application of more than one technique may give significantly different results. None seems to have been conducted recently on efficiency in Indian banking sector employing both parametric and non-parametric techniques of efficiency measurement using banking data over a period of time. The present study on bank efficiency in India, therefore, attempts to circumvent the above-mentioned gaps.

(3) The issues in the measurement of inputs and outputs in banking industry have been excellently discussed by Mlima and Hjalmarsson (2002).

2.4 - Sample and dataset

The banking sector in India consists of three types of banks, namely, domestic public sector banks, domestic private sector banks and foreign banks. The sample for the present study comprised of 27 state-owned Indian banks, 15 Indian private banks and 12 foreign banks aggregating to 54 banks. For the purpose of this study, all commercial banks that have continued their existence in India since 1991–1992 to 31st March 2006–2007 were included in the sample. The number of such banks was 54. Merged banks, new banks and those banks that ceased to exist during the period of study were dropped for the purpose of uniformity.⁴ The study relates to the period beginning with the initiation of banking sector reforms in India starting from the year 1991–1992 and covers 16-year period till 2006–2007. Data was balanced panel data and the number of observations amounted to 864. The secondary data used in the study was obtained from the official database archived and accessible from the Reserve Bank of India's (central bank of India) website (<http://www.rbi.org.in>). This is the most authentic source of statistics on Indian banking.

To define inputs and outputs of a bank, intermediation approach was followed. The three inputs included for estimating the efficiency scores were wages, fixed assets and deposits. Investments and advances were considered as outputs. The intermediation approach was considered more appropriate by the present study for examining the efficiency in banking industry because the primary function of banks is to intermediate inputs x_n into outputs y_m . Input variables and outputs included in the two models for the efficiency calculations were common. Table 2 lists the input and output variables. The three inputs included for estimating the efficiency scores were 'wages' or labour (X_1), 'fixed assets' or capital (X_2) and 'Deposits' (X_3) whereas, 'investments' (Y_1) and 'advances' (Y_2) were considered for modelling.

Table 2: Input and output variables

Inputs	Outputs
X_1 = Wages (labour) Wages refer to payments made to employees but exclude provisions.	Y_1 = Investments Investments include those in: 1 Government securities both in India and outside India, 2 Approved securities 3 Non-approved securities. Advances include: 1 Bills purchased and discounted 2 Cash credits, overdrafts, etc. 3 Term loans.
X_2 = Fixed assets (capital) Fixed assets excludes other assets.	Y_2 = Advances Advances refer to bills purchased and discounted, secured and unsecured advances, cash credits, overdrafts, loans, repayable, lease receivables, term loans.
X_3 = Deposits Deposits include: 1 Demand deposits 2 Savings bank deposits 3 Term deposits	

(4) There were 85 scheduled commercial banks operating in India as on 31st March 2008.

Indian banking sector has been dominated by public sector banks ever since the bank nationalisation in 1969. These banks accounting for large share of deposits and advances as market leaders are able to influence decisions about liquidity and rate variables in the system.⁵ Table 3 illustrates the dominance of public sector banks with the help of mean sizes of inputs and outputs. The dominance of the public sector banks is highlighted further by standardising the input and output variables of private banks and foreign banks by the mean values of public sector banks. The results are presented in Table 3.

Despite the differences in magnitude of the input and output variables, the state owned (public) and private sector banks compete not only with each other but also with foreign banks, necessitating a comparative study of these banks. Table 4 shows that private banks use only around 10%, 18% and 13% of wages, fixed assets and deposits (inputs) to produce around 12% of investments and 13% of advances as compared to public sector banks. Foreign banks on the other hand, use around 10%, 35% and 13% wages, fixed assets and deposits (inputs) to produce around 15% of investments and 19% of advances (outputs) in comparison to public sector banks.

Table 3: Input and output variables by banking group: 1991–1992 and 2006–2007

Variables	Output or input	Public banks	Private banks	Foreign banks	Total
Investments	Output (Y1)	1,293 (78.70)	154 (9.40)	196 (11.90)	1,643 (100)
Advances	Output (Y2)	1,684 (76.16)	216 (9.77)	311 (14.05)	2,211 (100)
Wages	Input (X1)	59 (84.30)	5 (7.14)	6 (8.56)	70 (100)
Fixed assets	Input (X2)	33 (67.95)	5 (10.20)	11 (21.85)	49 (100)
Deposits	Input (X3)	3,009 (78.93)	404 (10.60)	399 (10.47)	3,812 (100)

Notes: Figures are in averages in Rs. Crore. Figures in parenthesis show percentages.

Table 4: Standardised values of variables in relation to public sector banks

Variables	Output or input	Standardised values		
		Public banks	Private banks	Foreign banks
Investments	Y_1	1	0.1193	0.1516
Advances	Y_2	1	0.1284	0.1850
Wages	X_1	1	0.0973	0.1064
Fixed assets	X_2	1	0.1814	0.3471
Deposits	X_3	1	0.1345	0.1329

2.5 - Methodology

Different authors have used different techniques for measuring efficiency in banks as these techniques have their own merits and demerits. Estimation of frontier function is at the centre of studies on efficiency measurement. There are two competing techniques on how to construct frontiers. As stated earlier, the two most popularly used techniques to measure efficiency are DEA and SFA. DEA is a non-parametric method which uses linear programming. SFA on the other hand is a parametric method and uses regression. Both the techniques employ frontier analysis⁶ of data.

(5) Report on Trend and Progress of Banking in India 2001–2002

(6) In frontier analysis, the frontier forms the basis for describing the input-output relationship in a bank. It shows the deviations of each bank from the efficient frontier.

Applying the frontier analysis to banks, technical efficiency scores may be estimated. Technical efficiency of banks operating in India was measured using SFA and DEA. The traditional production specification assumes a single homogeneous output model. Banks, however, do not produce a single homogeneous product. It is possible to adapt the techniques developed for the estimation of a stochastic production function frontier in the single-output case to the estimation of a stochastic output distance function in a multiple-output case. Hence, a stochastic specification of banks is needed to incorporate multiple inputs and outputs. The ordinary regression technique does not provide such estimation of more than one output. To overcome this problem, distance functions can be used.

In order to incorporate multiple inputs and multiple outputs the present study followed the methodology used by Murthy and Surender (2000) and estimated a stochastic output distance function given as follows:

$$D_o = f(X, Y, a, b) + e,$$

where D_o is the distance measure, $f(\cdot)$ is the production technology, X is a vector of inputs, Y is a vector of outputs, a , b are vectors of parameters to be estimated, and e is the additive error term. This model was estimated using the translog (transcendental logarithmic) functional form given as follows:

$$\ln D_o(x, y) = \alpha_o + \sum \beta_n x_n + \sum \alpha_m \ln y_m + 1/2 \sum \sum \beta_{mn} (\ln x_n) (\ln x_n) + 1/2 \sum \sum \alpha_{mm'} (\ln y_m) (\ln y_{m'}) + \sum \sum \gamma_{nm} (\ln x_n) (\ln y_m)$$

where x and y are respectively, $N \times 1$ and $M \times 1$ vectors of inputs and outputs of banks. This equation was estimated it using the FRONTIER 4.1 program by Coelli (1995).

Further, technical efficiency scores were estimated for each bank for each year estimated assuming an output oriented variable returns to scale DEA model, using a program called DEAP Version 2.1: A DEA (computer) Program by Coelli (1996).

3. Efficiency measurement: comparing DEA and SFA

This section compares the results of efficiency estimates obtained by employing DEA with those employing SFA Frontier model for the 16 year period from 1991–1992 to 2006–2007. The data and specifications used in the DEA model served as a comparison point for the alternative model. The aim was to ascertain the appropriateness of the technique in the context of an emerging economy like India.

DEA and SFA have different merits and demerits.

1. DEA is non-parametric, which means that the danger of imposing a wrong functional form is avoided, SFA on the other hand, requires assumptions about the production function form and the distribution of the random error and inefficiency terms.
2. DEA can easily handle multiple inputs and outputs as opposed to the usual stochastic frontier formulation.
3. DEA requires no or little price information.
4. DEA requires no or little technological information since it makes few assumptions about the technology structure.

5. DEA can identify best practice firms. Moreover,

“the production frontier in DEA includes only the efficient units whereas the production function estimated by SFA is formed by the average of both efficient and inefficient units. While the non-parametric DEA method regards all deviations (including errors and imperfections) from the frontier to constitute a loss of efficiency, the SFA attempts to decompose such differences into inefficiency and noise by making explicit assumptions about the inefficiency component’s distribution. Thus, the SFA procedure only analyses differences in efficiency measured in relation to the optimal frontier which – with an unbiased estimate – are independent of exogenous shocks that are beyond the control of the bank’s management.” (Sengupta, 1989)

In order to compare the two techniques, three consistency checks were employed to test the two sets of results in terms of:

1. efficiency scores
2. relative rankings of sample banks
3. ability to identify high efficiency level and low efficiency level banks.

The results are given below.

3.1 - Efficiency scores

Across the whole sample, the mean efficiency for the 16 year period according to DEA was 92.88% while efficiency averaged 92.70% for SFA. The minimum efficiency score identified by DEA was 84.7% as compared to 91.83% by SFA. Table 5 provides the comparative statistics of efficiency distribution of DEA and SFA efficiency scores.

Table 5: DEA and SFA efficiency distribution: a comparison

Characteristic	DEA	SFA
Mean	0.9288	0.9270
Max	1	0.9342
Max – Mean	0.0712	0.0072
Min	0.847	0.9183
Std. Dev.	0.0435	0.005
C.V.	0.0469	0.0054
Skewness	– 1.1236	– 0.2774
Kurtosis	– 0.1126	– 0.9689
Q1	0.9155	0.9239
Q2	0.946	0.9275
Q3	0.9623	0.9309

The maximum efficiency score under DEA is of course 1 for a bank which is among the efficient banks in the sample whereas, under SFA, the frontier envelops the data points representing the various banks with no bank in the sample being studied operating on the frontier. Thus, a bank outside the sample is assu-

med to be efficient and operating on the frontier. The maximum efficiency score under SFA is 0.9342. A comparison of the efficiency scores under the two techniques may not be fair because of the difference in the estimation of the frontier.

However, comparisons would be justified if done on the basis of categorisation of banks in the sample into different efficiency levels. Thus, it was considered appropriate to classify banks into three categories on the basis of efficiency scores (irrespective of their ownership type) namely, high efficiency level banks, medium efficiency banks and low efficiency banks. The average efficiency scores for the purpose of such classification were divided as follows. In the case of DEA, since the average efficiency scores ranged between 0.847 and one (a range of 0.15), it was decided to make three class intervals of 0.5 each. The banks with efficiency score greater than 0.95 were categorised as high efficiency level banks, banks with efficiency scores between 0.9 and 0.95 were classified as medium efficiency level banks and banks with efficiency scores less than or equal to 0.90 were classified as low efficiency level. In case of SFA, the average efficiency scores ranged from 0.882 to 0.949 (a range of 0.067). Three class intervals were made of 0.022 each. The three intervals were namely, 0.882 to 0.904 (low efficiency levels), 0.904 to 0.926 (medium efficiency levels) and 0.926 to 0.948 (high efficiency level).

Table 6 shows the number of banks in each category. In case of DEA, 24% of banks belonged to the category high efficiency level banks, 19% were low efficiency level banks and 57% were medium efficiency level banks. Majority of the banks were medium efficiency level banks. Under SFA, these figures were 67%, 6% and 27% respectively. It may be concluded that the distribution of efficiency levels was more symmetrical in the case of DEA. SFA on the other hand provided an extremely skewed distribution and puts majority of the banks under study in the category of high efficiency level banks.

Table 6: Bank efficiency levels – DEA vs. SFA: a comparison

Efficiency levels	DEA – number (%)	SFA – number (%)
High efficiency level	13 (24)	36 (67)
Medium efficiency level	31 (57)	15 (27)
Low efficiency level	10 (19)	3 (6)
Total	54 (100)	54 (100)

As can be observed, the distribution of sample banks is more symmetrical in the case of DEA. In order to have an insight into the correlation between the efficiency scores estimated using DEA and SFA, two correlation coefficients were calculated. Firstly, the correlation between the average efficiency estimates for the entire period of study given by DEA for each bank and the average efficiency estimates given by SFA was calculated. Similarly, the average efficiency scores given by DEA for each year were correlated with those given by SFA. Table 7 shows that Karl Pearson's correlation coefficient between average efficiency scores of all 54 banks both bank-wise and year-wise. It may be observed that the correlation coefficient, though positive in sign, were extremely low at 0.001 and 0.122. Thus, it may be concluded that there is no significant correlation between the DEA efficiency scores and SFA efficiency scores.

Table 7: Karl Pearson's correlation coefficient – DEA and SFA

Particulars	Bank-wise	Year-wise
Correlation coefficient	0.001	0.122
Sig. (2 tailed)	0.992	0.3
N	54	16

The sign of the correlation coefficient was, however, positive though the degree of correlation is low in both the cases. The scattered points in Figure 1 show that there seems to be no significant correlation between the efficiency estimates obtained using DEA and SFA when both bank-wise and year-wise average efficiency scores were plotted on the scatter diagrams. Thus, a significant difference is observed in the average efficiency scores estimated by the two competing techniques i.e., DEA and SFA. Next, an effort was made to find out if there is any correlation between bank rankings based on efficiency scores under DEA and SFA.

Figure 1: Correlation between efficiency scores obtained using DEA and SFA (see online version for colours)

3.2 - Identification of top ten and bottom ten efficient banks

In order to compare the results from the two techniques a list of sample banks were arranged in order of the efficiency scores computed using DEA and SFA. A list of the top ten banks as rated by each of these techniques based on their computed efficiency scores is presented in Table 8.

Similarly, the banks with least ranking based on efficiency scores estimated by use of these techniques are presented in Table 9.

Table 8: Top ten efficient banks DEA vs. SFA

DEA	SFA
Indian Bank	South Indian Bank Ltd.
Indian Overseas Bank	Bank of Maharashtra
Barclays Bank Plc.	State Bank of Bikaner and Jaipur
Karnataka Bank Ltd.	Citibank N.A
Dhanalakshmi Bank Ltd.	Dhanalakshmi Bank Ltd.
South Indian Bank Ltd.	Bank of Tokyo Ltd.
State Bank of Travancore	Ratnakar Bank Ltd.
Bank of Baroda	Bank of Rajasthan Ltd.
Abu Dabhi Commercial Bank Ltd.	Bank of Nova Scotia
Oriental Bank of Commerce	Catholic Syrian Bank Ltd.

Table 9: Lowest ten efficient banks DEA vs. SFA

DEA	SFA
Vijaya Bank	Nainital Bank Ltd.
City Union Bank Ltd.	Bank of Bahrain and Kuwait B.S.C.
State Bank of Mysore	Barclays Bank PLC
Union Bank of India	City Union Bank Ltd.
State Bank of Indore	Bank of India
Citibank N.A.	Standard Chartered Bank
State Bank of Bikaner and Jaipur	ABN AMRO Bank N.V.
Ratnakar Bank Ltd.	Bharat Overseas Bank Ltd.
Bank of India	American Express Bank Ltd.
Allahabad Bank	Central Bank of India

As can be observed from these tables, there is little consistency between the rankings given by DEA and SFA regarding the top and bottom scorers so far as efficiency scores are concerned. The list of most efficient banks as suggested by DEA is entirely different from the one given by SFA with the exception of one bank (South Indian Bank). In the case of lowest ten efficient banks, the two techniques could identify only two common banks namely, Union Bank Ltd. and Bank of India.

3.3 - Efficiency rankings

It may be interesting to note that there is a possibility of the two techniques giving similar results if the relative rankings of banks are used for interpretation instead of efficiency scores as done above. Hence, Spearman's rank correlation coefficient was calculated to test this possibility.

Table 10: Spearman's rank correlation coefficient – DEA and SFA

Particulars	Bank-wise	Year-wise
Spearman's rho	– 0.021	0.109
Sig. (2-tailed)	0.878	0.88
N	54	16

Table 11: Correlation: DEA and SFA

Year	Pearson's	Spearman's
1991–1992	0.116	0.138
1992–1993	0.129	0.039
1993–1994	(0.208)	(0.181)
1994–1995	(0.148)	(0.09)
1995–1996	0.069	0.124
1996–1997	(0.006)	(0.129)
1997–1998	0.154	0.054
1998–1999	0.047	0.10
1999–2000	0.051	0.007
2000–2001	0.153	0.062
2001–2002	0.134	0.182
2002–2003	0.202	0.209
2003–2004	0.185	0.176
2004–2005	0.166	1.46
2005–2006	0.017	(0.047)
2006–2007	0.214	0.248

Table 10 presents the result of Spearman's rho between average annual efficiency of DEA and SFA. Correlation coefficients were calculated both for mean bank efficiency scores and for mean annual efficiency scores obtained under SFA and DEA. The sign of rho is positive but the value is extremely low. Spearman's rank correlation coefficient for banks between DEA and SFA rankings is also very low and insignificant. In fact, it has a negative sign which means that DEA and SFA give opposite rankings. A bank, which is ranked among the top performers under DEA, will be ranked among the low performers under SFA. This shows that there is a significant difference in the rankings obtained by the two competing techniques i.e., DEA and SFA. However, one needs to remember that the period under study covers 16 years (1991–1992 to 2006–2007) during which significant changes took place in the Indian banking sector. Using average efficiency scores to arrive at conclusions may give rise to misleading results. Therefore, it was considered appropriate to re-examine the period of study by calculating the correlation coefficients, both Pearson's and Spearman's for each year. Table 11 provides the results of the calculations.

As may be observed from Table 11, none of the coefficients were found to be significant. Not only were the correlation coefficients very low, some of them were negative in sign indicating a complete lack of consistency among the efficiency scores between those given by DEA and SFA.

When the estimated efficiency scores obtained under DEA and SFA were plotted graphically, a marked difference in the movement of efficiency levels during 1991–1992 to 2006–2007 under the two techniques could be observed. Figure 2 traces the trend in the efficiency scores for Indian banking sector during the 16-year period of study. The broken line shows the trend as per the efficiency scores obtained using DEA and the unbroken line shows that obtained using SFA.

Figure 2: Trend of efficiency scores over 1991–1992 to 2006–2007: DEA and SFA (see online version for colours)

The period 1991–1992 to 2006–2007 represents the era of reforms in the Indian banking sector. In order to facilitate proper analysis of the impact of reforms on the Indian banking sector, this period was bifurcated into two sub-periods, namely:

1. Phase 1: first generation reforms⁷ (1991–1992 to 1997–1998) hereafter referred as Phase 1
2. Phase 2: second generation reforms⁸ (1998–1999 till date i.e., 2006–2007) hereafter referred as Phase 2.⁹

There has been a phenomenal transformation in the Indian banking sector since 1992 due to the reform process, which included changes in the regulatory norms, use of information technology and changes in market structure. This undoubtedly brought about changes in the functioning of banks resulting in a changed input-output mix of banks which would have brought about variations in efficiency levels of banks. The graph shows that SFA based efficiency scores were more consistent over the years with very small variations as can be seen from the difference between the maximum score and the mean score. DEA based efficiency scores on the other hand, were characterised by more jumps and higher variations giving a jagged appearance to the trend. These variations in the efficiency levels of banks during the period of study were more pronounced under DEA. Under SFA, the variations in the efficiency scores were minimal. This is in spite of the fact that there have been structural changes in the Indian banking sector during the period of reforms and such changes are expected to bring corresponding changes in levels of efficiency. These results may be attributed to the possible presence of the specification error in SFA. Specification error is related to the inability of the model to reflect and respect the real characteristics of the industry under study. This risk may be avoided if the model is able to adapt to data instead of relying excessively on arbitrary assumptions. In this sense, non-parametric techniques such as DEA are by nature superior in terms of flexibility. Hence, the flexible structure allowed by DEA may compensate for the fact that it does not allow for noise (Syrjanen et al., 2006). Moreover, it is not always an easy task to pick up the right structural relationship for the noise term in case of banking sector of emerging economies undergoing transition.

(7) Based on Narasimham Committee Report (1991) (NCR I), Reserve Bank of India

(8) Based on Narasimham Committee Report (1997) (NCR II), Reserve Bank of India

(9) The reforms were introduced in India in two phases to avoid the adjustment problems faced by banks in the new environment.

The three consistency tests show that there is a high degree of inconsistency in the results provided by DEA and SFA. The choice of the technique has to be careful keeping in mind the features and suitability of the two techniques. DEA is considered to be the most effective way to evaluate the efficiency and it has been largely used in many applied works since its development (Luciano and Regis, 2007). An added advantage of using DEA is its suitability in case of quasi-pricing systems where government provides the services. It may, thus, be concluded that in emerging economies like India, DEA may be preferred for efficiency measurement of banking sector.

4. Efficiency measurement using DEA

This section investigates the efficiency movements experienced in the Indian banking sector with regard to the efficiency measurements by employing DEA. The period of study is the post reform period. As the architect of these reforms, Narasimham (1998) had pointed out that the reforms in the Indian banking sector can be classified into two phases: The first phase consisted of the curative measures, which were brought about for making the banking sector more oriented to the market and impart competition to the environment. The second phase consisted of the preventive measures, which were brought about to ensure smooth functioning of the banking sector in the long run. The primary curative measures included the reduction of reserve requirements, interest rate deregulation and lifting of entry barriers. Other important measures introduced in this category included prudential reforms in terms of following capital adequacy norms as well as adhering to well-defined asset classification and provisioning standards.

Supervisory and regulatory reforms were introduced to ensure transparency and adequate risk management practices were made mandatory. The thrust of the preventive measures was primarily on privatisation and government stake was reduced to 30%. The establishment of asset reconstruction companies was envisaged and capital adequacy norms were made more stringent. Besides these, there was an endeavour to convert 'weak banks' into 'narrow banks' and changes were also brought about in wage negotiations.¹⁰

Accordingly, the period of study has been divided into two sub-periods. The first sub-period spans from 1992–1993 to 1997–1998 while the second spans from 1998–1999 to 2006–2007.

Table 12: Summary results of efficiency of banks in Phase 1 (1991–1992 to 1997–1998)

Items	Mean for the period	1992-93	1993-94	1994-95	1995-96	1996-97	1997-98
No. of banks studied	-	54	54	54	54	54	54
Average efficiency (M)	0.898	0.847	0.854	0.848	0.924	0.945	0.969
Average inefficiency	0.116	0.18	0.17	0.18	0.08	0.06	0.03
Std. dev. (6)	-	0.17	0.20	0.18	0.07	0.05	0.04
No. of efficient banks	-	22	22	23	16	17	21
% of efficient banks	-	40.74	40.74	42.59	29.63	31.48	38.89

Notes: Average inefficiency is calculated by $(1-M)/M$. M refers to average efficiency.

No. of efficient banks refers to those banks that are on the efficiency frontier.

(10) Ownership Effects on Bank Performance: A Panel Study of Indian Banks, Bikram De, Fifth Annual Conference on Money and Finance in the Indian Economy, IGIDR, Mumbai 2003

4.1 - Phase 1 (1992–1993 to 1997–1998)

The efficiency scores for all the 54 sample banks for the period of Phase 1 of banking reforms (1992–1993 to 1997–1998) are presented in Table 12.

As may be observed from Table 12, the average efficiency score of all the 54 banks taken together in this period was 0.898. It implies that the outputs of the banks could be increased on an average by 10.20% without increasing the inputs further. The mean inefficiency decreased from 11% in 1992–1993 to 3% in 1997–1998. Also, the standard deviation of the mean efficiency scores decreased from 0.20 in 1993–1994 to 0.04 in 1997–1998 implying a more uniform or homogeneous distribution of efficiency scores of banks in the later part of Phase 1 of reforms. The number of banks operating on the efficient frontier was 14 amounting to 26% of the total banks studied. This figure increased in the later years to 23 by the year 1994–1995 amounting to 43% of the sample banks being efficient in that year. It would be interesting to note the individual break up of the mean efficiency scores of banks during this period. There was increased asymmetry between the banks with regard to their efficiency levels as only 14 banks out of the 54 sample banks could reach the efficiency frontier as may be observed from Table 5.

This would also imply that the average bank if operating on the efficiency frontier instead of at its present (virtual) location would produce 10% more output utilising the same inputs. The efficiency frontier was constructed for 14 banks. Half the foreign banks constructed the frontier. After the introduction of the first phase of reforms (preventive measures) in 1992, this scenario changed in the subsequent years. The number of efficient banks rose rapidly resulting with more than 40% of all banks being efficient in 1992–1993 to 1994–1995. After this, in 1996–1997, the number of efficient banks decreased to 17 amounting to 31.48% of all banks being efficient. The situation improved in 1997–1998 with 21 banks (38.89%) operating on the efficiency frontier.

Figure 3 Mean efficiency movements in Phase 1

It may be concluded that the average efficiency of the Indian banking sector has improved during the first phase of reforms from 0.847 in 1992 to 0.969 in 1997–1998. However, the impact of the reforms on the average efficiency was felt in the later years of reform process during Phase 1. The improvement in the mean efficiency levels was also accorded by decline in the standard deviation. This would mean that the improvement in the efficiency levels was wide spread. It would also imply that the efficiency levels have become fairly uniform during the last two years of Phase 1 of reforms. If this improvement is the consequence of the reform process, we may also conclude that there was a lag of two years by the reforms to significantly influence the efficiency levels as shown by Figure 3.

The drop in the efficiency scores in 1993–1994 may be attributed to two factors. The Indian banking sector, which is a part of global banking, had to bear the brunt of the global banking crisis experienced by banks during this period. The advent of the 1990s witnessed a wave of banking crises in developing countries.

These ranged from bank meltdowns in many transition countries in the early 1990s (triggered by macro economic instability).¹¹ In 1992, for the top 200 banks in the world, profits declined by 11%, deposits did not show any increase and loans rose by a meager three and a half percent. American banks could recover from the crisis only in 1993. Be it the British banks or the Japanese banks or the Scandinavian banks or for that matter the banks in the Far East, all had to face the forces of competition during this period. The Scandinavian banking industry was deregulated in the latter half of the 1980s. As a result, the banks found themselves free to determine their own lending growth leading to increased lending. This resulted in a surge in real estate and other asset prices leading to a speculative real estate price bubble. The real estate bubble was then suddenly burst at the beginning of the 1990s by a real interest rate shock caused partly by an international rise in real interest rates (often interpreted as a result of Germany's unification) and partly by misplaced expectations of rise in asset prices. The Indian banks too on the threshold of challenges and competition took time to emerge out of the global crisis.

The second factor that could be behind the drop in efficiency of banks during 1992–1993 and 1993–1994 relates to the opening up of the Indian economy through structural reforms at home itself. As a part of the restructuring, the interest rates on deposits were completely overhauled with the banks given the freedom to fix the interest rates on domestic prime lending rates (PLR) to spur healthy competition and cost consciousness among banks. Banks could no longer book income if it was not received for two quarters. Earlier, banks not only booked income on an accrual basis, but also paid income tax on it. Alongside came the provisioning norms.

Major steps were taken to improve the efficiency of the banks as mobilisers and allocators of capital. The government moved away from the earlier system of pre-empting a large portion of bank resources for the budget at artificially low rates of interest and government borrowing was done at market determined rates of interest. This eliminated what was once a heavy implicit tax on the banking system and enabled the banks to offer more attractive interest rates to depositors and to charge lower interest rates to good quality borrowers. Freedom given to banks to fix interest rates enabled them to discriminate among borrowers according to their track record. The introduction of prudential norms also forced the banks to improve the quality of their asset portfolio. The broad direction that 40% of advances must go to the priority sector remained in place but the new norms ensured that banks would look for credit-worthy borrowers in all categories. These changes were accompanied by major efforts at improving banking technology including the introduction of computerisation.¹³ These steps taken as part of the reform programme resulted in changes in the valuation of various input and output variables. By the end of Phase 1, there was a marked improvement in efficiency with which banks converted the inputs into outputs. This is reflected by the higher efficiency score of 0.969 in 1997–1998.

(11) *The Anatomy of Banking Crises* by Rupa Duttagupta and Paul Cashin IMF Working Paper, International Monetary Fund 2008

(12) Staffan Viotti (2000)

(13) 'Economic Reforms for the Nineties', Montek Singh Ahluwalia (I Raj Krishna Memorial Lecture, 1995), University of Rajasthan

4.2 - Phase 2 (1998–1999 to 2006–2007)

In the background of the South East Asian crisis and keeping in view the BASEL Committee's recommendations, the Narasimham Committee Report (1998) suggested further reforms (curative measures) in the Indian banking sector which included higher capital risk adjusted ratio (CRAR), stricter non-performing assets (NPA) norms, introduction of asset liability management (ALM) and risk management guidelines.

Table 13 presents the summary results of the efficiency scores of banks in Phase 2. In Phase 2 too, there was again a lag of one year by the reforms to significantly influence the efficiency levels and in 2000–2001, the mean efficiency of the Indian banking sector again improved to 0.947. By 2001–2002, the mean efficiency reached a high of 0.966.

The average efficiency score during Phase 2 was 0.954 and ranged between 0.920 to 0.970 and the standard deviation of the average efficiency scores also remained fairly low ranging from 0.04 to 0.06 for all the years except for 2002–2003. In Phase 2, the efficiency frontier was constructed for 21 banks. This number varied in the other years and ranged from 17 to as many as 27 banks. The number of efficient banks varied between 32% (approx.) to 50%. One half of the sample banks were efficient in 2006–2007. Standard deviation of efficiency scores of banks in Phase 2 was low and ranged between 0.04 and 0.09 implying that the banks in Phase 2 were more homogeneous in terms of their efficiency scores.

The number of banks operating on the efficient frontier was 19 in 1998–1999 amounting to 35.19% of the total banks studied. This figure increased in the later years to 24 (44.44%) in 2001–2002 and by the year 2006–2007, 50% of the banks studied were operating on the efficient frontier. Figure 4 traces the trend of efficiency in Indian banking sector in Phase 2. Towards the end of the nineties the efficiency of the Indian banking sector dipped. The mean efficiency that had improved to 0.969 in 1997–1998 dropped to 0.951 in 1998–1999 and to 0.937 in 1999–2000. This decrease in the efficiency may be attributed to the aftermath of the South East Asian crisis in the later part of the nineties.

Figure 4 identifies two points of decline in the efficiency of Indian banks in Phase 2 represented by points A and B. The efficiency scores started declining from 1998–1999 after the introduction of Phase 2 of reforms and reached a low of 0.937 in 1999–2000 (point A). The decline in the efficiency may be attributed to restructuring in the banking sector as a consequence of the reform programme. Moreover, the impact of the restructuring on the Indian banking sector as a whole was neither uniform nor equally penetrating. Different banks responded with different degrees of adaptation and implementation contributing to different levels of efficiency with the overall impact of decline of efficiency during the period 1998–1999 to 2000–2001.

Table 13: Summary results of efficiency of banks in Phase 2 (1998–1999 to 2006–2007)

Items	Mean for the period	1998 1999	1999 2000	2000 2001	2001 2002	2001 2003	2003 2001	2004 2005	2005 2006	2006 2007
No. of banks studied	-	54	54	54	54	54	54	54	54	54
Average efficiency (M)	0.9526	0.951	0.937	0.947	0.966	0.92	0.962	0.961	0.966	0.963
Average inefficiency	0.0498	0.05	0.07	0.06	0.04	0.09	0.04	0.04	0.04	0.04
Std. dev. (6)		0.05	0.06	0.05	0.04	0.09	0.05	0.05	0.04	0.06
No. of efficient banks		19	17	18	24	17	26	24	20	27
% of efficient banks		35.19	31.50	33.33	44.44	31.50	48.15	44.44	37.04	50

Notes: Average inefficiency is calculated by $(1-M)/M$. M refers to average efficiency.
No. of efficient banks refers to those banks that are on the efficiency frontier.

Figure 4: Mean efficiency movements in Phase 2

The efficiency scores started improving after 1999–2000 and reached the peak in 2001–2002. The second low efficiency point represented by point B in the graph occurred in 2002–2003. This decline in efficiency may have been contributed by the significant deceleration in the overall growth of the economy from 6.1% in 1999–2000 to 4% in 2000–2001.¹⁴ Further, fall in efficiency in the banking sector can

(14) India Development Report, World Bank, 2005

also be seen as a reflector of decline in public sector savings, expressed as a percentage of GDP from (-) 0.09% in 1999–2000 to (-) 1.7% in 2000–01.¹⁵ Moreover, the general government deficit as percentage of GDP increased from 8.9% in 1998–1999 to 10% in 1999–2000 explaining the decline in efficiency via the ‘crowding out effect’.¹⁶ These factors may have aggregated to negatively influence the efficiency levels with a lag of one to two years.

The situation improved in 2003–2004 with the Indian banking sector experiencing a jump in its efficiency levels from 0.920 in 2002–2003 to 0.962 in 2003–2004. This improvement may have been the result of the overall growth in the industrial sector from 5.7% in 2002–2003 to 6.9% in 2003–2004. Since then, the mean efficiency scores have stabilised and have ranged between 0.961 and 0.966. It may, thus, be concluded that there has been distinct improvement in the levels of efficiency in Indian banks during the post reforms period. Not only have the average efficiency scores improved but also the degree of homogeneity in the efficiency scores has improved.

5. Concluding remarks

The two techniques DEA and SFA used for measuring bank efficiency in India during the period 1991–1992 to 2006–2007 failed to offer consistent results based on each of the consistency checks namely:

1. relative efficiency scores
2. relative rankings of sample banks
3. ability to identify high efficiency level and low efficiency level banks.

In short, the results obtained from the two techniques are different. There is thus, a need to make a deliberate choice in respect of the method of computation of efficiency score.

This study found DEA to be a more appropriate technique as compared to SFA for computation of efficiency scores for two simple reasons. First, DEA was able to trace the changes in the Indian banking better. This may be attributed to the simple reason that it is not necessary to make any prior assumption regarding the nature of distribution of inefficiency component in DEA. Second, whichever method is chosen for efficiency measurement, it is necessary to remember that the estimated efficiency scores need to be interpreted in the light of the techniques used in their computation and its ability to reflect the real characteristics of the industry under consideration. SFA fails in this regard.

Results based on DEA efficiency scores show that the overall trend of efficiency of the Indian banking sector was an increasing one. However, significant year-to-year fluctuations in efficiency existed among banks. The regulator has an important role to play in ensuring that banks are encouraged to improve their efficiency so that the banking system is strengthened and serves the national objective of conserving resources while giving best of services.

An obvious limitation of the study is that it examines only technical efficiency. Moreover, limited number of inputs and outputs has been used for modelling a bank.

These limitations may be seen as fruitful avenues for future research in this area. The present study can be extended to examine other types of efficiency like cost efficiency, profit efficiency and revenue efficiency. Future researchers can also examine the efficiency in Indian banking sector with that of other countries. Inter-country comparisons can reveal important results.

(15) Quick estimates of National Income for 2000–2001 of Central Statistical Organisation (CSO), January 2002

(16) The general government deficit refers to the combined Central and State deficit – World Bank Report 2000.

Acknowledgements

The authors would like to express their gratitude to Prof. Tim Coelli for answering our queries regarding running the DEAP and FRONTIER software. It was he who suggested that we should use distance functions to incorporate multiple inputs and outputs in the Translog function. The authors also acknowledge the help received from Prof. Surender Kumar, TERI (India) during the process of modelling. Last, but not the least, the authors thank two anonymous reviewers for giving very useful suggestions to improve the quality of the paper.

References

- Al-Faraj, T.N., Alidi, A.S. and Bu-Bshait, K.A. (1993)** 'Evaluation of bank branches by means of data envelopment analysis', *International Journal of Operations and Production Management*, Vol. 13, pp.45–52.
- Al-Obaidan, A.M. (1999)** 'Net economic gain from diversification in the commercial banking industry', *Applied Financial Economics*, Vol. 9, No. 4, pp.343–354(12).
- Banker, R.D., Charnes, A. and Cooper, W.W. (1984)** 'Some models for estimating technical and scale inefficiencies in data envelopment analysis', *Management Science*, Vol. 30, pp.1078–1092.
- Bauer, P.W., Berger, A.N., Ferrier, G.D. and Humphrey, D.B. (1998)** 'Consistency conditions for regulatory analysis of financial institutions: a comparison of frontier efficiency techniques', *Journal of Economics and Business*, Vol. 50, pp.85–114.
- Berg, S.A., Førsund, F.R. and Jensen, E.S. (1992)** 'Malmquist indices of productivity growth', *Scandinavian Journal of Economics*, Vol. 94, Supplement, S211–S228.
- Berger, A.N. and Humphrey, D.B. (1997)** 'Efficiency of financial institutions: international survey and directions for future research', *European Journal of Operational Research*, Vol. 98, pp.175–212.
- Bhaumik, S.K. and Dimova, R.D. (2004)** 'How important is Ownership in a market with a level playing field? The Indian Banking sector re-visited', *Journal of Comparative Economics*, Vol. 32, No. 1, pp.165–180.
- Bhaumik, S.K. and Piesse, J. (2004)** 'The risk aversion of banks in emerging credit markets: evidence from India', William Davidson Institute Working Paper No. 774.
- Bowlin, W.F., Charnes, A., Cooper, W.W. and Sherman, H.D. (1985)** 'Data envelopment analysis and regression approaches to efficiency estimation and evaluation', *Annals of Operations Research*, Vol. 2, pp.113–138.
- Brockett, P., Charnes, A., Cooper, W., Huang, Z. and Sun, D. (1997)** 'Data transformations in DEA cone ratio envelopment approaches for monitoring bank performances', *European Journal of Operational Research*, Vol. 98, pp.250–268.
- Bukh, P.N.D., Forsund, F.R. and Berg, S.A. (1995)** 'Banking efficiency in the Nordic countries: a four-country Malmquist index analysis', Bank of Norway, Working Paper Research Department.
- Casu, B. and Girardone, C. (2002)** 'A comparative study of the cost efficiency of Italian Bank conglomerates', *Managerial Finance*, Vol. 28, pp.3–23.
- Chakrabarti, R. and Chawla, G. (2005)**, 'Bank Efficiency in India since the Reforms: An Assessment', *Money and Finance*, ICRA Bulletin.
- Chatterjee, G. (2006)** 'Is inefficiency of banks in India a cause for concern? Evidence from the post reform era', *Journal of Emerging Market Finance*, Vol. 5, No. 2, pp.151–182.
- Chen, T-Y. (2002)** 'A comparison of chance-constrained DEA and stochastic frontier analysis: bank efficiency in Taiwan', *Journal of the Operational Research Society*, Vol. 53, pp.492–500, doi:10.1057/palgrave.jors.2601318.
- Coelli, T. (1995)** *A Guide to FRONTIER Version 4.1: A Computer Program for Stochastic Frontier Production and Cost Function Estimation*, No. 7/96, Centre for Efficiency and Productivity Analysis.
- Coelli, T. (1996)** 'A Guide to DEAP Version 2.1: A Data Envelopment Analysis Computer Program' No. 8/96, Centre for Efficiency and Productivity Analysis.
- Das, A. and Ghosh, S. (2006)** 'Financial deregulation and efficiency: an empirical analysis of Indian banks during the post reform period', *Review of Financial Economics*, Elsevier, Vol. 15, No. 3, pp.193–221.

- Das, A., Nag, A. and Ray, S.C. (2004)**, 'Liberalization, ownership, and efficiency in Indian banking: a nonparametric approach', *Economics Working Papers*, University of Connecticut.
- Debasiah, S.S. (2006)** 'Efficiency performance in Indian banking: use of data envelopment analysis', *Global Business Review*, Vol. 7, No. 2, pp.325–333.
- Denizer, C., Gultekin, B. and Gultekin, M. (2000)** 'Distorted incentives and financial structure in Turkey', *Paper Presented at the Financial Structure and Economic Development Conference*, in February 10–11, 2000 at the World Bank, Washington, DC.
- DeYoung, R. (1997)** 'Measuring bank cost efficiency: don't count on accounting ratios', *Financial. Practice and Education*, Spring/Summer, Vol. 1.7, No. 1, pp.20–31.
- Drake, L. (2001)** 'Efficiency in UK banking', *Applied Financial Economics*, Vol. 11, pp.557–571.
- Elyasiani, E., Mehdian, S.M. and Rezvanian, R. (1994)** 'An empirical test of association between production and financial performance', *Applied Financial Economics*, Vol. 4, pp.55–59.
- Farrell, M.J. (1957)** 'The measurements of productive efficiency', *J.R. Statistical Society, Series A*, Vol. 120, pp.253–281.
- Ferrier, G. and Lovell, C. (1990)** 'Measuring cost efficiency in banking: econometric and linear programming evidence', *Journal of Econometrics*, Vol. 46.
- Ferrier, G.D. and Lovell, C.A.K., (1990)** 'Measuring cost efficiency in banking: econometric and linear programming evidence', *Journal of Econometrics*, Vol. 46, pp.229–245.
- Fiorento, E., Karman, A. and Koetter, M. (2006)** 'The cost efficiency of German banks: a comparison of SFA and DEA', German National Bank Discussion Paper Series 2: Banking and Financial Studies No. 10/2006.
- Fukuyama, H. (1995)** 'Measuring efficiency and productivity growth in Japanese banking: a nonparametric frontier approach', *Applied Financial Economics*, Vol. 5, No. 2, pp.95–107.
- Gilbert, R.A. and Wilson, P.W. (1998)** 'Effects of regulation on the productivity of Korean banks', *Journal of Economics and Business*, Vol. 50, pp.133–155.
- Halkos, G. and Salamouris, D. (2001)** 'Efficiency measures of the Greek banking sector: a non-parametric approach for the period 1997–1999', *Munich Personal RePec Archive*, No. 2858.
- Hao, J., Hunter, W. and Yang, W. (2001)** 'Deregulation and efficiency: the case of private Korean banks', *Journal of Economics and Business*, Vol. 53, pp.237–254.
- Hardy, D.C. and Patti, E.B. (2001)** 'Bank reform and bank efficiency in Pakistan', International Monetary Fund, Working Paper, WP/01/138, IMF, Washington DC.
- Herberholz, C. (2002)** 'The impact of foreign entry on the Thai domestic banking sector', *Chulalongkorn Journal of Economics*, May, Vol. 14, No. 2.
- Isik, I. and Hassan, M.K. (2002)** 'Technical, scale and allocative efficiencies of Turkish banking industry', *Journal of Banking and Finance*, Vol. 26, pp.719–766.
- Isik, I. and Hassan, M.K. (2003)** 'Financial disruption and bank productivity: the 1994 experience of Turkish banks', *Quarterly Review of Economics and Finance*, Vol. 43, pp.291–320.
- Jemric, I. and Vujcic, B. (2002)** 'Efficiency of banks in Croatia: a DEA approach', Croatian National Bank Working Papers.
- Kaparakis, E.I., Miller, S.M. and Noulas, A.G. (1994)** 'Short-run cost inefficiency of commercial banks: a flexible stochastic frontier approach', *Journal of Money, Credit and Banking*, Vol. 26, No. 4, pp.875–894.
- Kumbhakar, C.S. and Bhattacharyya, A. (1996)** 'Productivity growth in passenger-bus transportation: a heteroskedasticity error component model with unbalanced panel data', *Empirical Economics*, Vol. 21, pp.557–573.
- Kumbhakar, S.C. and Lovell, C.A.K. (2000)** *Stochastic Frontier Analysis*, Cambridge University Press.
- Kumbhakar, S.C. and Lozano-Vivas, A. (2004)** 'Deregulation and productivity: the case of Spanish banks', Economic Working Papers at Centro de Estudios Andaluces E2004/24, Centro de Estudios Andaluces.
- Kwan, S.H. (2003)** 'Operating performance of banks among Asian economies: an international and time series comparison', *Journal of Banking & Finance*, Vol. 27, pp.471–489.
- Lipsey, R.G. (1995)** *An Introduction to Positive Economics*, Oxford University Press. Bank efficiency measurement using alternative techniques of frontier analysis 29
- Luciano, E. and Regis, L. (2007)** 'Bank efficiency and banking sector development: the case of Italy', ICER Working Papers – Applied Mathematics Series 5-2007, ICER – International Centre for Economic Research.
- Mahesh, H.P. and Rajeev, M. (2007)** 'Liberalisation and productive efficiency of Indian commercial banks: a stochastic frontier analysis', Munich Personal RePec Archive, Paper No. 827.

- Mendes, V. and Rebelo, J. (1999)** 'Productive efficiency, technological change and productivity in Portuguese banking', *Applied Financial Economics*, Vol. 9.
- Menkhoff, L. and Suwanaporn, C. (2003)** 'The rationale of bank lending in pre-crisis Thailand', ZEF Discussion Paper on Development Policy, University of Bonn.
- A. M. Mlima and L. Hjalmarsson (2002)** 'Measurement of inputs and outputs in the banking Industry', *Tanzanet Journal*, Vol. 3, No. 1.
- Murthy, M.N. and Kumar, S. (2000)** 'Measuring cost of environmentally sustainable industrial development in India: a distance function approach', Project on 'Accounting and Valuation of Industrial Pollution: Environmentally Corrected GDP for India.
- Narasimham Committee Report I (1991)** Reserve Bank of India.
- Narasimham Committee Report II (1997)** Reserve Bank of India.
- Narasimham Committee on Banking Sector Reforms (1998)**
- Ozkan-Gunay, E. and Tektas, A. (2006)** 'Efficiency analysis of the Turkish banking sector in pre-crisis and crisis period: a DEA approach', *Contemporary Economic Policy*, Vol. 24, No. 3.
- Pastor, J.M. (2002)** 'Credit risk and efficiency in the European banking system: a three-stage analysis', *Applied Financial Economics*, Vol. 12, pp.895–911.
- Patti, B.E. and Hardy, D.C. (2005)** 'Financial sector liberalization, bank privatization, and efficiency: evidence from Pakistan', *Journal of Banking and Finance*, Vol. 29, No. 8, pp.2381–2406.
- Paxton, J. (2006)** 'Technical efficiency in the rural financial sector: evidence from Mexico', *The Journal of Developing Areas*, Vol. 39, No. 2, pp.101–119.
- Rangarajan, C. (1998)** 'Banking sector reforms: rationale and relevance', *Reserve Bank of India Bulletin*, pp.41–51.
- Reserve Bank of India Website**, available at <http://www.rbi.org.in>, containing the database on Indian Economy.
- Resti, A. (1997)** 'Evaluating the cost efficiency of the Italian banking system: what can be learned from the joint application of parametric and nonparametric techniques', *Journal of Banking & Finance*, Vol. 21, pp.221–250.
- Sarkar, J., Sarkar, S. and Bhaumik, S.K. (1998)** *Does Ownership Always Matter? Evidence from Indian Banking Sector*, Elsevier, Vol. 26, No. 2, pp.262–281.
- Sathye, M. (2003)** 'Efficiency in a developing economy: the case of India', *European Journal of Operational Research*, Vol. 148, No. 3, pp.662–671.
- Sengupta, J.K. (1989)** *Efficiency Analysis by Production Frontiers: The Nonparametric Approach*, Kluwer.
- Shanmugam, K.R. and Lakshmanasamy, T. (2002)** 'Production Frontiers and efficiency measures: an analysis of banking sector in India', *Asia-Africa Journal of Economics and Econometrics*, Vol. 1, No. 2, pp.211–228.
- Sherman, H.D. and Gold, F. (1985)** 'Bank branch operating efficiency: evaluation with data envelopment analysis', *Journal of Banking and Finance*, Vol. 9, pp.279–315.
- Srivastava, P. (1999)** *Size, Efficiency and Financial Reforms in Indian Banking*, Indian Council for Research on International Economic Relations.
- Staffan Viotti (2000)** 'Dealing with banking crises – proposal for a new regulatory framework', *Economic Review*, March.
- Syrjanen, M., Bogetoft, P. and Agrell, P. (2006)** 'Efficiency benchmarking project B: analogous efficiency measurement model based on stochastic Frontier analysis', *Final Report*.
- Taylor, W.M., Thompson, R.G., Thrall, R.M. and Dharmapala, P.S. (1997)** 'DEA/AR efficiency and profitability of Mexican banks: a total income model', *European Journal of Operational Research*.
- Weill, L. (2004)** 'Measuring cost efficiency in European banking: a comparison of Frontier techniques', *Journal of Productivity Analysis*, Vol. 21, pp.133–152.
- Williams, J. and Nguyen, N. (2005)** 'Financial liberalisation, crisis, and restructuring: a comparative study of bank performance and bank governance in South East Asia', *Journal of Banking and Finance*, Vol. 29, pp.2119–2154.
- Zaim, O. (1995)** 'The effect of financial liberalization on the efficiency of Turkish commercial banks', *Applied Financial Economics*, Vol. 5, pp.257–264.
- Zardkoobi, A. and Kolari, J. (1994)** 'Branch office economies of scale and scope: evidence from savings banks in Finland', *Journal of Banking and Finance*, Vol. 18, pp.421–432.

PROGRAMME GRANDE ÉCOLE, GRADE MASTER

GROUPE ÉCOLE SUPÉRIEURE DE COMMERCE DE PAU

Campus Universitaire 3, rue Saint-John Perse - B.P. 7512 - 64075 PAU Cedex - France
Tél. 33 (0)5 59 92 64 64 - Fax : 33 (0)5 59 92 64 55 - info@esc-pau.fr - www.esc-pau.fr
ESCPAU Bangalore Office : N°33, 22nd Main, 1st Cross 2nd Phase JP Nagar Bangalore 560 078 - India
HECF FES : N°6, Rue Abi Hamid Al Ghazali AGDAL FES - Maroc

Membre de la Conférence des Grandes Écoles et du Chapitre des Grandes Écoles de Management - Membre de la Fondation Nationale pour l'Enseignement de la Gestion des Entreprises (FNEGE) - Membre Fondateur de Pyrénées-Océanes Campus - Membre de l'European Foundation for Management Development (EFMD) - Membre de l'Association to Advance Collegiate Schools of Business (AACSB) - Membre du Consejo Latinoamericano de Escuelas de Administración (CLADEA) - Membre du Consejo de Rectores de las Universidades Chilenas (CRUCH) - Membre du Centre de Management Euro Amérique Latine (CMEAL) - Membre de la Conférence des Recteurs et des Principaux des Universités du Québec (CREPUQ).