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BANKING PRODUCTIVITY AND ECONOMIC GROWTH

IN EMERGING COUNTRIES

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ABSTRACT

This thesis investigates, through three essays, the cost efficiency of the banking system in the Middle East and North Africa, and the South East Asia regions. Firstly, it provides empirical evidence on the technology gap between Islamic and conventional banking in both regions, and then investigates the nexus between cost efficiency and economic growth in the Middle East and North Africa region specifically.

The first chapter provides a theoretical framework for Islamic finance and banking beforehand and aims to explain the foundations of Islamic finance along with an overview of the two banking models in practice. We underline the importance of the profit and loss sharing schemes as a cornerstone for Islamic finance contribution to social welfare.

The second chapter offers an empirical study to investigate the existence of a technology gap between Islamic and conventional banking (due to Quranic law compliance) resulting in different cost efficiency levels. We focus on twelve emerging countries from the Middle East and North Africa, and the South East

Asia regions, between 2000 and 2006 and apply a stochastic Metafrontier approach. Our findings show that, on average, both types of bank display similar mean cost efficiency and technology levels. At the country level, we find substantial cost efficiency differences, but these are not due to the technology gap.

The third chapter examines the nexus between cost efficiency and economic growth in the Middle East and North Africa region. We apply a causality analysis between cost efficiency and financial deepening using the Generalized Methods of Moments and our findings show a significant and positive causality and reverse relationship between financial deepening and banking productivity. We introduce a set of control variables associated with the long run growth and find an interesting interaction with banking productivity and financial deepening suggesting that efforts should be focusing on the investments' efficiency and the increase of regulation to spur a more stable financial system and foster financial deepening in the future.

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LIST OF ABBREVIATIONS AND ACCRONYMS

AAOIFI	Accounting and Auditing Organization for Islamic Financial Institutions
DEA	Data Envelopment Analysis
GDP	Gross Domestic Product
GMM	Generalized Method of Moments
IBIS	Islamic Banks and Financial Institutions Information Database
IFI	Islamic Financial Institutions
IMF	International Monetary Fund
LIBOR	London Inter-Bank Offered Rate
LR	Likelihood Ratio test
MENA	Middle East and North Africa
OPEC	Organization of the Petroleum Exporting Countries
PBUH	Peace Be Upon Him (the prophet Mohammad)
PLS	Profit and Loss Sharing
SEA	South East Asia
SFA	Stochastic Frontier Approach
TE	Technical Efficiency
TGR	Technology Gap Ratio
UN	United Nations
WB	World Bank

LIST OF DEFINITIONS

Ahkam	Rulings in Islam
Bay Bithamin Ajil	Deferred payment sale
Gharar	Uncertainty
Hadith	The Prophet's (pbuh) tradition
Halal	Sharia' permitted
Haram	Prohibited by Sharia'
Ibadat	Worship
Ibahah	Principle of permissibility
Ijara contract	Leasing contract
Iqtina	Purchase
Istisna' contracts	Manufacture contract
Mu'amalat	Mutual dealings
Mudarabah	Silent partnership
Murabahah	Sales contract at a profit mark-up
Musharakah	Partnership (joint-venture)
Qard (Hassan)	Interest free loan
Rab al-mal	Financiers (investors)
Riba	Interest / Usury
Riba al-duyoon	Interest on debts
Riba al-fadhl	Interest on sales
Riba al-nasiah	Interest on deferred payments
Salam contracts	Advance purchase (Forward contract in conventional finance)
Sharia'	Sacred law revealed by God Almighty
Sukuk	Certificates of Investment
Sunnah	The tradition of the Prophet Mohammad
Wakalah	Agency form of contract

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AUTHOR'S DECLARATION

I, Walid Ghannouchi, declare hereby that this thesis is my own personal work; that this thesis has been done after registration for the Ph.D degree; and that I have not previously submitted such work and not submitting such work in candidature for another diploma.

Walid Ghannouchi

CHAPTER 1

INTRODUCTION AND MOTIVATIONS

Over the last three decades, a number of developing countries, following the post-colonialism era, has undertaken financial sector reforms in order to promote growth and construct a sound financial system. The Middle East and North Africa (MENA) and the South East Asia (SEA) regions present a particular interest where the cultural diversity and disparities in natural resources across and within the two regions are important. Nevertheless, a few countries in these two regions have witnessed an important economic growth and financial system development, shifting their status from under-developed to emerging economies. There exist large disparities in wealth and economic development between the countries in these regions with consequently different financial developments since the 1970's (period in which all colonized countries in the region gained their independence). In the MENA region, the financial markets are generally still in the early phases of economic development and are based on bank-

dominated credit mechanisms (Turk-Ariss, 2009) whereas in the SEA region, different levels of financial developments co-exist, presenting various levels of integration in global markets across countries, fostered by the financial liberalisation during the 1990's. When the Asian financial crisis stroke in 1997, it ended the liberalisation efforts and impacted countries in the SEA region which started immediately bank restructuring programmes and lasted until the early 2000s (Williams and Nguyen, 2005).

The MENA region has a strategic geopolitical location. First, it is politically considered as the epicentre of world crises, chronically war-prone and the site of the world's most protracted conflicts (Hinnebusch, 2003, p. 1) and second, economically, as owning the major world's oil reserves. But most importantly, it is the birthplace of Islam and subsequent development epicentre. With this regard, the SEA region, accounts for over 40% of world's Muslims largest population based on the Pew Research Center (2009) report on the global Muslim population mapping[1].

This common feature between the two regions – the integration and influence of Islam on the culture, has an important influence on the economic and financial systems of both regions. An alternative financial system – Islamic finance – has

[1] See Muslim population map in the Figure A.i.1

emerged in its modern form with large differences in interpretation, practice and application across countries. This "newly" established financial system (early stages of Islamic finance in its modern form can be traced back to the 1960's) co-exists along with the well established Western financial intermediation system in both regions, and its integration depended heavily on local population's needs and on the interpretation difference across the religious schools of thought. The early 1980's have witnessed the first initiatives in Islamic banking which gradually turned into a massive development of Islamic banking during the 2000s with a spill-over to non-Muslim countries. While some countries (such as Pakistan and Iran) chose to adopt a fully pledged Islamic financial system, others (such as Malaysia and Bahrain) simply integrated Islamic banking within their current conventional system and adapted their regulations to this context.

In this thesis we select 12 countries from the MENA and SEA regions, where an Islamic banking activity has been monitored. There exists 21 countries where Islamic banks were operating from 2000 till 2006, but due to limitations related to lack of data disclosure and issues linked to financial transparency in developing countries, only 12 countries could be selected, of which 11 countries are classified as emerging countries according to the IMF (2009), Bangladesh being considered as a one of the least developed countries in Asia according to the UN (2010). At the macro-economic level, the selected countries show some disparities in terms

of wealth and growth, as 5 out of 12 are members of the Organization of the Petroleum Exporting Countries (OPEC), and hence show high per capita GDP figures as compared to the other countries in the sample (Figure A.i.2 and Figure A.i.3). In terms of economic growth, OPEC countries in the MENA region have profited from the boost in oil prices from 2002 (Qatar reached a peak of 21% of growth rate - Figure A.i.4). The oil profits were invested in infrastructure and real estate investments. While all other countries had a steady increase in growth (Figure A.i.5) favoured by economic reforms and investments incentives, Turkey witnessed a sharp decrease in growth during 2001 (following the crisis it faced linked to the Russian financial crisis in 1998, political turmoil and the destructive Earthquake in 1999). In the SEA region, all countries in the sample show a steady improvement in growth after 2001 (Figure A.i.6). Malaysia, whose GDP growth recovered to 7.9% in 2000, was reduced to 0.7% in 2001 as the global economic downturn and the aftermath of the 11 September 2001 terrorist attacks on the United States caused a 10.6% reduction in exports. Regarding the banking sector, there was a large increase in Islamic banking activity between 2000 and 2006 (Figure A.i.7) with a notable expansion in the MENA region (Figure A.i.8). This, caused amongst other factors, by a peak in oil prices, generating large amounts of liquidity has contributed to the development of Islamic finance in the region,

giving the MENA region a leading position in Islamic banking in terms of total assets.

For the aforementioned reasons, we found it interesting to undertake an investigation of the recent banking system development in the MENA and SEA regions from a banking productivity perspective.

The aim of this thesis is to initially assess the differences in productivity, to check for the existence of differences in technology between the Islamic and the conventional banking systems in the MENA and SEA regions, and then to investigate the impact of the banking productivity in the MENA region on economic growth.

We therefore intend to answer the following research questions:

1. Are Islamic banks more cost efficient than their conventional counterparts?
2. Are there differences in technology between Islamic and conventional banks?
3. What is the impact of banking cost efficiency on economic growth in the MENA region? And does economic growth affect banking cost efficiency?

The structure of the thesis is organised as follows:

Chapter 1 sets the thesis in its framework, and provides the motivations along with a brief general overview of the economy and financial system of the countries in the sample. The research questions are presented in this chapter;

Chapter 2 provides an overview of the main features of Islamic finance, its foundation and most common products in Islamic banks. The aim of this chapter is not to be exhaustive in terms of Islamic banking products description, but to provide a point of reference for the next empirical chapters;

Chapter 3 aims at answering the first and second research questions by conducting an empirical analysis to compare Islamic and conventional banking cost efficiency at a first stage and to assess the technology gap between the two industries at a second stage. This constitutes the first empirical study using the stochastic Meta-frontier approach to investigate the technology gap between the two industries in the literature;

Chapter 4 presents the empirical analysis to answer the third research question. We focus on the MENA region and investigate the nexus between banking productivity and growth in seven countries;

Chapter 5 provides the concluding remarks, presenting a summary of our main findings for each chapter, considerations about the limits of this study and possible further developments.

CHAPTER 2

THE CONCEPTS OF ISLAMIC FINANCE

2.1 Introduction

The aim of this chapter is to present the main features of Islamic finance, its foundation and most common products in Islamic banks. The structure is as follows:

Section 2.2 provides an overview of the historical development of Islamic banking;

Section 2.3 reviews the concept and underlying foundations of Islamic finance;

Section 2.4 presents two Islamic banking models and the most commonly encountered products offered in the industry;

Section 2.5 concludes, stressing the importance of the underlying principles of Islamic finance in the financial system to promote social welfare.

2.2 Historical development of Islamic Banking

The history of Islamic finance has its roots at the early stages of Islam around 610 A.D. The first practice of Islamic finance as a framework for economic life was dictated by the Sharia' (Islamic law) as behavioural rules to be observed in every day's trade and finance operations. Islamic finance is based on the concepts of "halal" (activities or things permitted by the Sharia') which will be presented in the next section.

History of modern Islamic banking started in the early 1960s, after all Muslim countries gained their independence. In their efforts for reconstruction, these countries needed to manage effectively their financial systems and focus on growth and rapid development, which made many of them turn to Islam for guidance (Siddiqi, 2001).

In 1963, an experiment in Mit Ghamr in the Nile valley in Egypt took place 'putting the Islamic principles governing financial dealings into practice' (Iqbal and Molyneux, 2007, p. 37). This entity was a credit cooperative and has mobilized small savings from the rural sector largely through saving accounts. No interest was paid to the account holders but there were eligible for small, short-term, interest free loans for productive purposes and had the possibility to

withdraw their deposits on demand. The cooperative introduced also a profit sharing scheme with investment accounts. Iqbal and Molyneux (2007)

The first interest free financial institution was the "Nasser Social Bank" established in 1971 in Egypt with the denomination "bank" appended in its name. It had mostly a social scope activity providing interest free loans to needy people, scholarships to students and micro-credit to small projects on a profit sharing basis. Later on, Dubai Islamic Bank was established by a group of businessmen in 1975 and was the first Islamic Bank fostered by a private initiative, with the help of the United Arab Emirates and Kuwait contributing to its capital as an official support.

In July 1975, the Islamic Development Bank was established in pursuance of the Declaration of Intent issued by the Conference of Finance Ministers of Muslim Countries held in Jeddah in December 1973. The declaration was signed by the representatives of 23 member countries of the Organization of the Islamic Conference, and representing members are currently 56 countries according to the Islamic Development Bank[2].

The development of Islamic banking as a model, from 1975 till early 1990s, gained credibility and respect on both theoretical and practical sides. Financial

[2] List provided by the Islamic Development Bank's website: www.isdb.org

Sharia' compatible products were developed and returned good results to banks. Private initiative has flourished and a large number of Islamic financial institutions came to light, three countries - namely Iran, Pakistan and Sudan - gradually eliminated interest from their entire economies and substituted it with a fully Sharia's compliant banking system based on Islamic principles.

Islamic financial products were recognized as genuine means of financial intermediation by the World Bank and the International Monetary Fund through studies conducted to assess Islamic banking products compatibility in a world dominated by the conventional banking model (Mirakhor, 1987; Sundararajan, et al., 1998, and Solé, 2007).

The Islamic banking model attracted also banking corporations such as Citibank, ABN AMRO, HSBC and other renowned multinationals who started offering Islamic financial products in the Gulf region, mainly around that period (early 1990s).

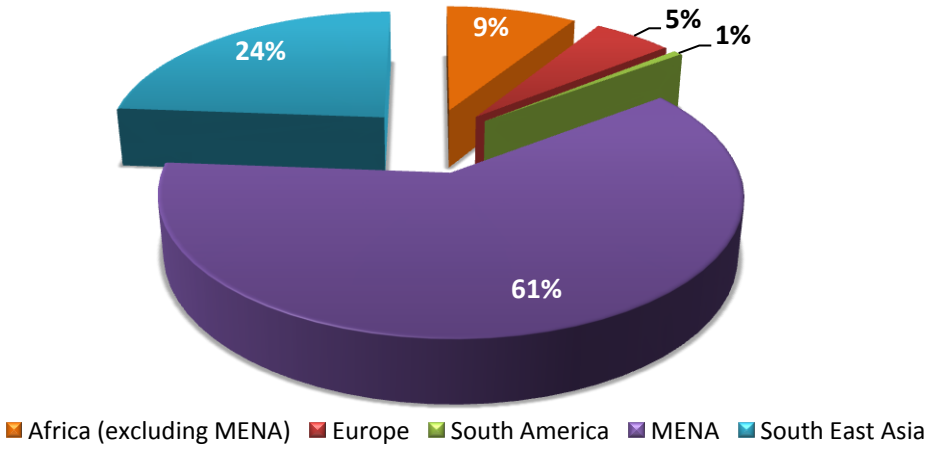
In parallel, other financial institutions such as investment funds, mutual funds and insurance companies (Takaful companies) were created and increased in number.

Initially, Islamic banks had to face the fact that most of them were working in a conventional banking environment and framework which was not adapted to their specific needs. But gradually, the countries hosting Islamic banks have started constructing a supporting institutional framework to help sustain the growth of Sharia's compliant financial industry.

Figure 2.1 shows the current distribution of Islamic banking institutions; we have compiled this list based on two different data sources. The first database is the Bureau van Dijk Electronic publishing (Bankscope); this database reports, as of April 2010, a list of 121 Islamic banks. The second database is the Islamic Development Bank database – Islamic Banks and Financial Institutions Information IBIS [3] which reports a total number of 65 banks at the same date. Following this mismatch of reported number of Islamic banks, we decided to compile the list based on both databases. The results show in Figure 2.1 a number of 168 Islamic banks distributed unevenly around the world, with a large concentration in the MENA region.

[3] IBIS database is available at: www.ibisonline.net

Figure 2.1 - Geographical distribution of Islamic Banks by Region



Source: Author's own elaboration, based on IBIS and Bankscope databases

2.3 The concepts and foundations of Islamic banking

In Islamic economies, as opposed to the conventional systems, religion plays a predominant role in setting the basic rules which each economic agent has to observe in dealing with its counterparties. Islamic jurisprudence includes two kinds of rulings (*ahkam*) (Syed-Ali and Ahmad, 2004).

- The first category called worship (*ibadat*) governs the relationship between men and God and states that nothing is permitted unless covered by explicit or analogical permission by God through Qu'ran.
- The second category called mutual dealings (*mu'amalat*) governs the relationship among mankind. The general principle is that of permissibility (*ibahah*), stating that everything is permitted unless clearly prohibited by God. This principle is called the "Doctrine of Universal Permissibility" which aims to **ensure fairness and justice between parties and to promote social harmony**. In addition to this principle, Islam allows parties to agree on any condition when negotiating, as much as it doesn't violate Sharia's ruling; this is called the "Golden Principle of Free Choice".

> In one of an authentic saying Dawood (1981) reports the Prophet stating that: *'All the conditions agreed upon by the Muslims are upheld, except a condition which allows what is prohibited or prohibits what is lawful'*

In the following sections we give an overview of what is considered as prohibited by Sharia' (*haram*) and provide the rationale behind these prohibitions.

2.3.1 Prohibition of *riba*

According to El-Gamal (2006), the meaning of *riba*, as it is used in the Arabic language means to increase. Jobst (2007) adds the concept of excess to this definition. In the Islamic terminology interest means effortless profit or that profit which comes free from compensation or that extra earning obtained that is free of exchange.

Some synonyms of *riba* would be interest or usury. In the following, when we use the *riba* term, it will refer to these synonyms.

In the Qur'an *riba* is clearly forbidden as noted in the following verses:

> *"Those who devour usury will not stand except as stands one whom the Satan by his touch has driven to madness. That is because they say, "trade is like usury", but Allah has permitted trade and has forbidden usury"* Qur'an (Al-baqarah verse no.275)

Then in the next verse:

> *"Allah will deprive usury of all blessing, and will give increase for deeds of charity, for he does not love any ungrateful sinner."* Qur'an (Al-baqarah verse no.276)

Furthermore:

> *"Oh you who believe! Fear Allah and give up what remains of your demand for usury if you are indeed believers."* Qur'an (Al-baqarah verse no.278)

Stressing the fact that the capital shouldn't increase over time by mean of interest increasing process:

> *"If you do not, take notice of war from Allah and his Messenger sallallahu alaihe wasallm but if you repent you shall have your capital sum. Deal not unjustly and you shall not be dealt with unjustly."* Qur'an (Al-baqarah verse no.279)

riba is primarily an economic issue in view of the fact that all religions and mythologies have prohibited, restricted, discouraged, disliked, or degraded *riba* in one way or the other since the inception of human interaction. All three major revealed religions i.e. Islam, Christianity, and Judaism have strongly condemned and prohibited *riba* in its original versions.

The prohibition of *riba* essentially implies that the fixing in advance of a positive return on a loan as a reward for waiting is not permitted by the Sharia (Iqbal and Molyneux, 2007).

Two categories of *riba* are enclosed in the definition:

Riba on Debts (riba Al-Duyoon)

This is what the Qur'an prohibited and refers to as a war against Allah and his prophet. This type of *riba* represents the excess of the principal in a loan that must be paid by the borrower to the lender along with the principal as a condition of the loan.

This typology of *riba* includes the *riba* on Deferred Payments (*riba al-nasiah*) which is applied to "money-money exchange" and stands for the increase in lieu of delay or postponement of payment (i.e., extending the period for payment by charging more than the principal value) of a due debt; thus once the amount has

been determined in the contract, the debtor can't be asked for any increase if the payment is delayed.

Riba on Sales (riba Al-fadhl)

This type of *riba* is specifically prohibited by the Prophet (*peace be upon him*) in his Sunnah which gives a more comprehensive implication to *riba* and is not merely restricted to loans. *riba* on sales applies to certain types of sales transactions, both immediate exchanges as well as credit exchanges. It is commodity specific and results in what is known as *riba* on Increase (*riba al-fadhl*) which arises in barter change of commodities. According to Muslim (1955), six specific commodities have been identified by a well-know *hadith* stating:

> *'Gold for gold, silver for silver, wheat for wheat, barley for barley, dates for dates and salt for salt, like for like, payment being made hand by hand. If anyone gives more or asks for more, he has dealt in riba. The receiver and giver are equally guilty'*

The question arising from this hadith – Prophet's *(pbuh)* tradition– is if the extent of its meaning goes beyond those six commodities identified; Islamic jurists have debated the question and it comes out that gold and silver stand for monetary

commodities and thus it has been generally concluded that all commodities used as money enter in the sweep of *riba* al-fadhl.

The rationale behind forbidding *riba* has been explored by Islamic scholars, Siddiqi (2004) singles out five such reasons:

- *riba* corrupts society;
- *riba* implies improper appropriation of other people's property;
- *riba*'s ultimate effect is negative growth;
- *riba* demeans and diminishes human personality;
- *riba* is unjust.

The last reason is the most emphasized by Islamic scholars. As an illustration, let us consider the case of an entrepreneur who suffered a loss under an interest based contract loan. This would imply that beyond the loss he suffered by losing his business and his labour, he will have to pay the interest and the capital to the lender. The financier would recover his capital plus his profits (interest) no matter the losses borne by the entrepreneur. As a matter of fact, this is unjust. Inversely, this situation can also be unjust to the financier. Let us consider the case of an economy, like most under-developed countries, where the inflation rate is high and the interest rate in use is lower than the inflation rate making the

real rate of interest negative (effective rate of return). If $i_{inf} > i$ where i_{inf} is the inflation rate, i the interest rate of the loan then the effective rate of return $i_{eff} = i - i_{inf} < 0$

Now let's see how this phenomenon looks like from the bank's perspective. Banks collect the surplus units from small savers, pay them the i interest rate and pool them into loans to lend to entrepreneurs. These entrepreneurs may succeed in business, or may as well fail. In case they succeed, they will just have to pay the interest of the loan. That is if their profitability is at a rate of 60% for example and the loan rate is of 10% the bank will have an opportunity cost of 50% of its shares in the business if it were a partner instead of a lender. Thus banks pay a very little amount of interest to their depositors since they receive just the interest minus their administrative expenses and their margin, and this would be perceived more sharply in an inflationary economy. If this investment was based on a profit sharing basis instead of the interest one, it would return a much higher stake to the bank and its depositors, creating a fair and just distribution of wealth in the economy.

Interest free economy promotes a better allocative efficiency. One of the arguments is the criteria of distribution of credit: for an interest based transaction it's the credit worthiness of the borrower which is the most important criteria for

lending, while it's the worthiness of the project and its productivity which are taken into account in an interest free one. In the latter situation finance would go to the most productive projects bearing higher returns rather than the low return ones. This leads to a **better allocation of economic resources and the system in more efficient**.

2.3.2 Prohibition of Gharar

The Arabic word *gharar* means risk, uncertainty, and hazard. Unlike *riba*, *gharar* is not precisely defined. *Gharar* is also considered to be of lesser significance than *riba*. In other words *gharar* means exposing to risk in business transaction under uncertainty about the price. It is more a concept than an expression in itself. 'Generally speaking, *gharar* encompasses some forms of incomplete information and/or deception, as well as risk and uncertainty intrinsic to the objects of contract' (El-Gamal., 2006, p. 58). The concept of *gharar* has been broadly defined by the scholars in two ways:

- First, *gharar* implies uncertainty.
- Second, it implies deceit.

The Qur'an has clearly forbidden all business transactions, which cause injustice in any form to any of the parties. It may be in the form of hazard or peril leading to uncertainty in any business, or deceit or fraud or undue advantage. Apart from the above simplistic definition of *gharar*, some definitions of *gharar* seem to have a parallel in the concept of uncertainty in conventional finance.

Based on *Hadith*, for *gharar* to have legal consequences, it must fulfil four conditions:

1. It must be excessive, not trivial. A slight *gharar*, such as *gharar* in the sale of similar items which are not identical at one and the same price is held to be negligible.
2. It occurs in the context of commutative contracts, thus precluding *donation*.
3. That *gharar* affects the subject matter of contract directly, as opposed to what may be attached to it (e.g. in a cow, it is the animal itself, not its yet to be born calf).
4. That the people are not in need of the contract in question. Should there be a public need for it, *gharar*, even if excessive, will be ignored. This is because satisfying the people's need takes priority by virtue of the Qur'anic principle of removal of hardship. The Shari'ah thus validates

salam contracts (advance purchase) and *istisna'* contracts (manufacture contract) regardless of the gharar elements therein, simply because of the people's need for them.

We present in the following some interesting examples of situations considered as including gharar, taken from Iqbal and Molyneux (2007), p. 13:

- Ignorance of the genus: for example, saying that A sells B 1 kilogram of apples for $5 involves gharar because it is not clear what type of apples are the subject of the sale;
- Ignorance of the species: for example, saying A sells to B his pet for $100;
- Ignorance of the attributes: for example, saying A sells to B his car for $5,000;
- Ignorance of the quantity of the object: for example, saying A sells B a box of oranges for $20;
- Ignorance of price: for example, saying A sells to B a dress for a week's salary;
- Ignorance of the specific identify of the subject: for example, saying A sells to B a flat for $50,000;

- Ignorance of time of payment if deferred sales: for example, saying A buys a house from B for $100,000 which A will pay later;
- Inability to deliver the object: for example, saying A sells to B a bird sitting on a tree;
- Contracting on a non-existent object: for example, saying A sells to B the harvest of his farm from the next crop;
- Not being able to inspect the object: saying A sells to B the content of a carton for $50;
- More than one option in a contract unless one is specifically chosen: for example, saying A can either take B's car for $10,000 or B's boat for $15,000. The sale would become valid only after A exercises his option and specifically chooses what he is buying.

These examples are not exhaustive but they should be sufficient to give a fairly good idea of what prohibition of gharar implies (Iqbal and Molyneux, 2007).

The majority of jurists have understood gharar as a broad concept in that it comprises uncertainty and risk-taking as well as excessive speculation and gambling, and ignorance over the material aspects of contracts. It is a pervasive

concept that permeates the whole spectrum of contracts and transactions in Islamic law.

Following the concept of excessive risk under uncertainty, one sub classification of gharar which Qur'an prohibited clearly is all kinds of gambling and games of chance (*maysir*) based on these verses:

> *"O, you who believe! Intoxicants (all kinds of alcoholic drinks), and gambling, and Al-ansab (animals that are sacrificed in the name of idols on their altars) and Al-Azlam (arrows thrown for seeking luck and decision) are an abomination of Satan's handiwork. So avoid that (abomination) in order that you may be successful. "* Quran (Al Mâ'idah verse no.90)

> *"They will ask thee about intoxicants and games of chance. Say: In both there is great evil as well as some benefit for man; but the evil which they cause is greater than the benefit which they bring."* Quran (Al- Baqarah verse no. 219)

According to Al-Suwaillem (2006), what is considered as a tolerable risk by Islamic scholars is the one that would satisfy the next conditions:

- It is inevitable
- It is insignificant.
- It is unintentional.

So what is inacceptable is to separate the risk from the actual activity. Treating risk separately from the transactions would lead to a speculative spiral and would create more risk making the economy instable, as what has been witnessed during the subprime crisis in 2007.

However, it is important to point out that, according to Iqbal and Molyneux (2007), not all activities integrating a certain amount of risk are prohibited. Islamic finance encourages risk sharing activities between the entrepreneur and the financier as it will be developed later in the Islamic banking model.

2.4 The Islamic Banking Model

Muslim agents desire to manage their lives in accordance with their faith and thus Muslim investors and savers desire to invest their money in Sharia' compliant products in order to earn Sharia' permitted (*halal*) returns on their investments. In this scope lot of instruments have been since three decades and are still developed by financial engineers and Islamic scholars to provide Islamic banks with such compliant products to offer to the Muslim community and non-Muslim investors interested in these "ethical" financial products.

Iqbal and Molyneux (2007) consider that Islam recognizes the useful role that financial intermediation can play. *Mudarabah* was used in the early days of Islam in the form of trading caravans and Islamic scholars consider the earning of profits from an intermediary role as a genuine occupation.

Financing modes in Islamic banking are based on a very important pillar making the financial operations qualified as permitted (*halal*) : the Profit-Loss Sharing scheme (PLS scheme). This basically implies by mean of partnership, between the bank and its customers, that the outcome of each financial transaction is shared proportionally between the two parties, be it a loss or a profit. In this partnership, the bank and the entrepreneur share profits and losses on the basis of their capital share in the business and on the basis of their contribution to the

management process. In this way, no fixed rate of return is guaranteed, and the system is equity-based.

All financial operations described in the following sections are made under the Profit-Loss Sharing scheme, on one side or both sides of the banks' balance sheet. The PLS scheme allows banks to act as partners and not as creditors. Iqbal and Molyneux (2007) have interestingly synthesised the Islamic banking model into two main models: Two-tier *Mudarabah* and One-tier *Mudarabah*. This emphasizes the fact that Islamic banks are in substance, as their conventional counterparts, **profits seeking financial institution**.

2.4.1 Two-tier *Mudarabah*

In this model, Venardos (2005) explains that the assets and liabilities side of the bank's balance sheet are fully integrated. On the liabilities side, depositors enter into a mudarabah contract with the bank to share the overall profits accruing to the bank's business. Here the depositors act as financiers by providing funds and the bank acts as an entrepreneur by accepting them. On the assets side, the bank, in turn, enters into mudarabah contracts with entrepreneurs who need resources

for their investments and who are willing to share the profits with the bank according to the ratio of profit sharing stipulated in the contract after deducting the expenses incurred in managing the funds by the bank. Under this model, banks may also accept demand deposits (current accounts) which are allowed to be withdrawn at any time but yield no return to the depositor. Banks are allowed to use these deposits for their activity but at their own risk, in fact the repayment of these deposits is guaranteed. **This model enhances efficiency, equity and stability of the banking system**.

2.4.2 One-tier *Mudarabah* combined with multiple investment

This model visualizes the mobilization of savings on the basis of mudarabah and the use of funds so acquired to earn profits through trade, commerce and industry (Iqbal and Molyneux, 2007, p. 15). Bank liabilities are divided into two parts: one for demand deposits and the other for investment accounts. Depositors can chose on which base they want to put their savings, demand deposits being guaranteed but holding no returns. Investment deposits are used by the bank in the operations of project financing which vary from short term

mark-up financing to instalment sales. In this model the relationship between the bank and the investor is organized on the basis of *Mudarabah* or *Musharakah* while in its relationship with the entrepreneur the banks uses the other financial instruments of financing Sharia' compliant. These instruments can be summarized in the operations below:

2.4.2.1 Mudarabah (Silent partnership)

'The model of silent partnership was originally envisioned in Islamic economics and finance as the cornerstone of the prospective Islamic financial industry' (El-Gamal., 2006, p. 120). *Mudarabah* is an arrangement whereby an investor or group of investors entrusts capital to an entrepreneur, who puts this into production or trade, and then returns to the investors a pre-specified share of the resulting profits, along with their principal. The remaining share accrues to the entrepreneur as a reward for his time and effort. If the business fails, the capital loss is borne entirely by the investors, the entrepreneur's loss being his expended labor. In cases where there is more than one financier of the same project (one project jointly financed by several banks), profits are to be shared in a mutually agreed proportion previously determined, but loss is to be shared in the proportion in which the different financiers have invested the capital. Hence, mudarabah is a viable basis for Islamic banking whereby Islamic banks plays a

role of is a financial intermediary. Some additional features of the mudarabah contract can be listed below:

- The investor is a passive investor meaning : non-executive;
- Contribution can be made in cash or non cash, however in the case of material contribution is has to be first be valued or sold for cash before establishing the contributor's share in the mudarabah
- A profit share between entrepreneur(s) and investor(s) is agreed at the outset, based on any ratio agreed at the outset of the mudarabah;
- The ownership of the invested assets remains with the investor at all times;
- Losses should be shared according to the financing share of each financier. The financier's maximum loss is limited to his share of the financing and the entrepreneur must not bear any of loss attributable to invested capital. Any liability is limited to the extent of the total capital contribution made by the investors, except where such an investor has allowed the entrepreneur to incur debts on his behalf;

- With the permission of the investor, the entrepreneur may contribute some of his own capital to the project or raise fresh capital from others on the basis of mudarabah;
- The entrepreneur may only lend available funds with the permission of the investor;
- The entrepreneur is not allowed to draw remuneration in any other form than profit-share. In the absence of a guaranteed wage, the entrepreneur has no recompense for his efforts unless the project is profitable;
- The entrepreneur may be required by investors to engage only in strictly defined activities in which case the mudarabah becomes one of limited silent partnership (literally: *mudarabah al-muqayadah*). Where no restrictions apply, the mudarabah becomes one of unlimited silent partnership (*mudarabah al-mutlaqah*).

2.4.2.2 Musharakah (Partnership or joint-venture)

Under musharakah, the entrepreneur adds some of his own capital to that supplied by the investors or financiers (rab al-mal), exposing himself of the capital loss. The difference between the two modes of financing lies in the entrepreneur's own financial commitment. In the context of Islamic financing,

the arrangement can be done where that the Islamic bank and the entrepreneur agree to participate in a joint venture project to be completed within an agreed period of time. Both parties contribute to the capital of the operation and agree to divide the net profit in an agreed proportion. In the event of loss, all parties bear loss in proportion to their share of financing. The newly developed model of Islamic financing based musharakah is diminishing partnership by which the investors' share in a musharakah is progressively retired or liquidated. The arrangement is made in such a way that the investor, in his payment of periodic profits distributions to the bank, pays not only the bank's profit share but also a predetermined portion of his own profits which go towards reducing the bank's capital share. The additional funds are normally held in a special account, which will be used either to purchase the bank's share in a lump sum at the end of musharakah period, or they are applied progressively to reduce the bank's capital share and thereby also reducing the bank's claim on profits. The bank's share is thereby reimbursed over time by the investor.

Basic rules governing *Musharakah* contracts include the following:

- All partners must contribute capital to the partnership;

- Profits can be distributed in any proportion by mutual consent. a fixed amount of payment must not be agreed at the outset as the benefit to the investor in respect of his or her investment;
- As a general rule all partners contribute with both capital and management. However, it is possible for any partner to be exempted from contributing labour or management. In that case, the share of profit of the sleeping partner has to be in strict proportion to his capital contribution.
- The partners' losses are to be shared according to the financing share of each partner and may not be limited to the value of their capital contributions.
- The partnership may be agreed for a set period of time or be indefinite. It can be established as permanent musharakah in which invested funds are not subject to repayment in the short term, or as diminishing musharakah where invested funds are repaid over time as profitability allows. Such divestment terms are agreed at the outset.

2.4.2.3 Murabahah (Sales contract at a profit mark-up)

Murabahah was originally an exchange transaction in which a buyer purchases items from a seller at a specified profit margin payable to the seller. Thus, in murabahah the two parties agree to trade at a price equal to the cost plus mark-up or profit (El-Gamal., 2006, p. 67). It is assumed that the seller will divulge his costs accurately, such that the profit-margin can be agreed accurately. Consequently, this type of sale is a form of 'trust sale' since the buyer must trust that the seller is disclosing his true costs. Where a trader acts on behalf of another party in buying goods, murabahah may be seen as a payment for the trader's service in locating, transporting and delivering the goods.

The amount of the profit margin in money terms should be specified. The profit margin is not a reward for the use of the financier's money since it is not permissible to rent out money in Islam. The situation in which a bank or financier buys an item and simultaneously sells it on at a profit to a customer under a murabahah contract is known as 'murabahah to the purchase-orderer'. To some commentators, this is a controversial technique since it can easily be used as a means of circumventing the prohibition on *riba*. Here, the financier's objective is to rent money, not to trade goods, and as with most modern Islamic

finance transactions the objective is achieved by means of a combination of otherwise halal contracts.

Murabahah is typically used to facilitate short-term trade transactions and has been adopted in recent times as a financing mechanism, under which an Islamic bank replaces the trader of olden times in order to finance an end user's requirements. *Murabahah* is often referred to as 'cost-plus financing' and frequently appears as a form of trade finance based upon letters of credit.

The majority of financings arranged in the modern Islamic financial market are based upon murabahah. However, it is often not clear to what extent the providers of such finance undertake risk that is substantially different to that undertaken by interest-based banks in the course of their lending. One reason for the controversy that surrounds murabahah as an "Islamically" acceptable financing mechanism arises from the differentiation between the price for spot payment and the price for deferred payment sale (*Bay Bithamin Ajil*) that is usually in evidence. There is no argument between scholars where the aggregate value of instalments paid under deferred payment sale equals the spot price – even if viewed as a combination of sale of goods and a loan advanced by the seller to the buyer, then in this case the loan would be an interest-free one.

In common with the general rules of exchange transactions in Islam, the subject matter of the murabahah contract must be in existence, under the ownership and in the physical or constructive possession of the seller at the time of contracting.

2.4.2.4 Salam and Istisna' (Islamic forwards)

Salam (advance sale) and *istisna'* (manufacturing sale) can also be used as a method of financing in Islamic banking. Salam is a sale in which advance payment is made to the seller for deferred supply of goods. It is a sale and purchase transaction whereby the payment is made in cash at the point of contract but the delivery of the asset purchased will be deferred to a pre-determined date. *Istisna'*, on the other hand is a contract of manufacture where a manufacturing entity undertakes to manufacture goods for a buyer. The parties of the contract will decide on the price and the payment can be made either in lump sum or according to the schedule of the work completed. The distinction between *istisna'* and *salam* is on the nature of the goods being bought and sold. In *istisna'*, the purpose of a buyer is to obtain the manufactured goods, whereas in *salam* a buyer seeks to buy a future goods which are assured to exist. Thus, in *istisna'*, it requires a unique manufacturing process to produce the goods, whilst in *salam*, the items are not manufactured or constructed, but rather produced naturally such as crops.

Like many other modes of sale, this mode too, was prevalent even before the advent of Prophet. As a matter of principle, the sale of a commodity which is not in the possession of a seller is not permitted. But the practice of *salam* and *istisna'* has been legalized as an exception on the ground of necessity. These forward purchases of described goods, whether for full advance payment or progressive payments, are important device for Islamic financing. Salam, for example, can be used by the modern banks and financial institutions, especially to finance the agricultural sector. The bank can transact with farmers who are expected to have the commodity in plenty during harvest time from their crops or crops of others, which they can buy and deliver in case their crops fail. As a general rule, the price of *salam* can be fixed at a lower rate as compared to the price of those commodities when delivered on the spot. As such, the difference between the two prices is considered a valid profit for the banks or financial institutions. Since the delivery of the goods in *salam* is in the future, it is also allowed for the banks and financial institution to request the seller to furnish a security, which may be in the form of a guarantee or in the form of mortgage, to cover the risk of non delivery. In the case of default, the guarantor may be asked to deliver the same commodity; and if there is a mortgage, the buyer or the financier may sell the mortgaged property and the sale proceeds can be used either to realize the

required commodity by purchasing it from the market, or to recover the price advanced by him.

On the other hand, in the Islamic banking practice, *istisna'* is frequently employed to finance manufacture or construction projects. For example, if a client seeks financing for the construction of a house, the financier may undertake to construct the house on the basis of *istisna'*. Since it is not necessary that price to be paid in advance, nor it is necessary to be paid at the time of delivery, the parties may agree in the manner and time for payment. As such, the payment may be in instalment, according to the convenience for the customer. Another arrangement is called back to back *istisna'* or parallel *istisna'*. In this arrangement, the bank will enter into the contract of *istisna'* with the customer, and later contracted the second *istisna'* contract with the manufacturing party. This structure is normally used by the Islamic bank to finance purchases of major manufactured goods such as ships or planes. Under the first *istisna'* the bank as a seller accepts a long term schedule of payments from its customer, while under the second *istisna'* the bank as buyer pays the manufacturer over a shorter period with progress payments.

2.4.2.5 Ijara (leasing contracts)

Ijara is a form of leasing. It involves a contract where the bank buys and then leases an item – perhaps a consumer durable, for example – to a customer for a specified rental over a specific period. The duration of the lease, as well as the basis for rental., are set and agreed in advance.

Here the bank buys capital equipment or property and leases it out under instalment plans to end users. As in conventional leasing there may be an option to buy the goods at the end of the *ijara* built into the contracts - *Ijara* wa *Iqtina*. The instalments consist of rental for use and part payment.

The customer selects the asset to be financed and the bank then purchases it from the supplier and leases it to the customer for an agreed period. Refinancing of assets owned by the client in a sale and leaseback arrangement is allowed under certain circumstances. The bank being the owner of the asset is paid rent, fixed or variable as agreed by the parties. The rental amount is often benchmarked to the London Inter-Bank Offered Rate (LIBOR).

The bank must exercise all the lessor's rights and obligations such as maintenance, insurance and repair. The lessee gets the use of the asset for the

period of the lease subject to payment of rent. The lessee may assume the obligations such as maintenance etc. for a reduced rent.

2.4.2.6 Wakalah (Bank working as an agent)

Literally wakalah means protection or delegation. Legally wakalah refers to a contract where a person authorizes another to do a certain well-defined legal action on his behalf. An agent is someone who establishes contractual and commercial relations between a principal and a third party. Agency is necessitated by the fact that an agent has to perform certain tasks which the principal has neither the time, knowledge nor the expertise to perform himself. The need for agency arises where a person has no ability or expertise to perform a certain action. In this case clients give funds to the bank which will be their investment manager and it will have the form of a general *wakalah*. An agent may obtain a certain wage for his services thus the bank charges a predetermined fee for its managerial services.

Iqbal and Molyneux (2007) report that this kind of contracts is used by some Islamic banks to manage funds on an off-balance sheet balance. The contract is more widely used by Islamic mutual funds and finance companies.

2.5 Conclusion

The aim of this chapter was to provide an overview of the main principles of Islamic finance and the current modern framework for Islamic banking. We have seen that Islamic banking is based on principles which main objective is to contribute to social welfare through non-interest based investments, avoidance of excessive risk taking, and profit and loss sharing schemes (PLS). Nevertheless, Islamic banks are profit maximising and cost minimising institutions. This "*common*" feature with conventional banks, combined with the cost of risk related to profit and loss sharing on one side and the limited risk mitigation tools on the other side, leads Islamic banks to engage in only "risk safe" activities, which might be antagonists, from an allocative efficiency perspective, with pure social welfare – the main objective of a financial system governed by the Sharia' principles.

In the next chapters, we conduct two empirical analyses to answer to our research questions. In the first empirical study, we assess the cost efficiency of Islamic banks and conventional banks and then investigate if the two banking systems, totally different in their underlying principles, share the same technology. In the second empirical study, we isolate the banking system of the

MENA region (where the main bulk of Islamic banks' total assets are managed[4]) and check, first, the impact of banking cost efficiency on economic growth and, second, if a favourable economic growth atmosphere impacts banking cost efficiency.

[4] See Figure A.i.8

CHAPTER 3

THE TECHNOLOGY GAP BETWEEN ISLAMIC AND CONVENTIONAL BANKS IN EMERGING COUNTRIES

3.1 Introduction

The aim of this chapter is to answer to the first and second research questions by providing an empirical analysis of Islamic and conventional banks' cost efficiency and investigating the technology gap between the two industries.

Islamic banking industry has grown considerably over the last decade, compared to its early stage in the modern era (around the 1960s) when the first Islamic credit cooperative experience took place in Mit Ghamr in the Nile valley of Egypt. According to Standard & Poor's (2007), the growth rate of Islamic banking services outpaced that of conventional banking during the past decade, making it one of the most dynamic areas in international finance. The annual growth of Islamic Financial Institutions (IFI) has been estimated to 10% in the Gulf and almost 15% worldwide over the past 10 years. The year 2007 has shown that

Islamic banking is growing at a faster pace, in the range of 15% to 20%, driven by oil price peaks and increasing interest of new countries outside the ones where Islam is the principal religion. At this level new countries like Russia, South Africa and China, are at the early stage of implementing Islamic finance while the United Kingdom has adapted its regulation welcoming Islamic banking institutions since 2004.

Islamic and conventional banking thus coexist in the same market, but the former has more constraints due to the Sharia compliance restricting the use of some bank specific technology and products, such as the extensive use of complex interest-rate based derivatives and some types of securitization methods. As such, these two types of banks experienced different development in terms of financial products, risk mitigation and resources allocation, implying that Islamic and conventional banks may have different efficiency levels. While the literature dealing with the efficiency estimation in banking is extensive (Berger, 2007; Hughes and Mester, 2008), there are few studies dealing with Islamic banking and, especially comparing Islamic banking efficiency to its conventional peer (Hussein, 2004; Hasan, 2006; Bader et al., 2008). Overall, these studies show that Islamic banks tend to be more cost and profit efficient than the conventional ones, although various inconsistencies are also found, perhaps due

to the estimation of a common frontier assuming that both Islamic and conventional banks share the same production technology.

This chapter contributes to previous literature by directly comparing Islamic and Conventional banks in those emerging countries where Islamic banks are most active. Namely, we investigate the existence of a possible technology gap between Islamic and conventional banking (due to the Sharia compliance) resulting in different cost efficiency levels. Previous studies (Hussein, 2004; Hasan, 2006; Bader et al., 2008) focus on simply measuring cost efficiency either for a single country level (using small samples) or at the cross-country level pooling data without facing the data heterogeneity problem. To face the latter problem, various studies in commercial banking (Dietsch and Lozano-Vivas, 2000; Becalli, 2004; Glass e McKillop, 2006; Fiordelisi and Molyneux, 2010) suggest the inclusion of environmental variables in the frontier estimations. Despite the fact that we may straightforwardly apply this approach, it would be inappropriate to our study for two main reasons: first, Islamic banks are not likely to have access to different banking technologies available to conventional banks due to Sharia' compliance and, second, emerging market countries (where most Islamic banks are present) display substantial macro-economic and financial differences that make it quite difficult to control all these factors (see Berger 2007, p. 121). To solve these problems, we apply the Metafrontier

approach, as introduced by Battese and Prasada Rao (2002) and used in the banking industry by Bos and Schmiedel (2007). This enables us to examine a very large and updated sample of Islamic and Conventional banks (1500 overall observations over the 2000-2006 period) from twelve emerging markets countries in the Middle-East and North Africa (MENA) and South Eastern Asia (SEA) regions by accounting for both the data heterogeneity problem (relaxing the assumption that all banks in the sample are subject to the same external conditions) and the possible technology gap between conventional and Islamic banks (by estimating the Technology Gap Ratio (TGR), i.e. the ratio of the output for the frontier production function for the *j*-th industry relative to the potential output that is defined by the Metafrontier function).

Our results advance previous studies since we provide evidence that Conventional and Islamic banks have very similar mean (aggregate) cost efficiency levels in the emerging countries analysed and this is not due to technology gap. As such, Islamic banks seems to be not widely involved in profit-and-loss schemes which would have, theoretically, implied higher technology gap ratios between the two industries and higher technical and Meta-frontier efficiency scores for the Islamic banking industry. By distinguishing mean cost efficiency levels across the twelve countries analysed, we find substantial differences: Islamic banks are more efficient than Conventional banks

in Indonesia, Pakistan, Turkey and United Arab Emirates, while are less in Bangladesh, Kuwait, Malaysia and Tunisia. However, our results confirm that these differences are not due to a substantial technology gap: Islamic and Conventional banks display very high mean Technology gap ratios in all countries by confirming that Islamic banks have a weak application of the profit and sharing investment schemes and holds the same technology adapted as its conventional counterpart.

This chapter has the following structure:

Section 3.2 provides an in-depth literature review of the empirical work on Islamic banking efficiency;

Section 3.3 presents the methodology used to assess banks efficiency and the stochastic Metafrontier approach used to evaluate the technology gap ratio between the Islamic and conventional banking industry;

Section 3.4 describes the data and variables used in this study;

Section 3.5 presents the results and discusses our main findings;

Section 3.6 concludes commenting on the importance of involvement by Islamic banks into profit and loss sharing scheme, being the cornerstone of their activity.

3.2 Literature review

The number of papers dealing with Islamic banking efficiency is limited compared to the conventional banking industry and the studies carried out mainly focused on a small sample.

A first group of studies compares Islamic and conventional banks in a single country. Majid, et al. (2003) used a stochastic cost frontier method with the translog functional form on a sample of 34 commercial banks in Malaysia over the 1993-2000 time period, according to their results, Islamic and Conventional banks do not display statistically different results. Hussein (2004) assesses the alternative profit efficiency scores of 8 Islamic banks versus 8 conventional ones in Bahrain over 16 years (1985-2001) finding that Islamic banks outperform conventional banks. Sufian (2006) uses the Data Envelopment Analysis (DEA) to estimate (domestic versus foreign) Islamic banks efficiency in Malaysia from 2001 till 2004.

A second group of studies also runs cross-country efficiency estimation. Al-Shammari (2002) estimates both cost and alternative profit using the Stochastic

Frontier Analysis and a sample of 10 Islamic banks and 62 conventional banks in the Gulf Cooperation Council (GCC) area over the period 1995-1999. The author finds that Islamic Banks display higher cost efficiency as well as higher profit efficiency than conventional banks. Al-Delaimi and Al-Ani (2006) use the DEA for a cross-country cost efficiency estimation including in their study 24 Islamic banks only from 13 countries. Hasan (2006) estimates the efficiency of a panel of banks in 21 countries over the period of 1995 – 2001 by using both parametric and non-parametric techniques; the author shows that Islamic banks are less efficient than their conventional peers. Ariss (2007) uses the stochastic frontier analysis to estimate the cross-country cost efficiency of 41 banks applied to Islamic and conventional banks in Bahrain, Qatar and United Arab Emirates over the time period from 1998 to 2003. According to her results, cost efficiency improved over time for both conventional and Islamic banks and Islamic banks show a substantial more efficient use of their resources than conventional banks. Bader, et al. (2008) provide evidence of no differences between Islamic and conventional banking estimating cost, profit and revenue efficiencies of 43 Islamic banks and 37 conventional banks over a time period of 1990 – 2005 in 21 countries using Data Envelopment Analysis.

All these studies estimated bank efficiency estimates relative to a common best-practice frontier (i.e. the best-performing banks from the entire set of nations

under investigation, rather than the best-performing banks in the same country). Recent studies on efficiency in the financial sector (e.g. Bos et al., 2009) provide evidence that heterogeneity in the sample may visibly bias the estimation made on the basis of a common frontier. To solve the problem, several studies (e.g. Coelli et al.,1999; Dietsch and Lozano-Vivas, 2000; Becalli, 2004; Glass and McKillop, 2006; Fiordelisi and Molyneux, 2010) suggest including some variables in the estimation process that may represent the characteristics of each individual firm (or groups of firms) that affect the level of efficiency attained. However, the assumption of a single frontier is an unsettled issue in the efficiency literature. Berger and Humphrey (1997), p. 192 notes that 'cross-country comparisons are difficult to interpret because the regulatory and economic environments faced by financial institutions are likely to differ importantly across nations. That is, national differences in regulations, legal systems, financial market development, institutions, payment systems, competitive conditions, culture, demographics, and so forth may have important effects on costs and revenues that affect the distance from the common frontier, and it may be quite difficult to control for all of these factors'. By using the methodology proposed by Battese, et al. (2004), Bos and Schmiedel (2007) developed a different approach by estimating a "Metafrontier" (i.e. an envelope to the national frontiers) focussing on eight large industrialized nations (seven from Europe and Switzerland) to estimate nation-

specific cost and profit frontiers. The authors consider that the conventional estimates using common frontiers underestimate cost and profit efficiency and may result in biased cross-country comparisons.

3.3 Methodology

In order to assess the cross industry cost-efficiency between Islamic and Conventional banks, we use the Stochastic Frontier Analysis to estimate the efficiency of each bank relative to a common best-practice frontier (i.e. the best-performing banks from the entire set of nations under investigation, rather than the best-performing banks in the same country).

We check for the differences in efficiency between the Islamic and the conventional banking industries by pooling the whole sample of banks at a first step, estimate the cost efficiency, then we divide the sample into two groups (Islamic and conventional banks, respectively) and estimate their respective cost efficiency. Finally, we apply the stochastic Meta-frontier approach in order to account for the technology gap ratio between the two industries groups, check for the efficiency differences under the Meta-frontier framework and also

compare these new results to the initial results from the pooled frontier and industry specific frontiers.

The Metafrontier approach is applied in order to face heterogeneity in the sample (i.e. may visibly alter the estimation made on the basis of a common frontier). As noted by Bos and Schmiedel (2007), the sample heterogeneity may be properly faced by the simple incorporation of environmental variables in the efficiency estimation if banks have access to the same standards of technologies. Since Islamic banks are assumed to have access to different banking technologies due to the Sharia compliant products, we estimate cost efficiency using a Stochastic Meta-Frontier methodology as introduced by Battese and Prasada Rao (2002) with a first empirical application to Indonesian garment industry and applied to the European Banking industry by Bos and Schmiedel (2007). This approach is particularly suitable to our research aims since we are examining a very large set of banks from a great number of countries so that it would have been unpractical and unsafe to control for all possible environmental variables. As such, following Battese, et al. (2004) and Bos and Schmiedel (2007), our analysis is structured as follows: 1) we estimate the cost efficiency scores using the stochastic frontier model; 2) we run the Metafrontier model and compare the outcome to the efficiency scores estimated in step (1); and 3) we compute the Technical Efficiency (TE) and Technology Gap Ratio (TGR) relative to each group of banks.

3.3.1 The likelihood ratio test

First of all, we test if the Islamic and conventional banking industries witness a technology gap. At this level of the experiment, the likelihood ratio test is an important aspect of the process. It helps us determine whether the Metafrontier is really necessary for estimating the efficiency levels of the firms. If the two groups (Islamic and conventional groups) share the same technology, then the stochastic frontier production model would be enough to estimate the efficiency of the firms. We run a likelihood ratio (LR) test with the null hypothesis that the stochastic frontier models for the two groups is the same. This is calculated after estimating the stochastic frontier by pooling the data from all the two groups of firms. The LR Statistic is defined as follows:

$$\lambda = -2\{\ln[L(H0)/L(H1)]\} = -2\{\ln[L(H0)] - \ln[L(H1)]\} \quad (3.1)$$

Where L(H0) is the value of the log likelihood functions for the stochastic frontier estimated by pooling the data for all the two groups, and L(H1) is the sum of the values of the log-likelihood functions for the two stochastic cost functions estimated separately for each group. The degrees of freedom for the χ^2

distribution involved are 33, the difference between the number of parameters estimated under H1 and H0.

Testing the industry differences in technology we get a likelihood ratio value of 260 which is significant enough to reject the Null hypothesis that both industries can be estimated under the same frontier. This supports the rationale behind carrying out the stochastic Metafrontier efficiency estimation considering that the two industries do not share the same technology.

3.3.2 The Stochastic Frontier Model

The stochastic frontier approach was introduced quasi-simultaneously by Aigner, et al. (1977), Meeusen and Broeck (1977) and Battese and Cona (1977). The stochastic frontier model assumes that: 1) banks in the sample are assumed to compete in some way; 2) financial products offered by banks (outputs) are homogeneous; 3) the sample is limited to the firms that make use of the full range of inputs and outputs defined by the production set (Berger et al., 2000, p. 4) all firms operate under the same frontier in order to benchmark the differences in firm's efficiencies. Even though these firms do not use the same technology in

their production functions since this depends on their degree of specialisation (as in our case for Islamic banks and for conventional banks), this assumption has to be held when using the stochastic frontier approach. This is a key issue and this study deals with this specific point by estimating the technology gap differences in the sample considered.

Following Aigner, et al. (1977), the cost efficiency function can be specified as

$$\ln TC_{kt} = x_{kt}\beta + \varepsilon_{kt} \qquad (3.2)$$

Where TC_{kt} represents the total cost of the bank k in period t, x_{kt} is a vector of input prices and output quantities and β is a vector of parameters to be estimated; we assume that the error of the cost function is

$$\varepsilon_{kt} = v_{kt} + u_{kt} \qquad (3.3)$$

We specify a translog functional form with 3-input and 3-output for the cost frontier model represented in logs as

$$\ln TC_{kt} = \beta_0 + \sum_{i=1}^{3} \beta_i \ln Y_i + \sum_{j=1}^{3} \alpha_j \ln P_j + \lambda_1 T$$

$$+\frac{1}{2}\left(\sum_{i=1}^{3}\sum_{j=1}^{3} \delta_{ij} \ln Y_i \ln Y_j + \sum_{i=1}^{3}\sum_{j=1}^{3} \gamma_{ij} \ln P_i \ln P_j + \lambda_{11} T^2 \right) + \sum_{i=1}^{3}\sum_{j=1}^{3} \rho_{ij} \ln Y_i \ln P_i$$

$$+\frac{1}{2}\tau_{EE} \ln E \ln E + \tau_E \ln E + \sum_{i=1}^{3} \beta_{iE} \ln Y_i \ln E + \sum_{j=1}^{3} \alpha_{jE} \ln P_j \ln E + \varepsilon_{kt} \qquad for\ i \neq j \quad (3.4)$$

where TC_{kt} is the natural logarithm of total cost of bank k in period t, Y_i is the vector of output quantities, P_j are the input prices, E represents bank's equity capital and is included as a fixed input, specifying interaction terms with both output and input prices in line with recent studies (e.g. Altunbas et al., 2000; Vander Vennet, 2002; Fiordelisi and Ricci, 2010). We specify the time trend T to capture technological change as in Altunbas, et al. (2000). The v_{kt} are assumed to be independently and identically distributed as two sided normal $v_{kt} \sim N(0, \sigma_v^2)$ and captures the effects of statistical noise. The error component u_{kt}, which captures the effect of technical inefficiency, is assumed to be distributed as half-normal $u_{kt} \sim |N(\mu, \sigma_u^2)|$, independently of v_{kt}, and to satisfy $u_{kt} \geq 0$. Bos and Schmiedel (2007) consider that u_{kt} is drawn from a non-negative distribution

truncated at μ instead of zero (since half-normal distribution with mean zero implies that most banks are closely located to the frontier and with small level of inefficiency).

A point estimation of technical efficiency is given by $E(u_{kt} \mid \varepsilon_{kt})$, i.e., the mean of u_{kt} given ε_{kt}. To estimate bank specific cost efficiency, we calculate

$$CE_{kt} = \exp(-u_{kt}) \tag{3.5}$$

The cost efficiency scores CE_{kt} take a value between zero and one, with one being the most efficient bank. For the estimation of the parameters of the stochastic frontier function we follow the development proposed by Stevenson (1980) for the normal-truncated normal model using the maximum likelihood method and re-parameterize σ_v^2 and σ_u^2 as in Bos and Schmiedel (2007) by taking $\sigma^2 = \sigma_v^2 + \sigma_u^2$ and $\lambda = \sigma_u / \sigma_v$ [5].

[5] λ represents the ratio of the standard deviation of the variance of the one-sided component to that of the symmetric component and hence is non-negative (Waldman, 1982, p. 276)

3.3.3 The Meta-Frontier Model

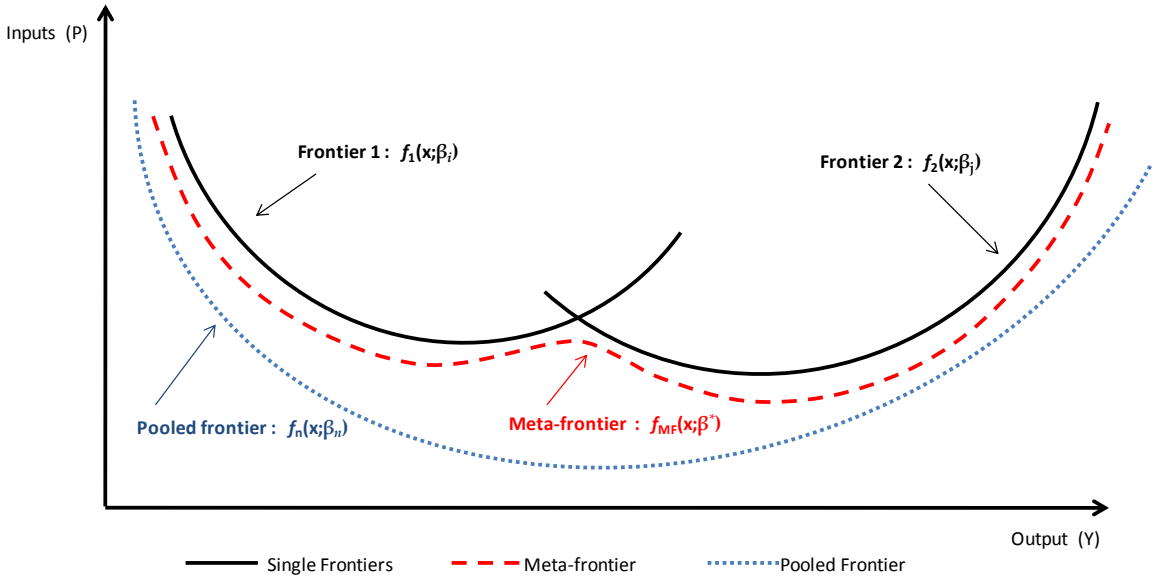
The stochastic cost frontier specified in the model (3.2) assumes that all banks share the same production technology by imposing a common set of parameters. We aim to verify this assumption in the Islamic banking industry by assessing if Islamic banks do not share the same technology as the conventional banks due to Sharia constraints restricting the use of some bank specific technology and products (as the use of complex interest based derivatives and securitization typologies for example). Moreover, depending on the location of the country-specific frontier and the technology gap ratio, the efficiency of some banks might be overestimated or underestimated. As a consequence, we relax the fourth assumption when considering a stochastic frontier approach: under the Metafrontier model banks are no more assumed to share the same production technology which was characterised by the functional form of the stochastic frontier function. The Metafrontier is defined as 'a deterministic parametric function (of specified functional form) such that its values are no smaller (larger in the case of our study as adapted to the Cost function) than the deterministic components of the stochastic frontier production functions of the different groups involved, for all groups and time periods' (Battese et al., 2004, p. 93). Following Battese et al., 2004, and with adaptation to our study the Metafrontier function model for the banks in the industry is expressed by:

$$Y_{kt}^{*} \equiv f\left(x_{kt}, \beta^{*}\right) = e^{x_k \beta^{*}} \tag{3.6}$$

Where Y^{*}_{kt} represents the output of the bank k in period t under the Metafrontier model, x_{kt} is a vector of input prices and output quantities and β^{*} is a vector of parameters of the Metafrontier function to be estimated such as:

$$x_{kt}\beta^{*} \leq x_{kt}\beta \tag{3.7}$$

Figure 3.1 – Cost Meta-frontier function model



Source: Author's own elaboration

As shown in Figure 3.1, the Metafrontier production function is assumed to be a smooth function to envelop slightly under the cost function for the group j of

frontiers considered.[6] The Eq. (3.6) can be reformulated in its general form for the purpose of the Metafrontier function derivation as follows:

$$Y^*_{kt} = e^{x_{kt}\beta^* + v_{kt} + u_{kt}} \tag{3.8}$$

We can express this alternatively by:

$$Y_{kt} = e^{u_{kt}} \times \frac{e^{x_{kt}\beta}}{e^{x_{kt}\beta^*}} \times e^{x_{kt}\beta^* + v_{kt}} \tag{3.9}$$

The $e^{u_{kt}}$ represents the technical efficiency relative to the stochastic frontier of bank *k* at time *t* in the *j*-th group.

$$TE_{kt} = \frac{Y_{kt}}{e^{x_{kt}\beta + v_{kt}}} = e^{u_{kt}} \tag{3.10}$$

$with\ \ 0 \le TE_{kt} \le 1$

The $\frac{e^{x_{kt}\beta^*}}{e^{x_{kt}\beta}}$ represents the Technology Gap Ratio (TGR) which measures the ratio of the output for the frontier production function for the *j*th group relative to the potential output that is defined by the Metafrontier function.

$$TGR_{kt} = \frac{e^{x_k\beta^*}}{e^{x_k\beta}} \tag{3.11}$$

[6] To simplify notations, we drop the j^{-th} group notation from the equations considered in the functions. The j^{-th} group refers to the two groups of banks gathered by industry considered in the study.

with $0 \le TGR_{kt} \le 1$

The technical efficiency relative to the Metafrontier is defined as follows

$$TE^{*}_{kt} = \frac{e^{x_k \beta^{*} + v_{kt}}}{Y_{kt}} \tag{3.12}$$

An alternative expression for the TE^{*} could be computed as follows

$$TE^{*}_{kt} = TE_{kt} \times TGR_{kt} \quad with \; 0 \le TE^{*}_{kt} \le 1 \; and \; TE^{*}_{kt} \le TE_{kt} \tag{3.13}$$

To estimate the Metafrontier model we follow the steps as proposed by Battese, et al. (2004) as to:

1) Obtain the maximum-likelihood estimates, $\hat{\beta}_j$ for the β_j parameters of the stochastic frontier for the *j*-th group;
2) Obtain estimates, $\hat{\beta}^{*}$, for the β^{*} parameters of the Metafrontier function such that the estimated function best envelopes the deterministic components of the estimated stochastic frontiers for the different groups. To identify the best envelope, we use as criterion the sum of squares of deviations of the Metafrontier values from those of the group frontiers;
3) Estimates for the technical efficiencies of firms relative to the Metafrontier function can be predicted by $\hat{TE}^{*}_{kt} = \hat{TE}_{kt} \times \hat{TGR}_{kt}$ where $\hat{TE}^{*}_{kt}$ is the

predictor for the technical efficiency relative to the given group frontier, as proposed in Battese and Coelli (1992). $\hat{TGR}_{kt} = e^{x_{kt}\hat{\beta}^*} / e^{x_{kt}\hat{\beta}}$ is the estimate for the TGR for the i^{th} firm in the j^{th} group relative to the industry potential., obtained by using the estimates for the parameters involved.

We chose the constrained linear least squares method in order to minimise the distance of the j^{th} group relative to the industry potential. We set as well the constraints such that $x_k \beta^* \leq x_k \hat{\beta}$ is respected and bound the results of the β* such that it smoothly envelops the minim estimators of j^{th} group.

This leads to the following optimization problem:

$$\min L^{**} = \sum_{t=1}^{T}\sum_{k=1}^{N}\left(x_{kt}\hat{\beta} - x_{kt}\beta^* \right) \quad with \; x_k \beta^* \leq x_k \hat{\beta} \tag{3.14}$$

3.3.4 Input and Outputs specification

We follow the intermediation approach since it is 'concerned with the overall costs of banking and is appropriate for addressing questions concerning the

economic viability of banks' (Ferrier and Lovell, 1990). Overall, this approach is in line with the Islamic financial system principles, and safely enables us to compare Islamic and conventional banks. Moreover, we consider banks as funds intermediates since they collect deposits and other liabilities and transfer these sources of funds into earning assets such as loans and investments.

For conventional banks, we specify three outputs consisting of loans, securities and off balance sheet items. In order to find an analogy in the choice of variables for Islamic banks, we group under the Loans variable, as proposed by Hussein (2004), the specific Islamic forms of debts (i.e. *Murabaha, Salam* and *Quard* fund for short term debts, and *Sukuk*, Leasing and *Istisna* for the long term debts), we consider for the second output variable the equity financing (i.e. Securities, *Mudaraba, Musharakah* and other Investments) and for the third output variable the off-balance sheet items since they generate income as well as liabilities for the banks and therefore should not be ignored.

We specify three inputs variables for both conventional and Islamic banks: the price of labour, the price of funds and the price of physical capital and we include bank's equity capital as a fixed input as previously discussed in the methodology. For Islamic banks, the price of funds is obtained by dividing the profits distributed to depositors and investors (the case of savings accounts for

the former and the case of profit and loss sharing investment accounts for the latter) resulting from the Islamic banks' investing and financing activities (specifically labelled as "funding expenses" in Bankscope Database) over total funds. In fact, the returns on the deposits at Islamic banks (whether in savings or two-tier *mudarabah* mode) are determined ex-post depending on the economic return on investment in which the deposits were placed (accordingly to the Sharia' principles).

The dependant variable "Total Cost" is calculated as the sum of interest expenses (i.e. profits distributed to depositors and investors for Islamic banks under respectively savings accounts and profit and loss sharing investment accounts), commission expenses, fee expenses, trading expenses and total operating expenses for each year.

3.4 Data

This study gathers data from twelve countries where an Islamic banking activity has been monitored in the MENA region and South East Asia region countries[7]. The data were compiled from the International Bank Credit Analysis Bankscope database and include the annual reports of conventional banks and fully pledged Islamic banks, excluding Islamic windows of conventional banks, over the time period 2000-2006.

For comparability purposes, accounting standards used to compile the annual reports are specific for each industry considered, as for conventional banks' annual reports are established under the IFRS standards whereas for Islamic banks, annual reports are established under the Accounting and Auditing Organization for Islamic Financial Institutions (AAOIFI) Standards which are the specific accounting standards for the Islamic banking industry (Bankscope allows downloading the data in the AAOIFI standards under the "SupraNational Islamnew"[8] Model format).

[7] For comparability purposes we discarded countries like Gabon, Lebanon, Iran, Yemen and Brunei from our sample mainly due to poor data availability. We also dropped from the sample banks labelled as Central Banks, Multi-lateral Governmental Bank, Non-banking Credit Institution and Specialised Governmental Credit Institutions.

[8] The "SupraNational Islamnew" Bankscope format includes in the depreciation: the amortization of goodwill which is not IFRS compliant, as well as the depreciation in physical capital that is bought for leasing.

Tables 3.1 and 3.2 summarize the number of banks and number of observations per country and per industry.

Table 3.1 - Number of observation per country over the period 2000-2006

COUNTRY / YEAR	2000	2001	2002	2003	2004	2005	2006	Total
BAHRAIN	11	10	9	13	13	18	19	93
BANGLADESH	28	30	31	31	30	30	29	209
INDONESIA	36	27	26	32	31	35	31	218
JORDAN	14	13	13	13	16	15	14	98
KUWAIT	6	8	9	9	11	13	10	66
MALAYSIA	26	28	33	33	34	32	38	224
PAKISTAN	13	12	13	17	18	24	25	122
QATAR	3	4	6	7	7	7	9	43
SAUDI ARABIA	10	10	5	10	9	10	11	65
TUNISIA	8	7	7	12	11	15	13	73
TURKEY	16	6	19	26	29	29	24	149
UNITED ARAB EMIRATES	16	17	21	21	22	24	24	145
Total	**187**	**172**	**192**	**224**	**231**	**252**	**247**	**1505**

Source: Author's own elaboration based on Bankscope

Table 3.2 - Number of observations per industry over the period 2000-2006

INDUSTRY / YEAR	2000	2001	2002	2003	2004	2005	2006	Total
Conventional Banks	181	166	184	213	213	221	212	1390
Islamic Bank	6	6	8	11	18	31	35	115
Total	**187**	**172**	**192**	**224**	**231**	**252**	**247**	**1505**

Source: Author's own elaboration based on Bankscope

We use cross sectional data to estimate the stochastic frontier efficiency and Metafrontier efficiency over a period of seven years. Overall, the sample consists

in an unbalanced panel data of 1,390 observations for conventional banks and 115 observations for Islamic banks. The large amount of missing values in the Islamic banks data led us to delete a large number of observations from the sample. Descriptive statistics of the outputs, inputs, dependant variable and equity variable are provided in table 3.3.

Table 3.3 - Descriptive statistics of the Outputs, Inputs, Dependant Variables and Equity Capital used in the empirical analysis

Panel (A) Conventional banking industry [1]

		Mean	StdDev	Min	Max
TC	Total Cost	289,774	678,140	347	9,476,828
Y1	Loans	2,190,534	3,869,356	1,142	35,769,685
Y2	Other Earning Assets	1,967,806	3,697,947	1,320	35,586,853
Y3	Off Balance Sheet Items	1,967,930	4,408,247	42	65,905,989
P1	Price of Labour	0.0119	0.0077	0.0003	0.0716
P2	Price of Funds	0.0484	0.0320	0.0013	0.2235
P3	Price of Assets	1.0551	1.3953	0.0008	13.2926
E	Equity capital	475,126	819,122	1,561	6,408,385

Panel (B) Islamic banking industry [1]

		Mean	StdDev	Min	Max
TC	Total Cost	156,351	216,439	4,700	1,317,009
Y1	Loans	2,242,446	3,947,185	18,800	24,107,477
Y2	Other Earning Assets	874,800	1,292,638	70	7,506,744
Y3	Off Balance Sheet Items	708,86	1,277,013	100	8,022,937
P1	Price of Labour	0.0135	0.0113	0.0006	0.0859
P2	Price of Funds	0.0377	0.0265	0.0027	0.1405
P3	Price of Assets	1.0319	1.5405	0.0089	8.8472
E	Equity capital	789,501	1,504,592	9,195	7,220,964

[1] All values are in thousand dollars, except for relative prices

Source of data: Author's own elaboration based on Bankscope

In our sample we notice that Islamic banks are on average incurring less total costs than the conventional ones even though the total loans amount has a similar level. Other earning assets are however not as large in the Islamic banks sample as for their conventional peers, the combination of this variable with the Off-balance sheet items suggests that Islamic banks, despite their rationale which should be oriented toward profits and losses sharing schemes *(PLS)* activities such as *Mudarabah* and *Musharakah*, are lacking the use of these investment modes.

3.5 Results

Table 3.4 reports the cost efficiency scores for the pooled cost efficiency, technology gap ratios and the Meta-frontier cost efficiency per banking industry.

Table 3.4 - Cost efficiency scores and technology gap ratios

Conventional Banking Industry	Observations	Mean	Std. Dev.	Max	Min
Pooled Cost Efficiency	1390	0.860	0.076	1.000	0.185
Single Cost Efficiency	1390	0.853	0.087	1.000	0.150
Technology Gap Ratio	1390	0.982	0.018	1.000	0.836
Metafrontier Cost Efficiency	1390	0.838	0.088	0.998	0.147
Islamic Banking Industry	**Observations**	**Mean**	**Std. Dev.**	**Max**	**Min**
Pooled Cost Efficiency	115	0.842	0.108	0.974	0.271
Single Cost Efficiency	115	0.845	0.092	0.968	0.464
Technology Gap Ratio	115	0.979	0.020	1.000	0.898
Metafrontier Cost Efficiency	115	0.828	0.092	0.943	0.453

Source: Author's own elaboration

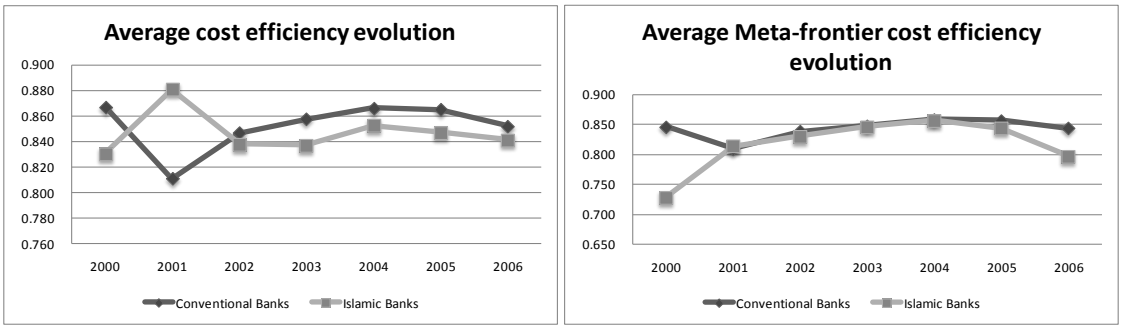
Our results show that conventional and Islamic banks display very similar mean cost efficiency levels. Similarly, the mean technology gap ratios (obtained from each industry specific efficiency frontier and the Meta-frontier technical efficiencies for both banking industries) are very close, being around the 98%. This implies that both Conventional and Islamic banks produce on average 98%

of the potential output given the technology available to all the countries considered in the sample as a whole. Overall, these results signal that under the current Islamic banking industry practices banks are not widely involved in PLS schemes which would have, theoretically, implied higher technology gap ratios between the two industries and higher technical and Meta-frontier efficiency scores for the Islamic banking industry. Interestingly, the pooled frontier estimates underestimate the cost efficiency levels of the two industries in our sample, confirming the Bos and Schmiedel (2007) conclusion that 'the assumption of one pooled frontier technology induces a strong bias in cross-country comparison and may yield misleading results'[9].

By distinguishing mean cost efficiency levels across the time period analysed (i.e. 2000-2006), we find the mean Meta-frontier cost efficiency levels for both industries very similar from 2001 to 2005, then the Islamic banking one witnesses a lower level of cost efficiency (Figure 3.2). These results provide further evidence that Islamic banks use similar technology to the conventional industry through more debt-like financing activities and contracts adaptation (such as *Murabahah* contracts) than developing Islamic specific products.

[9] A similar conclusion is also supported by Dietsch and Lozano-Vivas (2000)

Figure 3.2 - Mean pooled and Meta-frontier cost efficiency evolution



Source: Author's own elaboration

Table 3.5 - Mean cost efficiency scores and technology gap ratios by countries

	Islamic banks		Conventional banks	
COUNTRY / YEAR	Technology Gap Ratio	Metafrontier Cost Efficiency	Technology Gap Ratio	Metafrontier Cost Efficiency
BAHRAIN	0.97	0.83	0.98	0.86
BANGLADESH	0.94	0.65	0.98	0.86
INDONESIA	0.99	0.87	0.97	0.83
JORDAN	0.98	0.82	0.99	0.83
KUWAIT	0.99	0.74	0.99	0.85
MALAYSIA	0.99	0.78	0.98	0.84
PAKISTAN	0.98	0.86	0.97	0.80
QATAR	0.97	0.86	0.98	0.87
SAUDI ARABIA	0.96	0.83	0.99	0.86
TUNISIA	0.97	0.81	0.98	0.83
TURKEY	0.99	0.83	0.99	0.81
UNITED ARAB EMIRATES	0.99	0.87	0.98	0.85
Total	**0.98**	**0.81**	**0.98**	**0.84**

Source: Author's own elaboration

By distinguishing mean cost efficiency levels across the twelve countries analysed (table 3.5), we find substantial differences across Islamic and Conventional banks. Namely, we show that Islamic banks are more efficient than

Conventional banks in Indonesia (87% and 83%, respectively), Pakistan (86% and 80%, respectively), Turkey (83% and 81%, respectively) and United Arab Emirates (87% and 85%, respectively) Conversely, Islamic banks are found to be less efficient than Conventional banks in Bangladesh (65% and 86%, respectively), Kuwait (74% and 95%, respectively), Malaysia (78% and 84%, respectively) and Tunisia (81% and 83%, respectively). These differences are not due to a substantial technology gap ratios as mean values for Islamic and Conventional banks are very similar across countries (except for Bangladesh, Indonesia, Saudi Arabia) showing that both produce on average the same level (around 98%) of the potential output given the technology available in the country. Overall, the results strongly support that Islamic banks, through a weak application of the profit and sharing investment schemes, are using the same technology adapted as its conventional counterpart.

3.6 Conclusion

This study provides a cross-industry efficiency comparison between Islamic and conventional banks for twelve emerging countries 2000-2006 using the

Metafrontier approach by extending the established literature on Islamic banking efficiency. We show that Islamic banks are slightly less cost efficient than their conventional peers, which comes in contradiction with some previous studies who have found that Islamic banks are more cost efficient than conventional banks, but is in line with the recent studies considering similar samples and close time periods as the one considered into our study. This confirms that when based on more recent and comparable data, the various studies, even though using different methodologies, lead to more or less closer results.

The Meta-frontier method used in this study enabled us to provide a comparability method for banks belonging to different industries and operating under different technologies, and to apply the same methodology as for a cross-country analysis. This approach allows for a fair comparison of different banking industries by benchmarking the nature of production process for an average bank in each industry using the technology that is available to the sample as a whole.

This study has been limited by difficulties in getting more extensive data on Islamic banks, but the main message that stems from our results is that the Islamic banking industry is in need to develop its own specific technology in line

with its own core activity (profit-and-loss sharing) in order to reach higher efficiency levels and contribute to social welfare.

Considering that this study is not an end in itself, we suggest that further studies must be considered in order to investigate the banking world post-2008 crisis in emerging markets, and investigate the contribution level of both Islamic and conventional banking industries to the financial stability and social welfare.

CHAPTER 4

BANKING EFFICIENCY AND ECONOMIC GROWTH IN THE MENA REGION

4.1 Introduction

The aim of this chapter is to present an empirical study conducted in order to answer to the third research question: what is the impact of banking cost efficiency on economic growth in the MENA region? And does economic growth affect banking cost efficiency?

In the latest two decades, the MENA region has witnessed important efforts of market liberalization and upgrade of the banking systems. The choice of the MENA region is motivated by the facts that there is no specific empirical evidence on the analysis of the relationship between cost efficiency and financial deepening and that many countries in the region have deliberately proceeded to

reform their financial sectors aiming higher economic growth (Boulila and Trabelsi, 2004).

Hence, we consider that analysing banking productivity for the selected MENA countries in our sample would help providing evidence on the causes of financial intermediary development and help policymakers design reforms that promote growth-enhancing financial sector development.

This study focuses on seven countries in the MENA region in order to investigate the nexus between banking efficiency and economic growth. We consider the banking system with no distinction between conventional and Islamic banks, as our findings in **chapter 3** suggest that the technology gap between the two banking systems is quasi-null leading to strong similarities between Islamic and conventional banks in their banking activities.

The structure of this chapter is the following:

Section 4.2 reviews the literature related to the nexus between economic growth and financial development in the MENA region and stresses the absence of empirical research on the nexus between banking productivity and economic growth;

Section 4.3 describes the selected data and variables used for each step of the methodology;

Section 4.4 provides the methodological approach used to conduct this study;

Section 4.5 concludes with the results discussion and provides suggestions on the link between banking productivity and economic growth.

4.2 Literature review

There exists considerable literature on the nexus between finance and economics growth. Since Schumpeter (1912) stressed the importance of financial services in promoting economic growth, a large number of studies was undertaken exploring the finance economic growth nexus in various regions of the world showing a general positive relationship between the two (Greenwood and Jovanovic, 1990; King and Levine, 1993a; De Gregorio and Guidotti, 1995; Beck and Levine, 2002; Levine, et al., 2000; Fung, 2009...); other studies applied to developing countries, in line with the view of the World Bank (World Bank, 1989 and World Bank, 2005), suggest that the relationship between financial

development and economic growth cannot be generalized across countries because economic policies are country specific (Al-Yousif, 2002).

In the MENA region, a certain number of relevant studies investigated the impact of finance development on the economic growth and vice versa leading to mitigated conclusions. Boulila and Trabelsi (2004) investigated the causality between financial development and economic growth over a large time period from 1960 and 2002 in 16 countries and found little support that finance leads to long run economic growth but a tendency that causality runs from the real sector to the development of the financial sector whereas Abu-Bader and Abu-Qarn (2008) showed an empirical evidence from six countries in the MENA region that strongly supports the hypothesis that finance leads to growth and criticized that in the study Boulila and Trabelsi (2004) it is difficult to account for a long run relationship since 'for a large number of the countries, the number of observation did not exceed 25 years' (Abu-Bader and Abu-Qarn, 2008, p.804). Abu-Qarn and Abu-Bader (2007) conducting a study on 10 countries over the period 1960 to 1998, investigated the factors leading to the long run economic growth considering productivity gains and factor accumulation, their results support that factor accumulation is a leading contributor to economic growth. Furthermore, at the country level, Abu-Bader and Abu-Qarn (2008) focusing on Egypt's case found a positive causality relationship from financial development

to economic growth through a simultaneous increase in resources for investment and efficiency enhancement. These studies focusing mainly on the financial development of the economy as a whole do not specifically address any causality relationship between economic growth and financial institutions' efficiency. Interestingly, a study by Bolbol, et al. (2005) conducted at the country level considers the financial structure in Egypt and investigates its causality effect with the total factor productivity. Furthermore, Pasiouras, et al. (2009) investigated the relationship between bank efficiency and the regulatory and supervisory framework for 74 countries from 2000 to 2004, and included a set of control variables to assess the determinants of banking productivity.

To our knowledge there are no studies specifically investigating the causality between banking cost efficiency and financial deepening in the MENA region.

In order to assess the financial development in the MENA region we use a specific measure of financial deepening: credit to the private sector in terms of GDP (CPR), considered as one of the relevant indicators of the magnitude and the extend of financial intermediation broadly defined (Boulila and Trabelsi, 2004, p. 211) . This indicator has been used widely in the literature (King and Levine, 1993a; Demetriades and Hussein, 1996; De Gregorio and Guidotti, 1995; Levine et al., 1999; Guillaumont et al., 2006) and is supposed to delimitate more

precisely the investment financing activity to the private sector as opposed to the credits to the government or public companies and credits issued by the central bank.

Furthermore, we use other macro-economic variables considered as associated with the long run economic growth such as GDP per capita, to measure the degree of wealth in a given country, Government expenditures in terms of GDP, to measure the degree of implication of the government in the economy and considered as one of the major variables commonly used in estimating growth equations (Abu-Bader and Abu-Qarn, 2008), Consumer Price Index, measuring inflation level, Trade (exports and imports) in terms of GDP and the exchange rate for each country. A summary of the macro economic variables used in this study is presented in Table 4.1

Table 4.1 – Mean values of the macro economic variables in the MENA region

	CPR/GDP	GDP PER CAPITA[1]	TRADE/GDP	GOV/GDP	CPI %	XRATE
BAHRAIN	0.4960	15,204	1.5752	0.1703	0.8760	0.3760
JORDAN	0.7837	2,047	1.2527	0.2171	2.7156	0.7089
KUWAIT	0.5547	22,225	0.8750	0.2040	2.0158	0.2988
QATAR	0.3272	37,259	0.9469	0.1563	4.7251	3.6400
SAUDI ARABIA	0.3072	10,678	0.7571	0.2476	0.2593	0.1925
TUNISIA	0.6089	2,551	0.9674	0.1559	2.9314	0.5390
UNITED ARAB EMIRATES	0.5503	26,732	1.5018	0.1280	5.6571	0.1965

[1] Currency in USD

Source: IMF International Financial Statistics

4.3 Data and Methodology

4.3.1 Data

Table 4.2 provides a summary statistics of the variables used in this study split into bank based variables (used for the cost efficiency estimation) and the macro economic variables (used for the Generalised Method of Moments estimation).

Table 4.2 – Descriptive statistics of cost efficiency, financial deepening and macro-economic variables

	MEAN	STANDARD DEVIATION	MIN	MAX
Bank Based Variables				
PRICE OF LABOUR	0.0119	0.0087	0.0017	0.0859
PRICE OF FUNDS	0.0308	0.0168	0.0026	0.1405
PRICE OF ASSETS	0.7662	1.0705	0.0034	8.8333
LOANS (in USD)	2,654,402	3,832,375	2,805	24,107,477
OTHER EARNING ASSETS (in USD)	2,235,902	3,320,306	1,320	17,944,246
OFF BALANCE SHEET ITEMS (in USD)	1,807,536	3,230,672	100	32,277,549
Macro Economic Variable				
CPR/GDP	0.5183	0.1646	0.3073	0.7838
GDP PER CAPITA (in USD)	16,671	12,957	2,048	37,259
TRADE/GDP	1.1252	0.3203	0.7572	1.5753
GOV/GDP	0.1828	0.0417	0.1280	0.2477
CPI %	2.7401	1.9425	0.2594	5.6571
XRATE	1.9694	1.6418	0.2988	3.7489

Source: IMF International Financial Statistics and Bankscope (values computed by author)

4.3.2 Cost efficiency estimation

We gathered a total of 583 observations for seven countries in the MENA region over the time period 2000-2006. The data were compiled from the International Bank Credit Analysis Bankscope database and include the annual reports of both conventional banks and Islamic banks.

For comparability purposes, accounting standards used to compile to annual reports are specific for each industry considered, as for conventional banks' annual reports are established under the IFRS standards whereas for Islamic banks' annual reports are established under the Accounting and Auditing Organization for Islamic Financial Institutions (AAOIFI) Standards which are the specific accounting standards for the Islamic banking industry (Bankscope allows downloading the data in the AAOIFI standards under the "SupraNational Islamnew"[10] Model format).

We use the same approach as in **Chapter 3**: for conventional banks, we specify three outputs consisting of loans, securities and off balance sheet items and group for Islamic banks, under the Loans variable, as proposed by Hussein (2004), the specific Islamic forms of debts (i.e. Murabaha, Salam and Quard fund

[10] The "SupraNational Islamnew" Bankscope format includes in the depreciation: the amortization of goodwill which is not IFRS compliant, as well as the depreciation in physical capital that is bought for leasing.

for short term debts, and Sukuk, Leasing and Istisna for the long term debts), we consider for the second output variable the equity financing (i.e. Securities, Mudaraba, *Musharakah* and other Investments) and for the third output variable the off-balance sheet items since they generate income as well as liabilities for the banks and therefore should not be ignored.

We specify three inputs variables for both conventional and Islamic banks: the price of labour, the price of funds and the price of physical capital and we include bank's equity capital as a fixed input. For Islamic banks, the price of funds is obtained by dividing the profits distributed to depositors and investors (the case of savings accounts for the former and the case of profit and loss sharing investment accounts for the latter) resulting from the Islamic banks' investing and financing activities (specifically labelled as "funding expenses" in Bankscope Database) over total funds. In fact, the returns on the deposits at Islamic banks (whether in savings or two-tier mudarabah mode) are determined ex-post depending on the economic return on investment in which the deposits were placed (accordingly to the Sharia' principles).

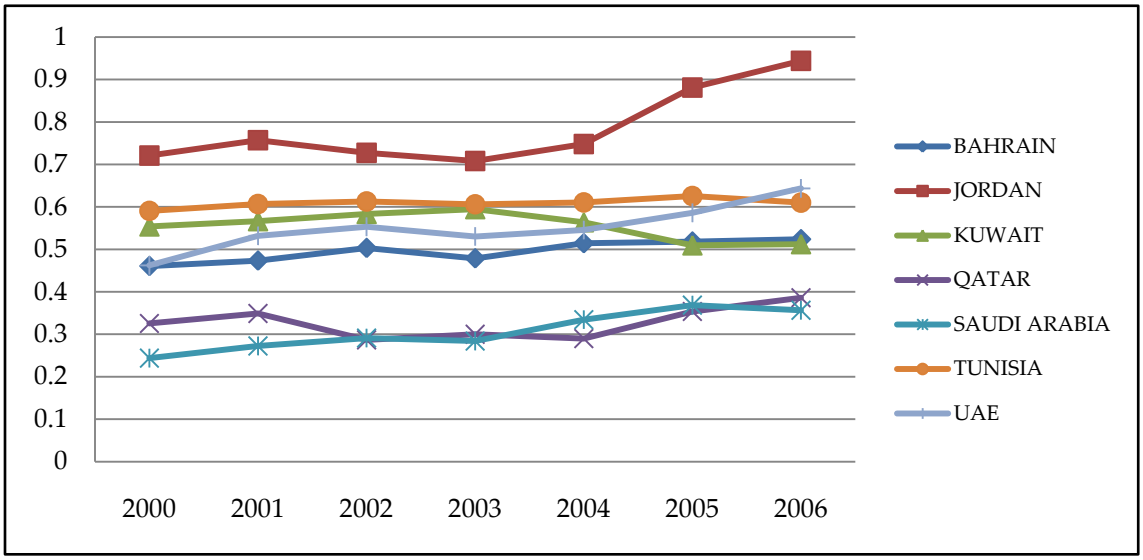
The dependant variable "Total Cost" is calculated as the sum of interest expenses (i.e. profits distributed to depositors and investors for Islamic banks under respectively savings accounts and profit and loss sharing investment accounts),

commission expenses, fee expenses, trading expenses and total operating expenses for each year.

4.3.3 Generalised Method of Moments estimation

The macro economic variables data used for the GMM estimation have been downloaded from the IMF International Financial Statistics. The variables' levels show certain disparities, in fact the credit to the private sector (CPR) in Figure 4.1 shows various levels depending on the country with a mean value of 51%, a minimum value of 31% observed in Saudi Arabia and a maximum value of 78% observed in Jordan, this shows the differences in the degree of financial deepening between the selected countries in the sample and clearly sets the countries with high level of CPR as relying heavily on banks credits.

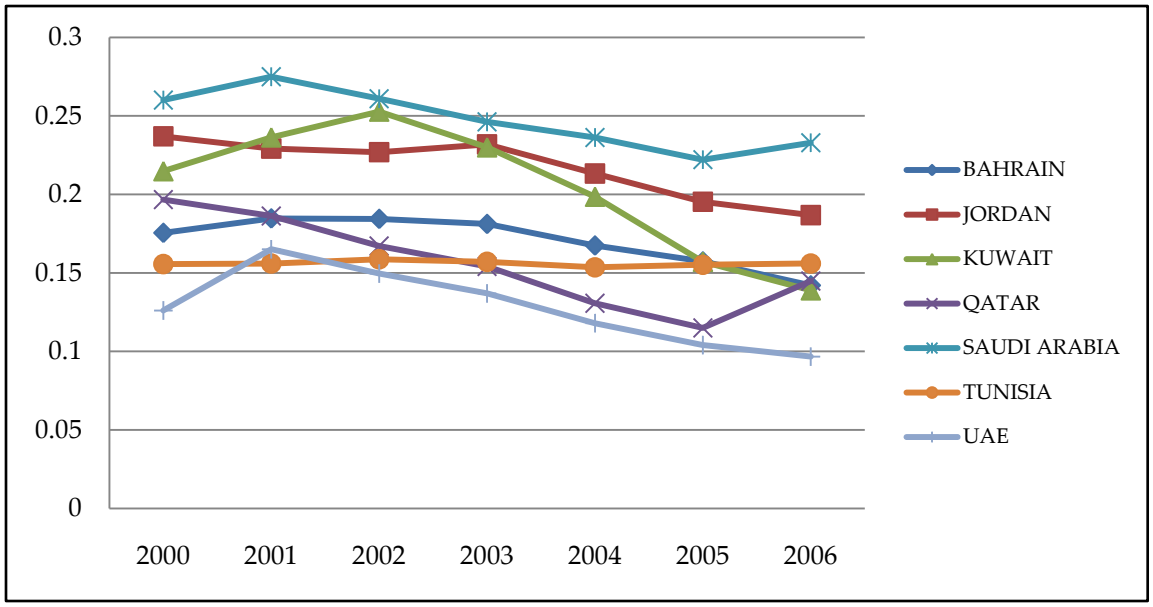
Figure 4.1 - Mean credit to the private sector in terms of GDP in the MENA region



Source: IMF international financial statistics

The inflation rate (CPI) shows an average value of 2.74% and maximum values observed in United Arab Emirates and Qatar where the inflation rate soared the subsequent years leading to a runaway two digits inflation rate. The TRADE in terms of GDP variable shows interesting results as it peaks at 157% for Bahrain and is relatively high for all the countries in the sample whereas the mean GOV/GDP value is relatively low with a mean value of 18% and as Figure 4.2 shows, the trend is rather oriented to lower government expenditures implying less implication from governments and more market liberalization.

Figure 4.2 - Mean government expenditures in terms of GDP in the MENA region



Source: IMF international financial statistics

4.4 Methodology

The methodology includes two steps. In the first step we estimate the cost efficiency scores of each country selected in the sample, for this we use the Stochastic Frontier Analysis to estimate the efficiency of each bank relative to a common best-practice frontier. In the second step we run a system of Generalized Method of Moments regression (GMM) to investigate the causality between banking efficiency and economic growth using at a first stage the Cost Efficiency as a dependant variable (answering the question: does financial

deepening lead to more cost efficient banks?) and at a second stage the Credit to Private Sector as the dependant variable in order to investigate the reverse causality (answering the question: does banks cost efficiency lead to more financial depth?)

4.4.1 The stochastic Frontier Approach

The SFA was introduced quasi-simultaneously by Aigner, et al. (1977), Meeusen and Broeck (1977) and Battese and Cona (1977). The stochastic frontier model assumes that: 1) banks in the sample are assumed to compete in some way; 2) financial products offered by banks (outputs) are homogeneous; 3) the sample is limited to the firms that make use of the full range of inputs and outputs defined by the production set (Berger et al., 2000); 4) all firms operate under the same frontier in order to benchmark the differences in firm's efficiencies.

Following Aigner, et al. (1977), the cost efficiency function can be specified as

$$\ln TC_{k\,t} = x_k \beta + \varepsilon_{k\,t} \qquad (4.1)$$

Where TC_{kt} represents the total cost of the bank k in period t, x_{kt} is a vector of input prices and output quantities and β is a vector of parameters to be estimated; we assume that the error of the cost function is

$$\varepsilon_{k\,t} = v_{k\,t} + u_{k\,t} \tag{4.2}$$

With v_{kt} , the random error term that accounts for measurement errors, bad luck and other factors unspecified in the cost function and u_{kt} the cost inefficiency term represents the minimum cost.

We specify a translog functional form with 3-input and 3-output for the cost frontier model represented in logs as

$$\ln TC_{kt} = \beta_0 + \sum_{i=1}^{3} \beta_i \ln Y_i + \sum_{j=1}^{3} \alpha_j \ln P_j + \lambda_1 T$$

$$+ \frac{1}{2}\left(\sum_{i=1}^{3}\sum_{j=1}^{3} \delta_{ij} \ln Y_i \ln Y_j + \sum_{i=1}^{3}\sum_{j=1}^{3} \gamma_{ij} \ln P_i \ln P_j + \lambda_{11} T^2 \right) + \sum_{i=1}^{3}\sum_{j=1}^{3} \rho_{ij} \ln Y_i \ln P_i$$

$$+ \frac{1}{2}\tau_{EE} \ln E \ln E + \tau_E \ln E + \sum_{i=1}^{3} \beta_{iE} \ln Y_i \ln E + \sum_{j=1}^{3} \alpha_{jE} \ln P_j \ln E + \varepsilon_{kt} \quad for\ i \neq j \tag{4.3}$$

Where TC_{kt} is the natural logarithm of total cost of bank k in period t, Y_i is the vector of output quantities, P_j are the input prices, E represents bank's equity capital and is included as a fixed input, specifying interaction terms with both output and input prices in line with recent studies (e.g. Altunbas et al., 2000; Vander Vennet, 2002; Fiordelisi and Ricci, 2010). We specify the time trend T to capture technological change as in Altunbas, et al. (2000). The v_{kt} are assumed to be independently and identically distributed as two sided normal $v_{kt} \sim N(0, \sigma_v^2)$ and captures the effects of statistical noise. The error component u_{kt}, which captures the effect of technical inefficiency, is assumed to be distributed as half-normal $u_{kt} \sim |N(\mu, \sigma_u^2)|$, independently of v_{kt}, and to satisfy $u_{kt} \geq 0$. We follow Bos and Schmiedel (2007) who consider that u_{kt} is drawn from a non-negative distribution truncated at μ instead of zero (considering a half-normal distribution with mean zero implies that most banks are closely located to the frontier and with small level of inefficiency so we relax this a priori assumption to estimate u_{kt} directly from the data).

A point estimation of technical efficiency is given by $E(u_{kt} | \varepsilon_{kt})$, i.e., the mean of u_{kt} given ε_{kt}. To estimate bank specific cost efficiency, we calculate

$$CE_{kt} = \exp(-u_{kt}) \qquad (4.4)$$

The cost efficiency scores CE_{kt} take a value between zero and one, with one being the most efficient bank. For the estimation of the parameters of the stochastic frontier function we follow the development proposed by Stevenson (1980) for the normal-truncated normal model using the maximum likelihood method and re-parameterize σ_v^2 and σ_u^2 as in Bos and Schmiedel (2007) by taking $\sigma^2 = \sigma_v^2 + \sigma_u^2$ and $\lambda = \sigma_u / \sigma_v$

4.4.2 Generalized Method of Moments

Levine (2004) considers the GMM methodology as especially useful when analyzing the finance-growth relationship since it is argued that financial development is intrinsically related to greater economic performance. Based on Roodman (2006) pedagogic paper, the system GMM is specifically designed for panel data estimation where (1) N (number of observations) is large sample and T (time period) is small, (2) linear function relationship, (3) dynamic single left-hand-side dependant variable, (4) non strictly endogenous independent variables, (5) fixed effects model and (6) heteroskedasticity and autocorrelation within individuals but not across them. Thus the system GMM is considered as

very reliable estimation methodology in the presence of endogeneity as it takes into account both the time and cross-sectional variations and gives the possibility to avoid any bias between cross country regressions. The use of instruments is considered as an advantage as outlined by Levine (2004) who considers that : 'to assess whether the finance-growth relationship is driven by simultaneity bias, one needs instrumental variables that explain cross-country differences in financial development but are uncorrelated with economic growth beyond their link with financial development.' (Levine, 2004, p. 43)

In their seminal paper, Arellano and Bond (1991) proposed the GMM methodology for panel data analysis which was then developed by Blundell and Bond (1998).

We consider the following model:

$$y_{i,t} = \alpha y_{i,t-1} + \beta X_{i,t} + \varepsilon_{i,t} \tag{4.5}$$

$$\varepsilon_{i,t} = \mu_i + \nu_{i,t} \tag{4.6}$$

$$\text{With } E[\mu_i] = E[\nu_{it}] = E[\mu_i \nu_{it}] = 0 \tag{4.7}$$

Where y is the dependent variable, $y_{i,t-1}$ is the lagged dependent variable, $X_{i,t}$ represent a set of exogenous variables (explanatory variables), $\varepsilon_{i,t}$ is the

disturbance term containing two orthogonal components: the fixed effects, μ_i representing the unobserved country-specific effect, and $\nu_{i,t}$ representing the idiosyncratic shocks. *i* and *t* being the observations and time respectively.

The issue in this model is that the lagged dependent variable $y_{i,t-1}$ is correlated with the fixed effects μ_i contained in the disturbance term, which Nickell (1981) identifies as the "dynamic panel bias" since 'using the standard within-group estimator for dynamic models with fixed individual effects generates estimates which are inconsistent as the number of "individuals" tends to infinity if the number of time periods is kept fixed' (Nickell, 1981, p. 1417).

Hence a first transformation called "Difference GMM estimator" is proposed by Arellano and Bond (1991) in order to eliminate the fixed effect, which gives:

$$\Delta y_{i,t} = \alpha \Delta y_{i,t-1} + \beta \Delta X_{i,t} + \Delta \nu_{i,t} \qquad (4.8)$$

Arellano and Bond (1991) suggest to use the lagged values of the exogenous variables as instruments to correct their endogeneity, with the assumption that there is no serial correlation in the error term $\nu_{i,t}$ and that $X_{i,t}$ are weakly exogenous. They use the following moment conditions:

$$E\left[X_{i,t-s}, \nu_{i,t} - \nu_{i,t-1}\right] = 0 \qquad (4.9)$$

For $s \geq 2$; t=3,...,T

They propose then to create a two step GMM estimator. In the first step the error terms are assumed to be both independent and homoskedastic across countries and over time, and in the second step they construct a consistent estimate of the variance co-variance matrix using the residuals obtained from the first step obtaining the *difference estimator* (Beck et al., 2000).

However, even after purging the fixed effects $y_{i,t-1}$ may still be endogenous as correlation persists between $y_{i,t-1}$ and $\nu_{i,t-1}$ in equation (4.8). The same applies for the explanatory variables as they might become potentially endogenous due to their correlation with $\nu_{i,t-1}$. Consequently, a second transformation is proposed by Arellano and Bover (1995) using a *system estimator* in order to eliminate the problems related to the difference estimator namely biasness and imprecision.

In this study, we follow Roodman (2006) using *xtabond2* with the STATA package to estimate the GMM system for it powerful features to provide on one hand the model testing results (the Hansen J-test and the second order autocorrelation) and on the second hand allows the use of a two-step robust estimation as proposed by Windmeijer (2005). Considering our sample of 583 observations, whereas Arellano and Bond (1991) consider that caution should be

advisable in making inferences based on the two-step estimator alone in samples of medium size, Windmeijer (2005) uses a corrected variance estimate to approximate the finite sample with more accurate inference.

The first stage of our estimation is the causality between Cost Efficiency (CE) and financial deepening (CPR) using the following equation:

$$CE_{i,t} = \alpha_{i,t} + \beta_1 CE_{i,t} + \beta_2 CPR_{i,t} + \beta_3 CPR_{i,t-1} + \beta_3 CPR_{i,t-2} + \beta_5 CPI_{i,t}$$

$$\beta_6 TRADE_{i,t_t} + \beta_7 GOV_{i,t} + \beta_8 XRATE_{i,t} + \beta_8 GDPpercapita_{i,t} + \mu_i + \nu_{i,t} \quad (4.10)$$

Then, in a second stage, we estimate the reverse causality represented by the following equation

$$CPR_{i,t} = \alpha_{i,t} + \beta_1 CPR_{i,t} + \beta_2 CE_{i,t} + \beta_3 CE_{i,t-1} + \beta_3 CE_{i,t-2} + \beta_5 CPI_{i,t}$$

$$\beta_6 TRADE_{i,t_t} + \beta_7 GOV_{i,t} + \beta_8 XRATE_{i,t} + \beta_8 GDPpercapita_{i,t} + \mu_i + \nu_{i,t} \quad (4.11)$$

Where the variables used in the GMM system are listed and defined in table 4.3

Table 4.3 – Variables used to assess the causality between cost efficiency and economic growth

Variable	Description
CE	Cost Efficiency
CPR	Credit to the private sector in terms of GDP.
CPI	Annual percentage change in inflation; measured as the change in the consumer price index.
TRADE	The summation of exports and imports in terms of GDP.
GOV	Government expenditure in terms of GDP.
XRATE	Logarithm of the annual average exchange rate. (national currency to USD)
GDP per capita	Logarithm of the average GDP per capita.

Source: IMF International Financial Statistics and Bankscope

In order to test the robustness of our results, we run 6 models considering for:

- Model 1: the endogenous dependent variable CE;
- Model 2: the endogenous dependent variable CE with its lag CE_{t-1};
- Model 3: The lagged endogenous dependent variables only CE_{t-1} and CE_{t-2};
- Model 4: the endogenous dependent variable CPR;
- Model 5: the endogenous dependent variable CPR with its lag CPR_{t-1}; and
- Model 6: The lagged endogenous dependent variables only CPR_{t-1} and CPR_{t-2}.

Finally, we analyse two tests to assess the GMM methodology as explained by Cameron and Trivedi (2009):

- The Hansen J-test: evaluates the correct identification of the variables used in the model and rejects the null hypothesis that the over-identifying restrictions are valid, so if the p-value > 0.05 the model is valid; and
- The second order autocorrelation assumption testing: for consistent estimation, the estimators require that the error term be serially uncorrelated.

4.5 Results and discussion

Table 4.4 reports the cost efficiency results of the selected countries in the sample. Over all banks in the MENA region show high cost efficiency scores and are comparable with previous studies on banking cost efficiency in the region (Al-Shammari and Salimi, 1998; Iqbal and Molyneux, 2007; Pasiouras et al., 2009).

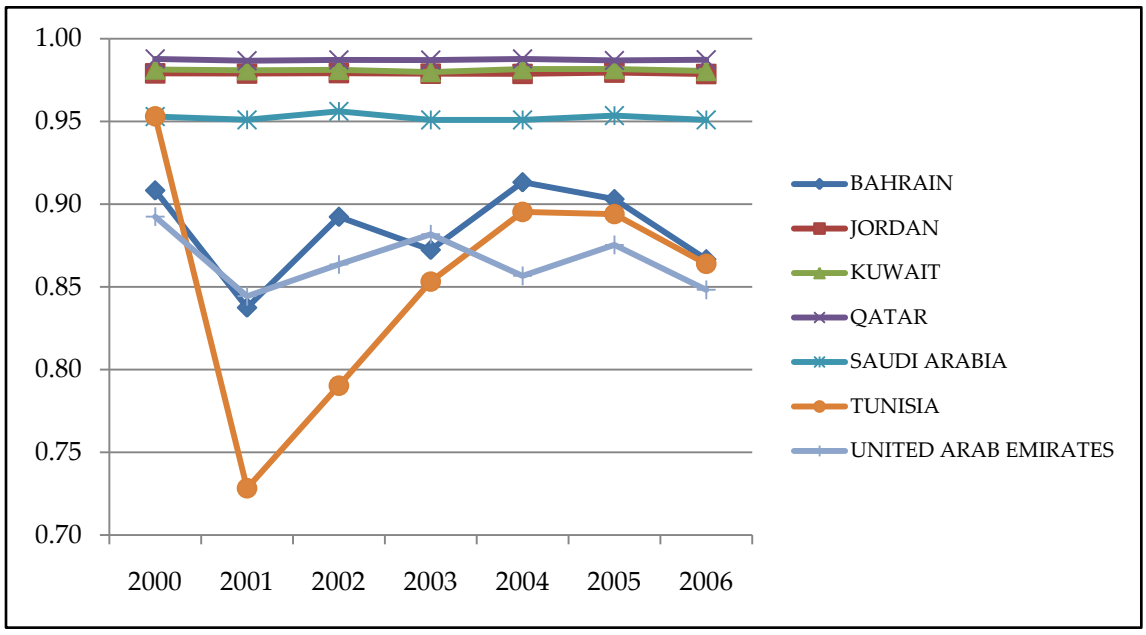
Table 4.4 – Cost Efficiency mean scores for MENA region Banks

	2000	*2001*	*2002*	*2003*	*2004*	*2005*	*2006*
BAHRAIN	0.91	0.84	0.89	0.87	0.91	0.90	0.87
JORDAN	0.98	0.98	0.98	0.98	0.98	0.98	0.98
KUWAIT	0.98	0.98	0.98	0.98	0.98	0.98	0.98
QATAR	0.99	0.99	0.99	0.99	0.99	0.99	0.99
SAUDI ARABIA	0.95	0.95	0.96	0.95	0.95	0.95	0.95
TUNISIA	0.95	0.73	0.79	0.85	0.90	0.89	0.86
UNITED ARABE MIRATES	0.89	0.84	0.86	0.88	0.86	0.88	0.85

Source: computed by the author

Figure 4.3 shows that for Tunisia, the United Arab Emirates and Bahrain mean cost efficiency scores are rather lower than the other 4 countries in the sample. This can be explained by the fact that in the last decade, these countries witnessed strengthening regulation which caused for the banks an increase in the costs of compliance (for more details see Naceur, 2003; Creane et al., 2004).

Figure 4.3 - Mean cost efficiency trends in the MENA region



Source: computed by the author

The next step of our analysis is to investigate the causality and reverse causality between cost efficiency and financial deepening.

In table 4.5, the results show the causality relationship from financial deepening towards the Cost Efficiency being the dependant variable.

Table 4.5 – Main model: Causality results, Cost Efficiency as a dependent variable

	CE (main model)	
CE lagged(t-1)	0.486	***
CPR	0.164	**
CPR lagged(t-1)	-0.096	
CPR lagged(t-2)	-0.030	
CPI	-0.001	
TRADE	-0.038	***
GOV	0.201	
XRATE	-0.009	
GDP per capita	0.006	
Cte.	0.421	
AR(1)	-2.630	
p-value	*0.009*	
AR(2)	-0.160	
p-value	*0.873*	
Hansen J test	55.380	
p-value	*0.821*	
Observations	321	

** p-value<0.1; ** p-value<0.05; ***p-value<0.01*

Source: Author's own elaboration

We find a positive relationship between CE and CPR. The CPR coefficient in the main model is significant and shows that an increase by 1% in the CPR impacts the CE by an increase of 16%. This can be explained by the fact that a greater financial deepening shifts up the level of outputs at the banks' level leading to an increased banking productivity. However, we consider this causality as relatively weak, as the main model validates the hypothesis that greater financial deepening implies greater banking productivity for the selected MENA countries

in our sample while in the robustness testing models in table 4.6 the CPR variable is not statistically significant.

Table 4.6 – Robustness testing models: Causality results, Cost Efficiency as a dependent variable

	CE (model a)		CE (model b)		CE (model c)	
CE lagged(t-1)	0.454	***	0.472	***	0.533	***
CPR	0.047		-0.001			
CPR lagged(t-1)			0.048		0.065	
CPR lagged(t-2)					-0.060	
CPI	0.003	**	0.003	**	0.001	
TRADE	-0.038	***	-0.034	***	-0.030	***
GOV	0.489	***	0.497	**	0.193	
XRATE	-0.009	***	-0.008	**	-0.008	
GDP per capita	0.010		0.010		0.001	
Cte.	0.336		0.313		0.429	
AR(1)	-2.680		-2.680		-2.670	
p-value	*0.007*		*0.007*		*0.008*	
AR(2)	-0.780		-0.760		-0.180	
p-value	*0.434*		*0.444*		*0.857*	
Hansen J test	80.180		79.040		59.970	
p-value	*0.928*		*0.930*		*0.716*	
Observations	441		441		321	

** p-value<0.1; ** p-value<0.05; ***p-value<0.01*

Source: Author's own elaboration

Investigating the control variables, the main model, supported by the robustness models results, shows the TRADE variable as significant and negatively impacting banking cost efficiency. The MENA countries in our sample present the particularity of containing four of the largest oil exporting countries, when digging at the level of imports and exports for each country we find that the level

of exports is relatively high. Hence the results suggest that banks evolving in expanding markets sustained by high levels of oil exports would be less constrained to control their expenses and thus become less cost efficient. The remaining control variables do not seem to have any significance in the main model, although in the robustness testing models the GOV has a significant positive impact on cost efficiency (models (a) and (b)) implying that government expenditures in the form of financial incentives boost banking productivity. CPI and XRATE in models (a) and (b) of the robustness tests are both statistically significant but have very weak impact. We can consider that an increment in inflation may increase interest rates, particularly lending rates, boosting banking performance and productivity.

The next stage of our analysis is the reversed causality. We investigate the impact of banking cost efficiency the financial deepening, or put it differently: does banking productivity improve financial deepening? We keep in this model the control variables in order to assess their effect on financial deepening.

The results provided by table 4.7 validate the Hansen J-test with a p-value above 5% so we consider our results as conclusive. We find a positive causality relationship running from CE and its lag CE_{t-2} to CPR.

Table 4.7 – Main model: Reverse causality results, Credit to the private sector (CPR) as a dependent variable

	CPR (main model)	
CPR lagged(t-1)	0.895	***
CE	0.146	***
CE lagged(t-1)	-0.084	
CE lagged(t-2)	0.124	***
CPI	0.007	***
TRADE	0.067	***
GOV	0.164	
XRATE	0.001	**
GDP per capita	-0.018	***
Cte.	-0.071	
AR(1)	-4.340	
p-value	*0.000*	
AR(2)	-0.760	
p-value	*0.446*	
Hansen J test	81.150	
p-value	*0.099*	
Observations	321	

** p-value<0.1; ** p-value<0.05; ***p-value<0.01*

Source: Author's own elaboration

Although not validated by the robustness models (d) and (f) in table 4.8, these results are very interesting since they show that banking productivity has both an immediate and a lagged effect on financial development in the selected MENA countries, model (e) confirms these findings at the lagged CE_{t-1} value.

Table 4.8 – Robustness testing models: Reverse causality results, Credit to the private sector (CPR) as a dependent variable

	CPR (model d)		CPR (model e)		CPR (model f)	
CPR lagged(t-1)	0.896	***	0.895	***	0.896	***
CE	0.025		0.001			
CE lagged(t-1)			0.056	***	-0.023	
CE lagged(t-2)					0.141	***
CPI	0.007	***	0.006	***	0.007	***
TRADE	0.069	***	0.070	***	0.063	***
GOV	0.384	***	0.357	***	0.184	***
XRATE	0.002	*	0.003	**	0.000	
GDP per capita	-0.015	***	-0.016	***	-0.018	***
Cte.	0.020		-0.001		-0.006	
AR(1)	-4.210		-4.240		-4.890	
p-value	*0.000*		*0.000*		*0.000*	
AR(2)	-1.790		-1.670		-1.690	
p-value	*0.073*		*0.096*		*0.091*	
Hansen J test	104.590		105.020		81.880	
p-value	*0.357*		*0.320*		*0.104*	
Observations	441		441		321	

** p-value<0.1; ** p-value<0.05; ***p-value<0.01*

Source: Author's own elaboration

The control variables show that TRADE has a significant impact on financial deepening. The level of trade is normally associated with greater financial development, through for example, a greater demand for new financial products, which could help with risk diversification. Bonfiglioli (2008) suggests that the degree of openness affects the efficiency in the economy through several channels such as specialization, comparative advantage, access to larger markets, and increased competition. Inflation and foreign exchange rate have significant

coefficient but present a very low impact on financial deepening. We find a significant positive effect of government expenditures on financial deepening in the three robustness models but not in the main model. In this context, these results corroborate Bonfiglioli (2008) findings, who argues that increases in government expenditure, focused on stimulating the financial sector, crowds out private investments which could in turn increase financial deepening and economic growth. Finally, and interestingly, the per capita GDP variable has a statistically significant but negative impact on financial deepening. This result is obtained under other specifications (models (e), (d) and (f)) and appears to be robust when estimated in the main model. At first glance this evidence may appear puzzling, but De Gregorio and Guidotti (1995) find similar results when analyzing the causality between financial deepening and long term growth in Latin America. They suggest that the negative relationship between CPR and the long run growth proxy GDP per capita comes from a negative effect on the efficiency of investments and is the result of financial liberalization in a poor regulatory environment. Moreover, they consider that the high level of financial intermediation could be a sign of a fragile and overexposed financial system, rather than one that was efficiently allocating credit. In the MENA region, the recent debt crisis in Dubai, one the seven states of the United Arab Emirates, is a true example of the lack of efficiency in investments. The real estate bubble

starting in year 2000 has propelled a frenetic expansion on the back of borrowed cash and speculative investment and burst in 2009 leading to a collapse in the whole middle-eastern economy where Dubai is a leading financial centre for real estate development.

Our results are thus supportive of a positive causality and reverse causality relationship between cost efficiency and financial deepening for the seven MENA countries in our sample.

4.6 Conclusion

This paper fills the gap in the banking cost efficiency literature in the MENA region and analyses the causality relationship between banking productivity and financial deepening in seven MENA countries from 2000 till 2006. We first estimated banking cost efficiency for each of the countries using the stochastic frontier approach methodology. Then, we tested for the causality and reverse causality relationship between banking productivity and financial deepening. Our empirical results show a significant and positive causality and reverse relationship between financial deepening and banks' productivity suggesting

that financial deepening has an important influence on banking productivity which has in turn a direct positive impact on financial deepening. We introduced a set of control variables associated with the long run growth, used in the literature following other studies and found that the degree of openness has a negative impact on banking productivity in the selected countries whereas it has a positive effect on financial deepening along with government expenditures and inflation. Our results, show a very interesting evidence of the negative impact of the GDP per capita on financial deepening in a poorly regulated environment where the investments in the economy are not efficient. Therefore, our results can be considered as an important argument to increase financial deepening in the selected MENA countries in order to achieve higher banking productivity. We consider that efforts should be focusing on the investments' efficiency and the increase of regulation to spur a more stable financial system and foster financial deepening in the future, which can lead to a virtuous cycle between financial deepening and banking productivity.

CHAPTER 5

CONCLUDING REMARKS

The aim of this thesis is: first, to check for differences in technology between the Islamic and the conventional banking systems in the MENA and SEA regions, and second, to investigate the impact of the banking productivity on economic growth in the MENA region. This thesis has been structured in order to answer the following research questions:

1. Are Islamic banks more cost efficient than their conventional counterparts?
2. Are there differences in technology between Islamic and conventional banks?
3. What is the impact of banking cost efficiency on economic growth in the MENA region? And does economic growth affect banking cost efficiency?

After providing in the second chapter an overview of the Islamic banking system, the roots of Islamic finance and its foundations; we conduct, in the third chapter, the first empirical analysis in order to answer to the first and second research questions. Previous studies comparing Islamic and conventional

banking efficiency across countries show mitigated results with a general tendency towards Islamic banking being more cost efficient than its conventional counterparts. However these studies used a cross-country analysis of efficiency based on a pooled frontier. The pooled frontier presents a limitation for it does not account for the differences between countries, or industries, underestimates cost efficiency and may result in biased cross-country comparison (Bos and Schmiedel, 2007). To bypass this limitation, various studies use environmental variables in an attempt to account for the various factors specific to each stochastic frontier. Nevertheless, Berger (2007) considers that it may be quite difficult to control for all of these factors. In our empirical study, to overcome the heterogeneity problem, we apply the stochastic Meta-frontier approach, which is considered by Berger (2007) as a methodological improvement. This methodology allows computing the technology gap between different groups, put differently, it allows for a fair comparison of different banking industries, by benchmarking the nature of production process for an average bank in each industry, using the technology that is available to the sample as a whole. Hence we investigate the differences in technology between the Islamic and conventional banking industries. Our results suggest that Islamic banks are slightly less cost efficient than their conventional peers. These results are in line with the recent studies considering similar samples and close time periods as the

one considered into our study. This proves that when using recent and comparable data, studies tend to convergence to the same results using different methodologies. Interestingly, we find extremely small differences in terms of technology between the two banking industries, suggesting that Islamic banks are not sufficiently involved into profit and loss sharing schemes but replicating conventional banks products through an "Islamisation" of conventional products. These results confirm El-Gamal (2006) who considers that the primary emphasis in Islamic finance is not on efficiency and fair pricing, but rather on contract mechanics and certification of "Islamicity" by Sharia supervisory boards to the extent that Islamic financial products cost more than the conventional products that they seek to replace. Consequently, our intuition is that Islamic banking industry should promote the development of its own specific technology and products in line with its own core activity (profit-and-loss sharing) in order to achieve higher efficiency levels and contribute to social welfare.

Our second empirical analysis in the fourth chapter provides an answer to the third research question. Our purpose in this analysis is to explore the nexus between banking cost efficiency and growth. We conduct a review of the literature and find that previous studies related to the MENA region focus only on the causality between financial development and economic growth and tend

to marginalise the nexus between banking productivity and economic growth. We identify the Credit to the Private Sector as a valid measure of financial deepening widely used in the literature. In our empirical analysis we first assess the banks cost efficiency using the stochastic frontier approach, and then we use the Generalized Method of Moments (GMM), specifically designed for panel data estimation as in our causality analysis. We follow Windmeijer (2005) and apply the two-step robust GMM methodology. The advantage of the GMM system is that it allows the use of instrumental variables that explain cross-country differences in financial development but are uncorrelated with economic growth beyond their link with financial development. To test the robustness of our results we build the main model and test different other models. Finally, we verify the correct identification of the variables used in the model and test that the error term is serially uncorrelated (a requirement for the GMM methodology results validity). In our results, we present evidence that banks, for the selected countries in the MENA region, show high cost efficiency scores. We find significant and positive causality and reverse relationship between financial deepening and banks' productivity suggesting that financial deepening has an important influence on banking productivity which has in turn a direct positive impact on financial deepening. We also find that the degree of openness has a negative impact on banking productivity in the selected countries whereas it has

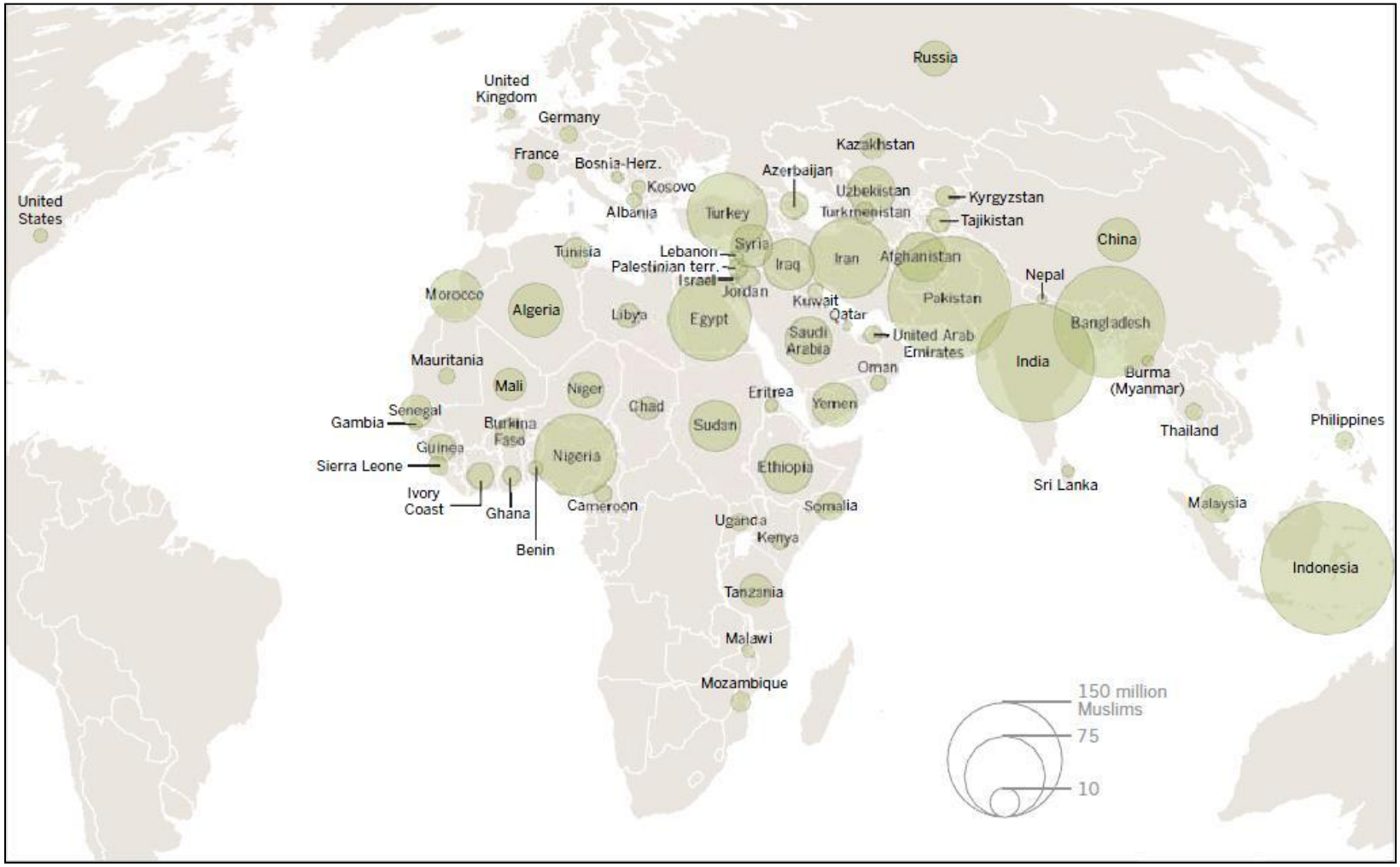
a positive effect on financial deepening along with government expenditures and inflation. Interestingly, we show that GDP per capita has negative impact on financial deepening in a poorly regulated environment, as this is highly related to the investments allocative efficiency in the economy. Finally our results suggest that efforts should be focusing on the investments' efficiency and the increase of regulation to spur a more stable financial system and to foster financial deepening in the future as this can lead to a virtuous cycle between financial deepening and banking productivity.

Future Research

Considering that this study is not an end in itself, we suggest that further empirical analysis should investigate the post 2008 financial crisis in emerging countries, and analyse to which extend Islamic banks moderated the effects of crisis is these countries. The analysis should drill down at the Islamic banks' investments portfolio level and assess its impact on the industry's productivity to attempt to define productivity determinants at the strategic level. This would complement a comparative study of allocative efficiency and its impact on economic growth between Islamic and conventional banks in emerging countries.

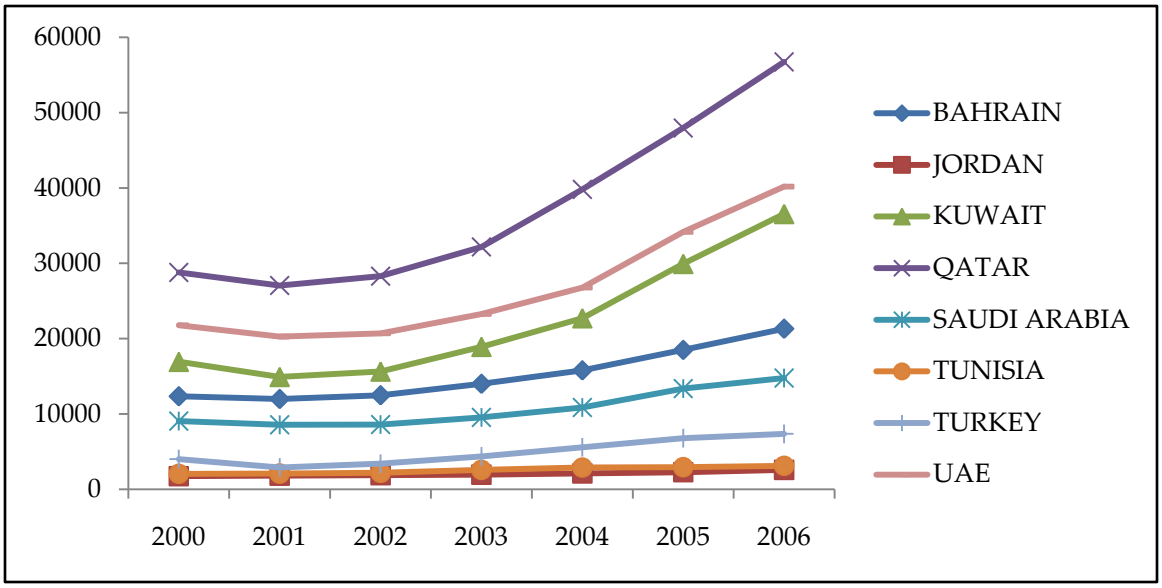
APPENDIX

Figure A.i.1 – Distribution of Muslim Population by Country and Territory



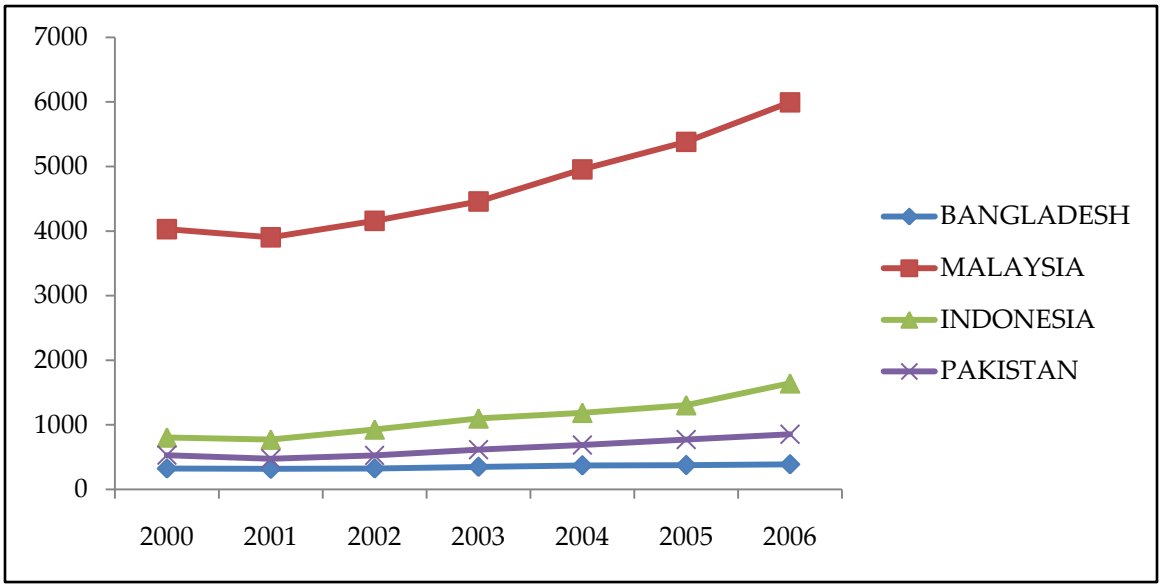
Source: Pew Research Center's Forum on Religion & Public Life - Mapping the Global Muslim Population, October 2009

Figure A. i.2 – GDP per capita in the MENA region (values in USD)



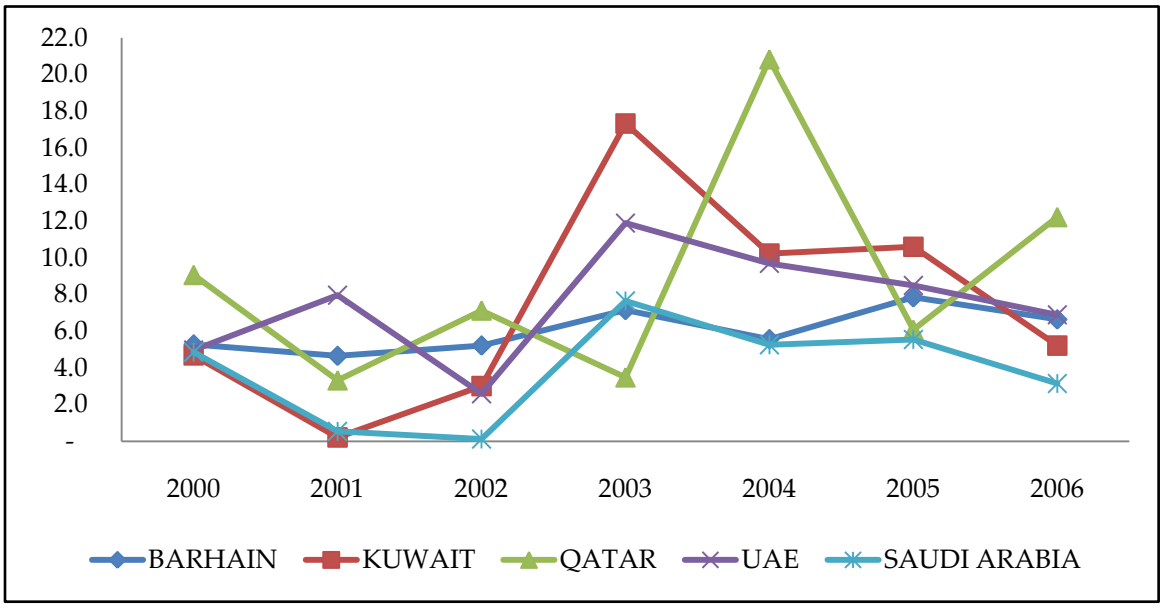
Source: elaborated by the author based on IMF database

Figure A. i.3 – GDP per capita in the SEA region (values in USD)



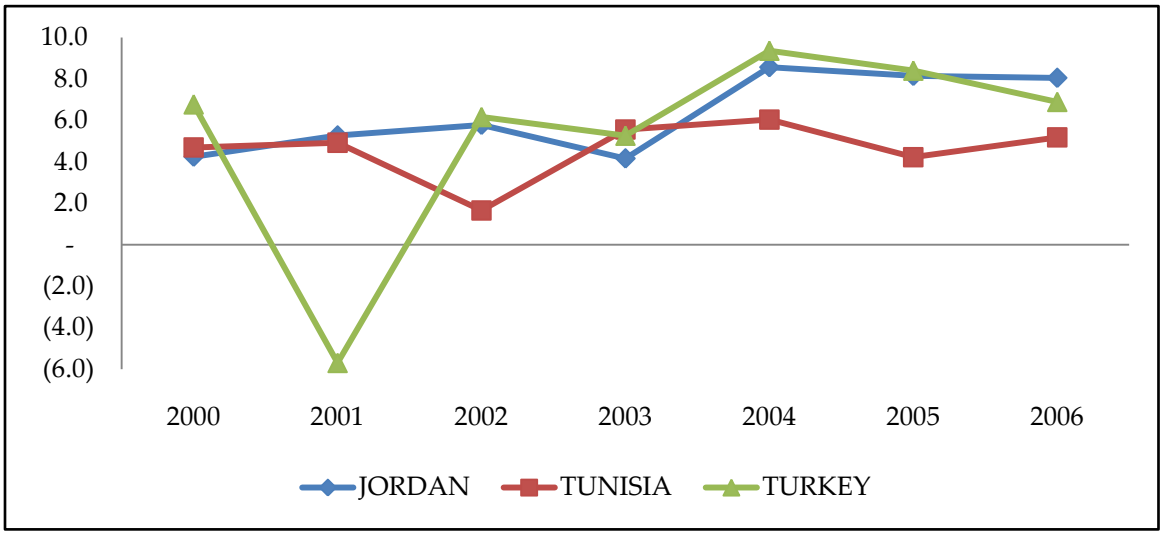
Source: elaborated by the author based on IMF database

Figure A. i.4 – Growth rate percentage in the MENA region – OPEC countries



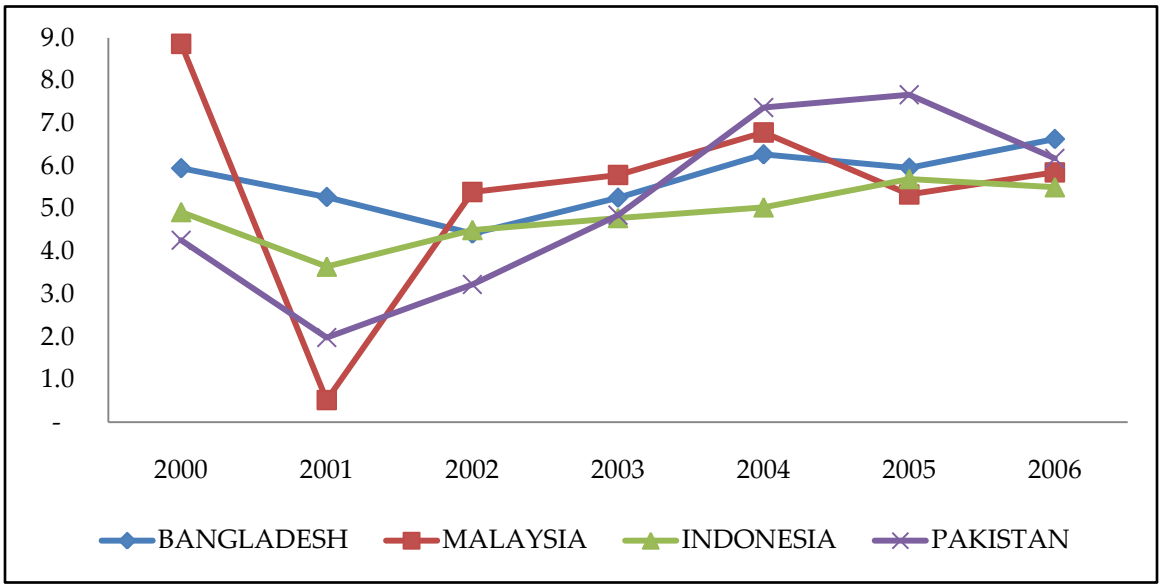
Source: elaborated by the author based on IMF database

Figure A. i.5 – Growth rate percentage in the MENA region – Non OPEC countries



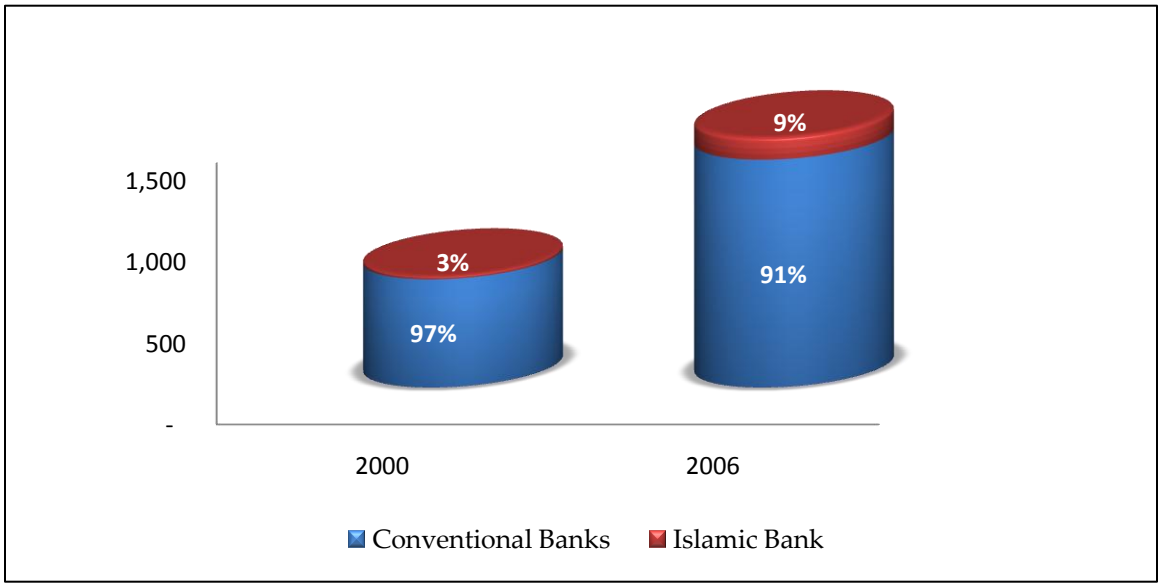
Source: elaborated by the author based on IMF database

Figure A. i.6 – Growth rate percentage in the SEA region



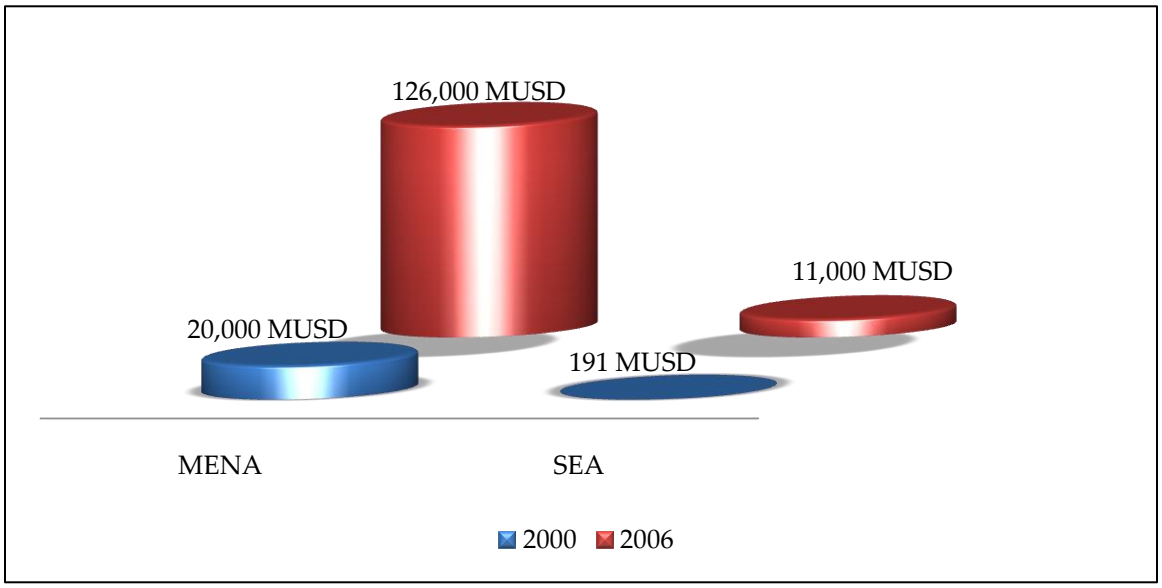
Source: elaborated by the author based on IMF database

Figure A. i.7 – Distribution of Total Assets across conventional and Islamic banks in the selected countries (values in Billion USD)



Source: elaborated by the author based on Bankscope database

Figure A. i.8 – Distribution of Islamic banks' Total Assets across the MENA and SEA regions (values in Million USD)



Source: elaborated by the author based on Bankscope database

Table A.3.1 – Cost estimated parameters for the Meta-frontier, pooled frontier and single frontier per industry [1]

Variable Name	Meta-Frontier [2]	Pooled Frontier	Single Frontier Conventional Banks	Single Frontier Islamic Banks
Constant	-1.001	-0.4206 (0.4010)	0.6706 (0.3265)	-10.0769 (1.3328)
Loans	0.940	0.7671 (0.0662)	0.6613 (0.0581)	1.9112 (0.4892)
Other Earning Assets	1.032	0.6275 (0.0682)	0.6360 (0.0639)	1.1262 (0.3357)
Off-balance Sheet	-0.365	-0.2774 (0.0495)	-0.1333 (0.0448)	-1.1252 (0.3056)
Labour	0.967	0.5645 (0.0855)	0.6029 (0.0678)	-0.2735 (0.4607)
Assets	0.016	0.0834 (0.0409)	0.1022 (0.0363)	0.2024 (0.2483)
½ (Loans)²	0.161	0.1861 (0.0092)	0.1700 (0.0082)	0.0774 (0.0786)
½ (Loans * Other Earning Assets)	-0.440	-0.4480 (0.0172)	-0.4802 (0.0154)	-0.5072 (0.0860)
½ (Loans * Off-balance Sheet)	-0.021	-0.0092 (0.0082)	0.0024 (0.0072)	0.04665 (0.0771)
½ (Other Earning Assets)²	0.180	0.1421 (0.0096)	0.1611 (0.0111)	0.1431 (0.0386)
½ (Other Earning Assets * Off-balance Sheet)	-0.039	0.0169 (0.0104)	0.0267 (0.0107)	-0.0600 (0.0461)
½ (Off-balance Sheet)²	0.015	-0.0168 (0.0036)	-0.0098 (0.0035)	0.0043 (0.0220)
½ (Labour)²	0.349	0.1525 (0.0147)	0.1356 (0.0128)	0.1782 (0.0726)
½ (Labour * Assets)	-0.124	0.0193 (0.0133)	0.0519 (0.0125)	0.0109 (0.0473)
½ (Assets)²	0.029	0.0012 (0.0043)	0.0008 (0.0043)	0.0412 (0.0192)
Loans * Labour	-0.100	-0.0305 (0.0179)	-0.0597 (0.0161)	-0.1441 (0.0829)
Loans * Assets	0.015	0.0174 (0.0106)	0.0016 (0.0098)	-0.0203 (0.0546)
Other Earning Assets * Labour	-0.154	-0.1013 (0.0222)	-0.0718 (0.0204)	-0.4059 (0.1022)
Other Earning Assets * Assets	0.009	-0.0331 (0.0118)	0.0066 (0.0114)	-0.0050 (0.0574)
Off-balance Sheet * Labour	0.101	-0.0390 (0.0128)	-0.0401 (0.0124)	0.1525 (0.0533)
Off-balance Sheet * Assets	-0.026	0.0066 (0.0079)	0.0141 (0.0078)	-0.0508 (0.0251)
Capital	-0.222	0.1166 (0.0806)	-0.1248 (0.0755)	0.6440 (0.5924)
(Capital)²	-0.094	-0.1553 (0.0150)	-0.1281 (0.0143)	-0.2913 (0.0975)
Loans * Capital	0.039	0.0268 (0.0102)	0.0658 (0.0092)	0.0526 (0.0611)
Other Earning Assets * Capital	0.016	0.0738 (0.0111)	0.0622 (0.0104)	0.0870 (0.0586)
Off-balance Sheet * Capital	0.052	0.0329 (0.0069)	0.0000 (0.0071)	0.1049 (0.0321)
Labour * Capital	0.088	0.0933 (0.0117)	0.0848 (0.0110)	0.2791 (0.0455)
Assets * Capital	-0.013	-0.0008 (0.0067)	-0.0181 (0.0067)	0.0158 (0.0314)
Time	0.045	0.1775 (0.0150)	0.2004 (0.0126)	0.0140 (0.0711)
½(Time)²	-0.008	-0.0353 (0.0036)	-0.0402 (0.0030)	-0.0052 (0.0157)

[1] Standard Errors are provided between parentheses

[2] Meta-frontier estimates are obtained using Matlab Optimization toolbox (linear programming solver with Large scale Algorithm), the results are optimized with a positive Objective function value, so the results are considered valid (standard errors are not provided by the toolbox output)

Source: Author's own elaboration

Table A.4.1 – GMM system estimates standard errors for causality between Cost Efficiency and financial deepening [1]

	CE (main model)	CE (model 1)	CE (model 2)	CE (model 3)
CE lagged(t-1)	0.4856 (0.0872)	0.4544 (0.1118)	0.4724 (0.1182)	0.5328 (0.0813)
PCR	0.1644 (0.0694)	0.0467 (0.0358)	-0.0008 (0.0769)	-
PCR lagged(t-1)	-0.0963 (0.1208)	-	0.0480 (0.0821)	0.0654 (0.0805)
PCR lagged(t-2)	-0.0299 (0.0932)	-	-	-0.0604 (0.0821)
CPI	-0.0006 (0.0013)	0.0033 (0.0016)	0.0034 (0.0017)	0.0006 (0.0018)
TRADE	-0.0381 (0.0146)	-0.0376 (0.0120)	-0.0341 (0.0129)	-0.0301 (0.0149)
GOV	0.2012 (0.2031)	0.4885 (0.1864)	0.4972 (0.2171)	0.1931 (0.1654)
XRATE	-0.0089 (0.0056)	-0.0091 (0.0033)	-0.0084 (0.0034)	-0.0080 (0.0048)
GDP per capita	0.0055 (0.0068)	0.0098 (0.0067)	0.0098 (0.0067)	0.0006 (0.0055)
Cte.	0.4214 (0.1087)	0.3358 (0.0921)	0.3129 (0.0979)	0.4293 (0.1110)
AR(1)	-2.63	-2.68	-2.68	-2.67
p-value	*0.009*	*0.007*	*0.007*	*0.008*
AR(2)	-0.16	-0.78	-0.76	-0.18
p-value	*0.873*	*0.434*	*0.444*	*0.857*
Hansen J test	55.38	80.18	79.04	59.97
p-value	*0.821*	*0.928*	*0.93*	*0.716*
Observations	321	441	441	321

[1] Standard Errors are provided between parentheses

Source: Author's own elaboration

Table A.4.2 – GMM system estimates standard errors for reverse causality between Cost Efficiency and financial deepening [1]

	CPR (main model)	CPR (model 4)	CPR (model 5)	CPR (model 6)
CPR lagged(t-1)	0.8954 (0.0172)	0.8961 (0.0150)	0.8951 (0.0149)	0.8957 (0.0157)
CE	0.1458 (0.0559)	0.0254 (0.0258)	0.0009 (0.0271)	-
CE lagged(t-1)	-0.0844 (0.0536)	-	0.0555 (0.0172)	-0.0225 (0.0350)
CE lagged(t-2)	0.1243 (0.0347)	-	-	0.1413 (0.0425)
CPI	0.0067 (0.0004)	0.0066 (0.0003)	0.0064 (0.0003)	0.0066 (0.0004)
TRADE	0.0672 (0.0070)	0.0688 (0.0060)	0.0700 (0.0060)	0.0633 (0.0073)
GOV	0.1636 (0.0715)	0.3835 (0.0472)	0.3572 (0.0493)	0.1839 (0.0657)
XRATE	0.0011 (0.0018)	0.0024 (0.0014)	0.0028 (0.0013)	0.0003 (0.0014)
GDP per capita	-0.0177 (0.0026)	-0.0154 (0.0021)	-0.0158 (0.0021)	-0.0178 (0.0024)
Cte.	-0.0710 (0.0417)	0.0199 (0.0223)	-0.0013 (0.0232)	-0.0060 (0.0356)
AR(1)	-4.34	-4.21	-4.24	-4.89
p-value	*0*	*0*	*0*	*0*
AR(2)	-0.76	-1.79	-1.67	-1.69
p-value	*0.446*	*0.073*	*0.096*	*0.091*
Hansen J test	81.15	104.59	105.02	81.88
p-value	*0.099*	*0.357*	*0.32*	*0.104*
Observations	321	441	441	321

[1] Standard Errors are provided between parentheses

Source: Author's own elaboration

Table A.4.3 – Cost estimated parameters for the single frontiers per country in the MENA region[1]

Variable Name	Bahrain	Jordan	Kuwait
Constant	-0.5953 (1.1139)	1.4353 (2.9227)	43.4893 (14.3215)
Loans	0.2525 (0.1921)	-1.1183 (0.9953)	4.6462 (1.1458)
Other Earning Assets	1.5858 (0.4206)	-0.2506 (0.7456)	-4.1489 (2.0423)
Off-balance Sheet	0.5673 (0.2409)	1.4531 (0.6284)	1.2124 (0.7611)
Labour	1.3629 (0.3326)	-0.3444 (0.7847)	-0.3519 (1.2966)
Assets	-0.3898 (0.1724)	0.1306 (0.6937)	0.9659 (0.699)
½ (Loans)²	0.2919 (0.0349)	0.8403 (0.2322)	-0.06 (0.0865)
½ (Loans * Other Earning Assets)	-0.806 (0.0935)	-0.1093 (0.2491)	-0.4566 (0.2257)
½ (Loans * Off-balance Sheet)	0.112 (0.0404)	-0.4584 (0.2177)	-0.0752 (0.1428)
½ (Other Earning Assets)²	0.1894 (0.078)	0.3624 (0.1445)	0.5483 (0.3319)
½ (Other Earning Assets * Off-balance Sheet)	-0.0078 (0.0534)	-0.4226 (0.1838)	-0.0349 (0.2776)
½ (Off-balance Sheet)²	-0.0351 (0.0146)	0.2313 (0.0896)	0.1533 (0.0846)
½ (Labour)²	0.2566 (0.0635)	0.1858 (0.0964)	0.4982 (0.1919)
½ (Labour * Assets)	0.0161 (0.0435)	0.2026 (0.1499)	-0.3013 (0.1396)
½ (Assets)²	0.0255 (0.015)	-0.0942 (0.0896)	0.0369 (0.0272)
Loans * Labour	0.134 (0.0605)	0.6303 (0.2769)	-0.5525 (0.1614)
Loans * Assets	-0.0793 (0.0298)	0.1 (0.1979)	-0.0828 (0.0732)
Other Earning Assets * Labour	-0.2384 (0.0899)	-0.4419 (0.1881)	0.7924 (0.3883)
Other Earning Assets * Assets	-0.0208 (0.0414)	0.3051 (0.1945)	-0.2008 (0.1833)
Off-balance Sheet * Labour	-0.0645 (0.0479)	0.4961 (0.1646)	0.2185 (0.1577)
Off-balance Sheet * Assets	0.0308 (0.0272)	-0.6168 (0.1356)	0.1031 (0.076)
Capital	-1.1874 (0.5081)	0.9309 (0.9638)	-7.1222 (3.5997)
(Capital)²	-0.0962 (0.184)	0.3067 (0.2419)	0.6275 (0.5994)
Loans * Capital	0.1082 (0.068)	-0.4636 (0.1888)	0.0132 (0.1731)
Other Earning Assets * Capital	0.1283 (0.1213)	-0.1364 (0.1728)	0.0628 (0.406)
Off-balance Sheet * Capital	-0.0696 (0.0468)	0.2204 (0.1033)	-0.1851 (0.1762)
Labour * Capital	0.0255 (0.0608)	-0.3209 (0.1377)	-0.1378 (0.2436)
Assets * Capital	0.0654 (0.0268)	0.1282 (0.1064)	0.0085 (0.1024)
Time	0.3622 (0.0503)	0.2898 (0.0523)	0.4372 (0.0955)
½(Time)²	-0.0851 (0.012)	-0.0751 (0.0129)	-0.0944 (0.0231)

[1] Standard Errors are provided between parentheses

Source: Author's own elaboration

Table A.4.3 (continued) – Cost estimated parameters for the single frontiers per country in the MENA region[1]

Variable Name	Qatar	Saudi Arabia	Tunisia	United Arab Emirates
Constant	-16.4322 (14.4266)	1.4189 (9.969)	-8.4029 (0.9903)	1.2411 (0.9972)
Loans	2.7107 (2.3355)	1.0713 (2.3567)	1.2015 (0.7498)	0.4105 (0.8526)
Other Earning Assets	-2.3763 (5.6802)	1.839 (2.5616)	-0.6986 (0.8173)	1.0897 (0.867)
Off-balance Sheet	-0.0577 (2.1352)	-0.7215 (1.1978)	0.6443 (0.8447)	0.2243 (0.858)
Labour	1.1724 (1.9167)	2.3617 (1.6862)	-0.0232 (0.9286)	0.3083 (0.9924)
Assets	0.9928 (1.536)	-1.0576 (2.4399)	1.7298 (0.9795)	0.2296 (0.9843)
½ (Loans)²	-0.1299 (0.6765)	0.3215 (0.3916)	0.1425 (0.1404)	0.1176 (0.5053)
½ (Loans * Other Earning Assets)	-0.9738 (0.9347)	-0.4279 (0.5237)	-0.3309 (0.2859)	-0.5042 (0.7677)
½ (Loans * Off-balance Sheet)	0.7153 (0.8075)	0.1191 (0.2708)	-0.1557 (0.3446)	0.0647 (0.7342)
½ (Other Earning Assets)²	1.272 (1.2988)	0.4233 (0.2927)	-0.1115 (0.1659)	0.274 (0.6828)
½ (Other Earning Assets * Off-balance Sheet)	-0.0961 (0.8547)	-0.6729 (0.2598)	0.7816 (0.3359)	0.0213 (0.6717)
½ (Off-balance Sheet)²	-0.17 (0.3108)	-0.1122 (0.0732)	-0.2953 (0.3217)	-0.0271 (0.2782)
½ (Labour)²	0.1564 (0.305)	0.6386 (0.1754)	-0.5238 (0.5766)	0.1548 (0.7429)
½ (Labour * Assets)	-0.177 (0.3298)	-0.456 (0.4278)	-0.4475 (0.5597)	-0.0028 (0.6824)
½ (Assets)²	-0.0494 (0.1625)	0.2503 (0.2882)	0.2711 (0.2496)	0.0002 (0.4938)
Loans * Labour	0.5313 (0.5615)	0.295 (0.4203)	-0.0749 (0.5288)	0.0276 (0.8365)
Loans * Assets	0.0679 (0.4173)	-0.1365 (0.5597)	0.1885 (0.2266)	-0.0263 (0.7665)
Other Earning Assets * Labour	-0.3777 (0.7644)	-0.3997 (0.3847)	-0.778 (0.4565)	-0.1146 (0.8237)
Other Earning Assets * Assets	-0.0132 (0.7302)	0.1394 (0.5813)	-0.2798 (0.3286)	-0.1169 (0.6429)
Off-balance Sheet * Labour	-0.4649 (0.3588)	-0.3803 (0.1828)	0.428 (0.6516)	-0.0528 (0.7966)
Off-balance Sheet * Assets	0.2518 (0.2899)	0.3459 (0.2548)	-0.0333 (0.235)	0.0028 (0.4357)
Capital	3.2223 (2.6591)	-1.0529 (2.9453)	1.2346 (0.7332)	-0.8734 (0.8813)
(Capital)²	0.441 (0.5748)	-0.1379 (0.6273)	-0.021 (0.2908)	0.0149 (0.7787)
Loans * Capital	0.1537 (0.5083)	-0.2089 (0.3575)	0.0308 (0.167)	0.128 (0.5031)
Other Earning Assets * Capital	-0.5625 (0.5867)	0.0218 (0.4377)	-0.058 (0.1487)	-0.0619 (0.5859)
Off-balance Sheet * Capital	-0.2047 (0.1885)	0.429 (0.1354)	-0.0245 (0.1801)	-0.038 (0.3797)
Labour * Capital	0.1394 (0.1965)	0.2006 (0.2647)	0.2435 (0.1599)	0.0938 (0.6413)
Assets * Capital	-0.2336 (0.1844)	-0.1711 (0.3957)	-0.1417 (0.1676)	0.0547 (0.4296)
Time	0.1181 (0.182)	0.3071 (0.0659)	0.2858 (0.0815)	0.2985 (0.6458)
½(Time)²	-0.0285 (0.0413)	-0.057 (0.0156)	-0.0445 (0.018)	-0.0631 (0.1509)

[1] Standard Errors are provided between parentheses

Source: Author's own elaboration

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