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PRODUCTIVITY AND TECHNICAL EFFICIENCY IN ISLAMIC BANKS: CROSS - COUNTRY ANALYSIS

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ABSTRACT

In this paper, we use the decomposed Malmquist index to analyze in depth the productivity of 36 Islamic banks in 15 countries before and after the international financial crisis, during the 2003-2011 periods. This analysis shows that productivity fluctuated over time for the same bank, and it varied from one region to another. Banks in the Gulf countries are the most efficient. In all Islamic banks, technical efficiency was the main cause of improving productivity and had helped to increase the volume of intermediation.

Contribution/ Originality: This study contributes in the existing literature by comparing the Islamic banks' technical and pure technical efficiency before and after the international crises (2008). It highlights that the Islamic banks' productivity variability was not always the same in all regions.

1. INTRODUCTION

As all commercial banks over the world, the Islamic banks in many countries invested heavily in technology to develop their service quality and their networks. They also extended their activities in their own countries and in many other countries. The rapid technological change and the increase of the bank size may affect their performance and their productivity.

The measurement of the bank productivity by Malmquist index (MPI) has not been empirically deeply analyzed in Islamic countries. The MPI allows us to distinguish between three different types of efficiency measures: technical, pure technical, and scale.

Islamic banks invest essentially through equity participation in private firms and in partnership with other investors.

The combination of inputs and outputs affect the banks' efficiency and their productivity. The study of Islamic banks' productivity under the production approach in several countries and the analysis of their efficiency under the assumptions of constant and variable returns to scale should allow highlighting their real evolution and their resistance to crises.

2. LITERATURE REVIEW

In the last decade, several studies focused on the efficiency analysis of Islamic banks using simple and advanced methodologies. However, productivity studies using the decomposed Malmquist index are rare. Opting for the intermediation approach, Johnes *et al.* (2014) used financial ratios, DEA and Malmquist index to measure the productivity of Islamic and conventional banks operating in the Middle East over the period (2004-2007). They found that Islamic banks operating in Qatar, Emirates and Bahrain were the most efficient. Banks in Saudi Arabia were the less efficient. During this period, Islamic banks productivity increased by 8.8%. This increase is due to the improvement of technological change by 18%.

El-Gamal and Inanoglu (2005) used the stochastic frontier approach to estimate the cost efficiency of Turkish banks. They compared the cost efficiencies of 49 conventional banks with four Islamic special finance houses. They found that the Islamic financial institutions were more efficient than conventional banks. The authors explained their finding by the emphasis on Islamic asset-based financing that led to lower non-performing loans ratios.

Yudistira (2004) examined the efficiency of 18 Islamic banks from 1997 to 2000. He used the DEA as a comparative measure of the various banks' efficiency. He found that Islamic banks in the Middle East were less efficient than Islamic financial institutions in other countries over the world.

The study of Sufian and Akbar (2009) was devoted to the measurement of efficiencies of Islamic banks in 16 countries in three regions: The Middle East, North Africa, and Asia. The sample period is 2001-2006. They used the DEA and found a positive relationship between efficiency and loan intensity, size, capitalization, and profitability. The authors found that Banks in the MENA region dominated the efficiency frontier during the period of study. So they were the global leaders. The results show that technically more efficient banks are those that have a smaller market share and low non-performing loans ratio.

According to Kashani and Obay (2010) Islamic banks in the United Arab Emirates (UAE) were most efficient in the Gulf region. Islamic and conventional banks in the UAE showed an increase in technical and pure efficiency but losses in scale efficiency. They demonstrated that there were no significant differences between the performance of the Islamic and conventional banks in UAE.

The empirical studies of Abdul-Majid *et al.* (2010) and Johnes *et al.* (2014) provide clear evidence that the Islamic banking system is less efficient than the conventional one. For the authors, this finding comes as no surprise because an Islamic bank operates mainly with customized contracts based on the principle of profit and loss sharing. Thus, Islamic banks incur greater administration costs and higher operational risk than conventional banks.

This result is not consistent with that of Abdul-Majid *et al.* (2010) who see that the managers of Islamic banks appear to make up for the disadvantages of their banking regime by being more efficient than their counterparts in conventional banks.

Čihák and Hesse (2008) compared the efficiency of a large sample of Islamic and Western banks between 1993 and 2004. They tried to capture the importance of bank size for institutional stability in the Islamic banks compared with the conventional ones. They demonstrated that Western banks were more efficient and that Islamic banks were relatively more stable when operating on a small scale.

Ali (2012) found that efficiency of Islamic banks operates in Middle Easter and non-Middle Eastern Counties have increased during the economic crisis.

3. METHODOLOGY

3.1. Malmquist Index

We use the Malmquist index as developed by Caves *et al.* (1982). This index is a quantity based ratio that measures the efficiency for two different periods (or two observations) reported during the same period. If MPI>1, productivity increases.

The decomposition developed by Ray and Desli (1997) gives details on the measurement of productivity, so it is widely used in empirical studies. We use it in this study. It is defined as follows:

$$M_{out}^{t1/t2}(x^{t1}, y^{t1}, x^{t2}, y^{t2}) =$$

$$\left[\frac{D_{out}^{t2}(x^{t1}, y^{t2}|VRS)}{D_{out}^{t1}(x^{t1}, y^{t1}|VRS)}\right] x \left[\frac{D_{out}^{t1}(x^{t2}, y^{t2}|VRS)}{D_{out}^{t2}(x^{t2}, y^{t2}|VRS)} x \frac{D_{out}^{t1}(x^{t1}, y^{t1}|VRS)}{D_{out}^{t2}(x^{t1}, y^{t1}|VRS)}\right] x$$

$$\left\{\left[\frac{D_{out}^{t1}(x^{t2}, y^{t2}|CRS)/D_{out}^{t1}(x^{t2}, y^{t2}|VRS)}{D_{out}^{t1}(x^{t1}, y^{t1}|CRS)/D_{out}^{t1}(x^{t2}, y^{t2}|VRS)}\right] x \left[\frac{D_{out}^{t2}(x^{t2}, y^{t2}|CRS)/D_{out}^{t2}(x^{t2}, y^{t2}|VRS)}{D_{out}^{t2}(x^{t1}, y^{t1}|CRS)/D_{out}^{t2}(x^{t1}, y^{t1}|VRS)}\right]\right\} \quad (1)$$

We have MPI = Technical efficiency change x Technical change x Scale efficiency change.

In this decomposition, technical efficiency change is measured relatively to the best practice technologies. The scale change factor is the geometric mean of a pair of scale efficiency ratios, one measured on period t_1 technology and the other measured on period t_2 technology.

3.2. Data and Sample

The data set includes input and output variables for 36 Islamic banks operating in 15 countries in Asia, Africa, and Europe for the years 2003-2011, using data of Bankscope.

3.3. Variables

According to the production approach, the Islamic banks are modeled as multi-product firms producing three outputs: deposits, loans, and income. They operate by engaging three inputs: employees' expenses, fixed assets, and equity.

4. RESULTS

4.1. Banks' Productivity Evolution

Table 1 provides the evolution of technical efficiency change, technological change, scale efficiency change and Malmquist index for the sample period.

Table-1. Decomposed Malmquist index

Years	EC	TC	SE	MPI
2003-2004	1,04	1,03	1,00	1,07
2004-2005	1,04	1,02	1,00	1,06
2005-2006	1,03	1,04	1,01	1,08
2006-2007	1,06	1,05	1,02	1,11
2007-2008	1,03	1,07	1,01	1,12
2008-2009	0,99	1,08	1,02	1,09
2009-2010	1,01	1,07	1,00	1,08
2010-2011	1,03	1,06	0,99	1,09

Source: Table developed by us according to the results of STATA10 software

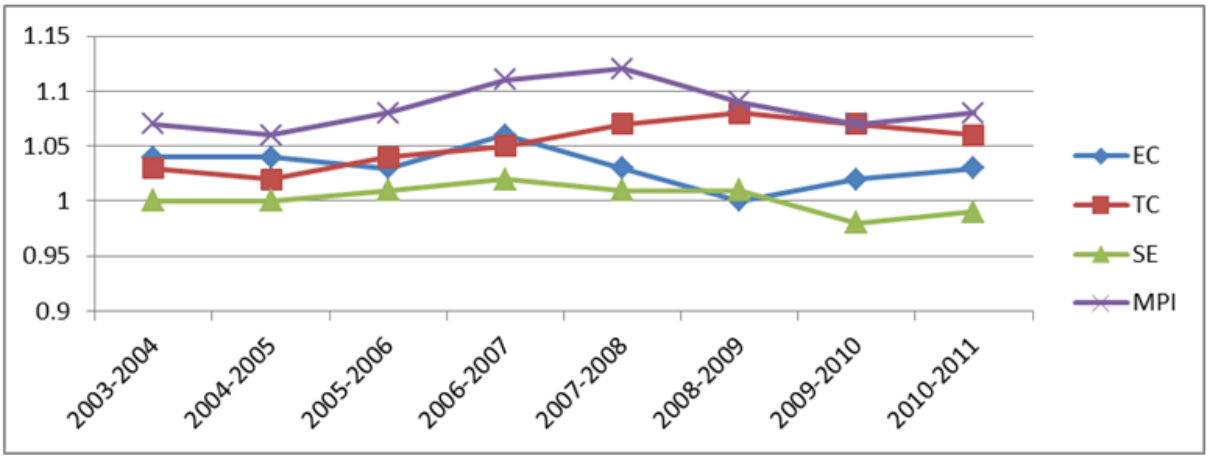

Figure-1. MPI components evolution

The MPI peaked before the international financial crisis; it dropped after. The TC peaked in 2008-2009. All the MPI components were close to 1. The SE was relatively the most stable. Moreover, the EC dropped after the crisis.

The Malmquist index was increasing from 2003 to 2008. The total productivity of the Islamic banking industry has improved by 4,7% during this period. This improvement is due to the increase of the technological change (3,8%).

However, it decreased between 2008 and 2010. This deterioration can be linked to the subprime crisis.

The technological change was greater than one during all the periods. It recorded the greatest increase between 2007 and 2009.

The scale efficiency change was the weakest MPI's component, and it varied slightly.

The evolution of productivity and efficiency indicators of Islamic banks since 2009 has occurred due to the confidence in their financing methods of investors, international firms and governments. The rule sharing of profits, losses, and risks reassure them. This rule led the managers of Islamic banks to reduce funding and investments in the high-risk markets during the crisis.

The MPI and its components had not the same evolution. However, we find that measurements of efficiency change are the closest to those of Malmquist index.

The first source of productivity improvement is the technical efficiency change. The scale efficiency contributed mostly to the deterioration of productivity.

4.2. Economies of Scale and Technical Efficiency

Table-2. Technical Efficiency and Economies of scale

	VRS		CRS	
Years	**mean**	**S.D**	**mean**	**S.D**
2003-2004	0,90	0,23	0,81	0,21
2004-2005	0,88	0,21	0,78	0,19
2005-2006	0,86	0,21	0,80	0,20
2006-2007	0,81	0,20	0,76	0,17
2007-2008	0,74	0,19	0,69	0,16
2008-2009	0,83	0,22	0,72	0,16
2009-2010	0,85	0,24	0,74	0,18
2010-2011	0,81	0,22	0,70	0,17

Source: Table developed by us according to the results of STATA10 software

Table 2 shows the measurements of technical efficiency calculated under the assumptions of constant (CRS) and variable (VRS) returns to scale successively called global technical efficiency and technical efficiency.

The difference between these two measurements shows that economies of scale exist in the Islamic banking industry. The average technical efficiency under VRS and CRS peaked in (2003-2004). Therefore, Islamic banks had to increase their production by 10% or 19% to become efficient.

However, the period (2007-2008) is marked by the lowest level of efficiency under the two assumptions. Therefore, Islamic banks had to increase their production by 26% to 31% to become efficient.

Technical efficiency under the VRS assumption was often higher than under the CRS one. The efficiency dispersion is relatively stable.

4.3. Productivity Analysis by Country

Table-3. Decomposed ratio by country

Country	EC	TC	SE	MPI
Malaysia	1,04	1,05	1,06	1,15
Bangladesh	1,03	1,04	1,01	1,08
Indonesia	1,02	1,03	1,02	1,04
Pakistan	1,01	1,02	1,01	1,04
Iran	1,02	1,04	1,04	1,18
UAE	1,03	1,05	1,06	1,18
Qatar	1,03	1,04	1,04	1,11
Kuwait	1,04	1,03	1,05	1,12
Bahrain	1,04	1,04	1,06	1,15
Saudi Arabia	1,03	1,04	1,03	1,10
Yemen	1,01	1,01	1,02	1,04
Egypt	1,02	1,01	1,01	1,04
Sudan	1,02	1,03	1,01	1,06
Jordan	1,01	1,02	0,94	0,97
Turkey	1,02	1,02	1,03	1,06

Source: Table developed by us according to the results of STATA10 software

Table 3 shows that Malaysian, Iranian and UAE banks were the most efficient between 2003 and 2011. This is primarily due to the improvement of their technical efficiency and to the rise of technological change.

We also find that 14 countries out of 15 recorded an increase of productivity. Only Jordanian banks had an average MPI <1 during the 2003-2011 period. Banks in United Arab Emirates and Saudi Arabia saved an average Malmquist index relatively stable and higher than 1 which means stable productivity.

The increase of the outputs for the same level of inputs leads to an improved productivity and best efficiency. Islamic banks have used similar technology during the sample period, but their activities fluctuated.

The Islamic banks in Bangladesh, Turkey, and Indonesia were always efficient. The Qatari banks were the most efficient under the assumption of constant returns to scale.

4.4. Productivity by Region

Table 4 and figure 2 highlight that Islamic banks in the Gulf were more efficient than other banks in other regions because they have a long experience, and they reached a high level of intermediation while using the new technology. Banks in South Asia were also efficient because of their long experience and Economic Development.

These banks' size is greater than the sizes of those in other regions all over the world. After 2008, the MPI had grown in all the regions

Table-4. Decomposed ratio by region

	Gulf				South Asia				Other			
	EC	TC	SE	MPI	EC	TC	SE	MPI	EC	TC	SE	MPI
2003-2004	1,06	1,04	1,01	1,13	1,04	1,03	1,01	1,06	1,02	1,02	0,98	1,02
2004-2005	1,07	1,02	1,02	1,12	1,03	1,03	1,01	1,05	1,02	1,01	0,97	1,01
2005-2006	1,06	1,04	1,02	1,14	1,03	1,05	1,01	1,07	1,00	1,03	0,97	1,03
2006-2007	1,08	1,06	1,02	1,18	1,05	1,05	1,02	1,11	1,06	1,04	1,01	1,04
2007-2008	1,05	1,08	1,02	1,19	1,03	1,06	1,01	1,11	1,01	1,07	1,00	1,06
2008-2009	1,04	1,08	1,02	1,14	1,02	1,06	1,01	1,09	1,00	1,04	0,99	1,03
2009-2010	1,04	1,06	1,01	1,14	1,02	1,10	1,00	1,09	1,01	1,05	0,98	1,01
2010-2011	1,03	1,05	1,01	1,15	1,04	1,08	0,98	1,10	1,02	1,05	0,98	1,03

Source:: Table developed by us according to the results of STATA10 software

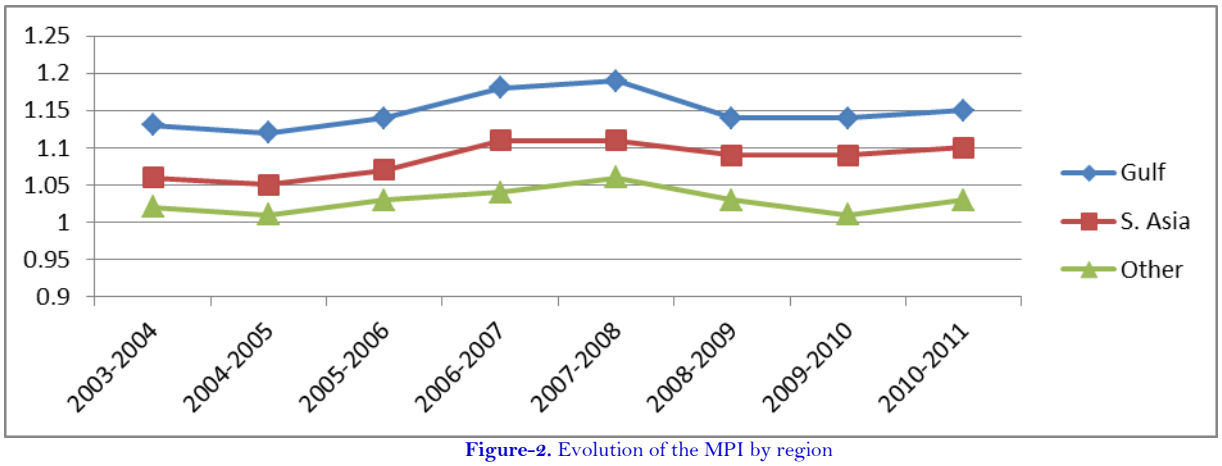

Figure-2. Evolution of the MPI by region

5. CONCLUSION

Islamic banks productivity indicators in all countries of the sample were mixed without clear trend because their business volumes varied for the same technology. The productivity deterioration may be linked to the subprime crisis.

The development of Islamic finance in the world had a positive impact and contributed to improving the efficiency of Islamic banking. Productivity was high in countries with large capital flows and whose banks had increased their networks and invested in new technology.

The change in technical efficiency is the main source of productivity increase during the (2003-2011) period. Almost half the sample recorded the same technical efficiency in both contexts returns to scale.

The productivity stability means that the Islamic banks have used similar technology during the study period.

The difference between measurements of technical efficiency in both cases of constant and variable returns to scale shows the existence of economies of scale in Islamic banking industry.

The Islamic banks in the Gulf countries were the most efficient due to their size the evolution of their deposits and loans.

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