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DOES THE INSTITUTIONAL QUALITY OF COUNTRIES MATTER FOR FOREIGN BANKS' EFFICIENCY? EMPIRICAL EVIDENCE FROM MAGHREB COUNTRIES

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The present paper examines whether the home and host countries' institutional quality explains the efficiency differences between the domestic and foreign banks operating in developing countries. The findings indicate a positive effect of foreign ownership on bank efficiency. More specifically, the efficiency differences, between domestic and foreign banks, do not depend on the host country's institutional quality. However, the home country's institutional quality improves the foreign banks' efficiency remarkably. In order to test the robustness of our findings, dynamic panel data models have been administered. The results are convergent and the GMM estimator outlines a strong persistence of banks' inefficiency.

Keywords: Cost Efficiency, Foreign Banks, Institutional Quality Indicator, GMM Model
JEL Classification: C30, G21, G32, K4

1. INTRODUCTION

Like most developing countries, the banking systems underway in the Maghreb region appear to display several problems. They have undergone significant reforms over the past two decades, particularly in regard to the Tunisian and Moroccan contexts, as part of comprehensive rehabilitation schemes. These reforms are aimed to restructure and privatize the publicly-owned banks and enhance the flow of foreign investors. The purpose is to encourage these investors to acquire the troubled banks, especially those lacking domestic capital. Obviously, the entry of foreign banks has increasingly aroused the interest of policy makers and academics. In general, intense debate has been noted as to the competitive advantage and effects of foreign banks on the already established domestic banks. Additionally, there is the emergence of another important issue, namely, that of efficiency differences distinguishing the foreign and domestic banks. In this

paper, a review of literature dealing with this topic is explored. The aim is to examine the fact whether it could be generally maintained that foreign ownership proves to have either negative, or positive effects on the efficiency of the Tunisia and Morocco based banks. Moreover, an attempt will be made to determine the extent to which the relationship between foreign ownership and efficiency depends on the hosting country's institutional quality as well as the differences marking the home and the host countries' legal and regulatory frameworks. To our best knowledge, the present work constitutes a pioneering study conducted to provide empirical results on this subject, relevant to the great Maghreb sited countries. To the best of the authors' knowledge, the present work constitutes an initial attempt whereby a comparison is established between the Tunisian and Moroccan banks, intended to clarify the sources of inefficiency, while highlighting the effective strategic decisions necessary to implement.

The contribution of our study is threefold. In a first place, the applied Fourier Flexible Form (FFF) of the cost function should allow us to overcome the weaknesses of the Translog form, which has dominated the banking efficiency analysis. Considered as a semi-nonparametric approach, the FFF turns out to be rather suitably fit for highlighting the multi-product characteristic of the banking industry. In a second place, the paper is axed on the idea both of the home and the host countries' of investigating institutional quality impact on the banking sector's efficiency. To this end, the principal component analysis (PCA) methodology is implemented to help in calculating each single country's institutional quality index. In effects, the originality of this paper lies mainly undertaking a special on the assessment of the moderating effect of institutional quality on the relationship between foreign ownership and efficiency, especially that studies dealing with such an issue relevant to the developing countries are almost inexistent. Additionally, the study period is marked with a major event witnessed by the Arab countries, including Tunisia and Morocco, namely, the Arab Spring revolutions. Actually, the countries have for long suffered from persistent instability and economic problems. Hence, controlling the impact of the Arab Spring Transition period on the domestic and foreign banks' efficiency appears to be a critical subject that is worth investigating. Accordingly, the study major contribution lies in providing new data concerning the bank cost efficiency issue, through evidence drawn from Tunisian and Moroccan banks related. Indeed, the attained results' interpretation could be of great help to policy makers as main guidelines for the effective measures necessary to be taken to enhance banking efficiency and promote the financial systems' overall stability. Such measures would be of great value not only to Tunisia and Morocco, but potentially also, to the entirety of the other Arab countries, where the banking structures and regulatory systems are highly comparable.

The paper is organized as follows. The upcoming section is devoted to display a relevant literature reviewed and depict the research related hypotheses. As for Section 3, it involves the relevant data and methodology applied. The baseline results and robustness checkup make subject Section 4. As Regards the last section, it encloses the conclusion along with some potential policy implications.

2. LITERATURE REVIEW AND HYPOTHESES' DEVELOPMENT

2.1. Foreign Ownership and Bank Efficiency

Berger et al. (2000) advance two major hypotheses: *the home field hypothesis* versus *the global advantage hypothesis*. The first hypothesis is set to state that domestic banks are more efficient than foreign banks. Indeed, owing to the lack of effective information concerning the host country encountered by banks with foreign ownership, the latter are actually rather liable to be exposed to the adverse selection problems in respect of the domestically-owned banks. Under *the global advantage hypothesis*, however, the foreign administrator, characterized with an informational advantage and better technology, proves to have a positive effect on banking performance. Still, the debate on the impact of foreign ownership on bank's efficiency remains a predominantly ambiguous issue. In this respect, Karas et al. (2010) argue that foreign banks turn out to be more efficient than domestic banks in the Russian context. This result appears to corroborate the finding documented in several studies dealing with various country contexts, such as those conducted by Weill (2003) and Sokic (2015). Hence, the following hypothesis could be formulated:

H_1: Foreign ownership has a positive effect on bank efficiency.

2.2. State Ownership and Bank Efficiency

With reference to prior literature, the government participation in the banks' capital is associated with lower efficiency, especially in regard of the developing countries, where public banks usually target social objectives and exert some political pressures. In this respect, Lensink et al. (2008) highlight that public banks appear to be generally less efficient than the private ones.

H_2: State ownership has a negative effect on bank efficiency.

2.3. Institutional Quality of the Host Country and Bank Efficiency

Demirguc-Kunt and Detragiache (1998) document that countries with poor institutional environments, characterized with inefficient legal procedures, heavy bureaucracies and corruption, are more liable to be faced with banking sector instability. According to Taboada (2011), a country with a stable policy and good quality public services is rather liable to attract greater foreign investors. More recently, Kalyvas and Mamatzakis (2017) have examined the effect of the host economy creditor rights and information sharing on the foreign banks' efficiency vis-à-vis the domestic banks over the period ranging between 2005 and 2009 period. As for Lensink et al. (2008), they state that the relationship between foreign ownership and efficiency appears to be

negative, mainly in countries marked with poor institutional quality. They outline that foreign banks prove to display greater difficulty in dealing with the host country associated regulation, banking supervision rules, local justice, and corruption. Actually, the institutional advantages provided by the host country are usually manifested through various transmission channels. Firstly, a greater level of media independence is likely to help improve information quality. Thus, higher transparency should allow foreign owners to interpret local information properly. Secondly, a greater political stability and lower levels of violence would contribute remarkably in improving the foreign banks' efficiency, especially when their provisions for loan losses prove to be relatively high. Besides, a high level of government effectiveness turns out to help in reducing the bureaucracy related cost of foreign banks. Then, a greater independence of the civil service sector should contribute in reducing the foreign banks' incurred costs, especially in areas where political pressures appear to oppose their entry. Moreover, the foreign banks' efficiency could well achieve certain improvement with good quality regulation and adequate banking supervision. Finally, increased control of corruption helps enhance affects cost-efficiency through lowering corruption costs. In sum, the institutional quality of the host country could well reflect the differences noticeable in the banks' efficiency among countries, as well as between foreign and domestic banks operating within the same country context. At this level, our relevant hypotheses could be formulated as follows:

H_3: Institutional quality has a positive effect on bank efficiency.

H_4: Relation between foreign ownership and bank efficiency depends on the institutional quality of the host country.

2.4. Institutional Quality of the Home Country and Bank Efficiency

Under *the global advantage hypothesis*, as put forward by Berger et al. (2000), foreign banks could well draw noticeable benefits from a competitive advantage, relative to their domestic counterparts. They use more advanced technologies brought about by the active markets characterizing their home countries. In this regard, Berger et al. (2005) consider that the foreign-owned banks have an advantage in serving multinational clientele, who generally encounter some financing difficulties on being served by domestic banks. In addition, Claessens et al. (2001) highlight that the entry of foreign banks into developing countries helps to improve banking governance through improved technology usually transferred from their developed home countries. Hence, the foreign banks' efficiency advantage has its origins in the highly effective institutions marking their home countries.

H_5: Institutional quality of the home country has a positive effect on the foreign bank's efficiency.

2.5. Institutional Distance and Bank Efficiency

According to Mian (2006), institutional distance is also another factor that need be considered when examining the foreign banks' associated behavior. Such a distance enables to determine the discrepancies prevailing in the legal and regulatory frameworks between the home country and the host country. In this respect, Lensink et al. (2008) argue that foreign banks turn out to operate more efficiently when the institutional distance between both of the home and host countries appears to decrease. Certainly, institutional distance implies a high level of information and agency costs to be incurred by foreign banks, relative to the domestic banks, especially within the context of developing economies. Similarly, Kalyvas and Mamatzakis (2017) have also discovered the persistence of a resultant negative effect of institutional distance on bank efficiency. Thus, the following hypothesis could be drawn:

H_6: Institutional distance has a negative effect on the foreign bank's efficiency.

3. DATA AND METHODOLOGY

3.1. Data

The present study is aimed to investigate the banking sector associated efficiency concerning a panel of banks operating in the Arab Maghreb region. In this context, our final sample includes 11 Tunisian banks, listed on the Tunis Stock Exchange and 6 Moroccan banks, listed on the Casablanca Stock Exchange, to be observed over the period 2005 to 2014. Accordingly, a regression involving a balanced panel dataset of 170 observations is obtained. Actually, only universal banks have been considered, for the purpose of maintaining the technology similarity condition, across banks on estimating the efficiency frontier. Besides, only listed banks are included to ensure the availability and continuity of the relevant banks' information. In addition, a smaller sub-sample, exclusively covering the foreign banks is implemented in order to facilitate the conduction of the investigation concerning the foreign banks' determinants from an institutional perspective.

The banks' related accounting and financial data are extracted from the annual reports published by the Stock exchange of Tunis BVMT and the Casablanca Stock exchange[1]. As for the bank ownership related data, they are collected from the annual reports available at the individual bank's relevant website. A reference has also been made to the World Development Indicator database of the World Bank, for the

[1] The accounting data concerning the selected banks are converted into the USD, in accordance with the annual exchange rate.

country-level variables to be measured. Finally, the institutional quality related data are drawn from the World Bank database[2], as provided by Kaufmann et al. (2010).

3.2. Estimation Methodology: Bank Efficiency and Institutional Quality

3.2.1. Efficiency measures

Concerning the present study, we consider to opt for the SFA method with the Fourier Flexible form (FF) for the purpose of determining the banks' efficiency levels. Actually, this approach stands as a global approximation of any cost or profit function achieved through allowing inflection points to be included in the frontier. Considered as *a semi-non-parametric approach*, Altunbaş et al. (2001) state that the FF represents an effective specification useful dealing with the problem engendered by an unknown true functional form.

Similarly, the one-step approach of Battese and Coelli's (1995) seems also worth applying, as it allows us to incorporate both of the country and bank level related variables to help detect a direct influence of the banks' inefficiency means. According to Al-Gasaymeh (2016), a cross-country efficiency study requires the setting up of a proper definition of a common frontier. For convenience purposes, only the following equation will be considered:

$$
\begin{aligned}
n\left(\frac{TC}{P_3}\right) = \alpha + \sum_{i=1}^{N} \beta_i \, ln\left(\frac{P_i}{P_3}\right) + \sum_{k=1}^{I} \gamma_k \, ln\, y_k + \Psi_t \\
+ \frac{1}{2}\left[\sum_{i=1}^{N}\sum_{j=1}^{N} B_{ij} \, ln\left(\frac{P_i}{P_3}\right) ln\left(\frac{P_j}{P_3}\right)\right] + \left[\sum_{k=1}^{I}\sum_{m=1}^{I} \gamma_{km} \, ln\, y_k \, ln\, y_m\right] \\
+ \frac{1}{2}[\Psi_{tt} \, T^2] + \sum_{i=1}^{N}\sum_{k=1}^{I} \eta_{ik} \, ln\left(\frac{P_i}{P_3}\right) ln(y_k) + \sum_{i=1}^{N} \rho_{it} \, ln\left(\frac{P_i}{P_3}\right) T \\
+ \sum_{k=1}^{I} \tau_{kt} \, ln\, y_k \, T + \sum_{r=1}^{R} Z_r + \sum_{n=1}^{N+I+1} \left[\phi_n \cos(x_n) + \omega_{nq} \sin(x_n)\right] \\
+ \sum_{n=1}^{N+I+1} \sum_{q=n}^{N+I+1} \left[\phi_{nq} \cos(x_n + x_q) + \omega_{nq} \sin(x_n + x_q)\right] \\
+ \sum_{n=1}^{N+I+1} \left[\phi_{nnn} \cos(x_n + x_n + x_n) + \omega_{nnn} \sin(x_n + x_n + x_n)\right] \\
+ u_{it} + v_{it}, \qquad (1)
\end{aligned}
$$

[2] This database is available at: www.govindicators.org

where TC is the total cost; Y_k is the vector of the banks' output; P_i is the vector of the banks' input prices; I is the number of outputs; N is the number of inputs. $\alpha, \beta, \gamma, \psi, \rho, \eta, \tau, \omega, \phi$ are the parameters to be estimated; T is the time trend, which is fully interactive with the entirety of the model's parameters; Z_r is the vector of the control variables. The latter are not interactive with the model's other variables. R is the number of the control variables'. v_{it} is the two-sided error term, assumed to be independently and identically distributed of the normal distribution $N(0, {\sigma_v}^2)$. u_{it} is the inefficiency term, assumed to be an exponential function of time, which is defined by: $u_{it} = \{exp[-\eta(t-T))]\}\, u_i$, where u_{it} is assumed to be independently and identically distributed, as the truncated-normal random variable $(\mu, {\sigma_u}^2)$; and eta (η) is an unknown scalar parameter to be estimated.

For the bank inputs and outputs to be already defined, we refer to the intermediation approach, as proposed by Sealey and Lindley (1977). The latter consider that the bank collects funds from savers and allocates them to loans or other productive assets, using capital and labor. This choice depends essentially on the banking sector relavant characteristics[3]. In what follows is a detailed description of the cost function associated variables. The endogenous variable is the total cost TC, which includes financial costs and operating costs. Concerning the exogenous variables, they comprise two outputs and three input prices. As can be noted, the first output Y1 encloses of total customer loans, while the second output Y_2 includes the entirety of the remaining earning assets. As for the price of financial capital P_1, it is measured by the ratio of interest expense to deposits and other borrowed funds. The price of physical capital P_2 is measured via the ratio of expenditures on premises and fixed assets to fixed assets. The labor cost P_3 is measured by the ratio of the bank staff costs to the number of its employees.

Regarding the control variables, two environmental variables are included, namely the GDP growth (gdp) and the banking market concentration (concentration)[4]. Following Mohanty et al. (2016), incorporating of the country-specific variables into the cost frontier definition should enable us to account for differences distinguishing the relevant countries. In addition, the bank-specific variables are added into the cost frontier specification to account for bank heterogeneity. We account for each single bank's capitalization level ($leqt$), as measured by the natural logarithm of equity, in order to rule out the effect of the differences marking the risk preferences on bank efficiency (Altunbaş et al., 2000). Besides, the ratio of other operating income to total assets (bsq) is also considered to highlight the differences persistent in service quality between banks (Lensink et al, 2008). Finally, the effect of technological progress over time is controlled through introduction of a time trend (T).

[3] Tunisian and Moroccan banks use of the collected deposits to incorporate them in the credit policy

[4] Concentration ratio is calculated as the sum of assets of three largest banks over the assets of all banks per country.

3.2.2. Institutional Quality Index

In this study, the aim of this study consists in investigating the impact of the institutional quality of both the home and host countries on bank efficiency. For this purpose, we refer to the global governance indicators, as set by Kaufmann and Kraay in the Worldwide Governance Indicators (WGI) project. The set of defined indicators are of a number of six, namely: Voice and Accountability (VA), Political instability and Violence (PV), Regulatory Quality (RQ), Government Effectiveness (GP), Rule of law (RL), and control of Corruption (CC). However, Kaufmann et al. (2010) note that these six indicators are not independent of one another given the strong correlation marking them. As for Langbein and Knack (2010), the WGI indicators are considered to reflect essentially the same governance concept, even through every indicator was intended to capture a distinct dimension of institutional quality. Hence, they could not be simultaneously integrated in our model as explanatory variables of banking inefficiency. Indeed, these indicators are combined into a single index by using the principal component analysis (PCA). This approach allows for aggregating the information latent in each indicator into a single institutional quality index. Also, one is able to control for the emerging multi-collinearity problems, as these indicators turn out to be simultaneously introduced within the same regression.

3.3. Econometric Specification via Tobit Model

On keeping us with previously conducted studies dealing with bank efficiency determinants, such as those elaborated by Huang et al (2011) and Lin et al. (2016), we consider opting for the Tobit regression model rather than using an OLS regression model to ovoid reaching biased results, as the OLS methodology resets on the assumption of a normal and homoscedastic distribution of the discrete dependent variable. The dependent variable ($ineff$) appears to range between 0 and 1, making this variable a censured dependent one. Therefore, the Tobit model stands as the most conveniently fit for dealing with the characteristics of the scores distribution. Indeed, three models are intended for use at the full sample level, while two models are devoted for implementation with the foreign banks' sub-sample[5].

Concerning the full sample case, we have:

$$\textbf{M1}:\ ineff_{i,t} = \alpha + \beta_1 foreign + \beta_2 state + \gamma \sum CV + \varepsilon_{i,t}. \quad (2)$$

$$\textbf{M2}:\ ineff_{i,t} = \alpha + \beta_1 foreign + \beta_2 state + \beta_3 institution\ host + \gamma \sum CV + \varepsilon_{i,t}. \quad (3)$$

$$\textbf{M22}:\ ineff_{i,t} = \alpha + \beta_1 foreign + \beta_2 state + \beta_3 foreign \times institution\ host + \gamma \sum CV + \varepsilon_{i,t}. \quad (4)$$

[5] We follow Lensink et al. (2008) in specifying our empirical equations.

M22 includes a crossed variable $foreign \times institution\ host$ in order to test the crossed effect of both of the foreign ownership and the host country's institutions on bank efficiency.

Regarding the sub-sample, we consider:

$$\textbf{M3}: ineff_{i,t} = \alpha + \beta_1 institution\ home + \beta_2 distance + \gamma \sum CV + \varepsilon_{i,t}. \quad (5)$$

$$\textbf{M4}: ineff_{i,t} = \alpha + \beta_1 institution\ home + \beta_2 distance + \beta_3 institution\ host + \gamma \sum CV + \varepsilon_{i,t}. \quad (6)$$

The two main independent variables related to the ownership structure are: foreign ownership and state ownership. They are measured by means of dummy variables ($foreign$ and $state$). Following Lensink et al. (2008) and Shehzad et al. (2010), a bank is considered to be foreign (state) bank if their foreign (state) shareholders own more than 50% of the shares. This ownership rate should help maintain an effective control by the foreign (state) owner. As already stated, the PCA is used to determine $institution\ host$ and $institution\ home$ variables. Finally, according to Lensink et al. (2008), the institutional distance ($distance$) could be measured via the Euclidean distance between the institutional quality of the host and the home country in regard to each foreign bank, as defined by Equation (7):

$$Distance = \begin{bmatrix} (VAhost - VAhome)^2 + (PVhost - PVhome)^2 \\ + (RQhost - RQhome)^2 + (GPhost - GPhome)^2 \\ + (RLhost - RLhome)^2 + (CChost - CChome)^2 \end{bmatrix}^{1/2} \quad (7)$$

According to a literature review concerning bank efficiency determinants, our empirical equations should serve to control for six different bank characteristics. The first one is the bank-risk position ($risk$). To this end, the loan loss provisions to total loans ratio will be applied to account for each of the banks' asset quality and risk level structure. Indeed, a high ratio should denote a bad loan quality and reflect high operational costs due to the credit associated risk (Berger and DeYoung, 1997), i.e., it would have a negative effect on bank efficiency. Still, this effect may turn out to be positive if one is to base the analysis on the financial theory's principal highlighting that risky loans generate more interest income and, therefore, better efficiency. Besides, we undertake to control for financial performance by accounting for the return-on-average assets variable ($roaa$). According to the financial theory, this variable helps in indicating whether the bank is using its assets in an efficient way (Lensink et al., 2008). In Consistence with the study conducted by Fries and Taci (2005) dealing with bank efficiency, we also consider introducing also the market share in terms of deposits ($sharmar$), as measured by the bank i total deposits to all banks' total deposits in each single country. To account for the bank's capacity to transform deposits into loans, we resort to applying the total loans to total deposits ratio. This variable ($inter$) serves to

reflect the efficiency extent of the financial intermediation process (Niţoi and Spulbar, 2015). Furthermore, and in compliance with Phan et al. (2016) line of thought, we opt for controlling the bank size ($size$), as measured by a natural logarithm of total assets. Indeed, the relevant empirical literature proves to reveal that the relationship associating bank size and efficiency may turn out to be either negative or positive. Finally, it is worth drawing attention to the major event that the Arab countries have witnessed over the study period, namely, the Arab Spring recurrent revolutions. Actually, Both Tunisia and Morocco have suffered from persistent instability and economic problems. In this respect, Ghosh (2015) documents that the Arab revolutions have engendered a noticeable decrease in bank profitability and increase in bank risk. Hence, it is necessary to control for the impact of the Arab Spring Transition period on the domestic and foreign banks' efficiency by incorporating a dummy variable ($crisis$)[6]. The error term is represented by $\varepsilon_{i,t}$.

4. EMPIRICAL RESULTS

4.1. Descriptive Statistics

Table 1, below, depicts the independent and control variables associated descriptive statistics relevant to the global sample as well as the sub-sample. As for Table 2, it illustrates the dependent variable ($ineff$) average means in terms of country and ownership.

Table 1. Descriptive Statistics

Continuous variables

Variables	Global sample (170 observations)		Subsample (70 observations)	
	Mean	Std. deviation	Mean	Std. deviation
$institution\ host$	-0.4435	0.5832	-0.4178	0.6086
$institution\ home$	-	-	0.293	0.8349
$distance$	-	-	2.7198	1.2896
$risk$	0.0129	0.015	0.0134	0.02
$roaa$	0.008	0.0103	0.0069	0.0114
$sharmar$	0.1176	0.0953	0.0661	0.0314
$inter$	1.2252	0.7714	1.2751	1.1361
$size$	15.2028	1.0618	14.5733	0.9103

[6] It is equal to the value 1 concerning the years 2011 and 2012, when Morocco and Tunisia ware marked by the highest level of disruptions and strikes, relative to the other years of the study period.

Table 1. Descriptive Statistics (con't)

Dummy variables		
Variables	Modality	Frequency
$foreign$	1: the large shareholder is foreign	41,18%
	0: otherwise	58,82%
$state$	1: the large shareholder is state	35.29%
	0: otherwise	64.71%
$crisis$	1: for 2011 and 2012 years	20%
	0: otherwise	80%

Table 2. Inefficiency Average

Tunisian banks		Moroccan banks	
Foreign	domestic	foreign	domestic
0.2917	0.3648	0.2752	0.1709
0.3316		0.2057	

Accordingly, the banks' sample turns out to score an average of 1.29% relevant to the loan loss provisions to total loans ratio ($risk$), which appears to be of a higher score when only the foreign banks appear to be considered in a separate basis. In addition, one can also notice that the average host institution and home institution corresponding scores are of the rates of -0.41 and 0.2, respectively. As for the institution distance variable, its average score is of a rate of 2.71. Regarding the ownership structure, the State and the foreign proprietors appear to hold, on average, 35% and 40% of the entire banks' capital, respectively.

Based on table 2, the Tunisia sited banks appear to be characterized with an average inefficiency level of the rate of 33.16%, thus, display with lower efficiency scores than the Moroccan banks (with 20.75% on average)[7] throughout the period 2005-2014. Additionally, one could well note that the foreign banks operating in Tunisia turn out to be, on average, more efficient than their domestic peers, which is not the case for Morocco.

4.2. Cost Frontier Estimation

The cost frontier associated results, as figuring on Table 3[8], appear to be reasonably good. Still, it appears that the higher level of loans proves to generate lower total cost. Indeed, by increasing the produced outputs' level, banks are able to cover their expenses. As regards the Y_2 related parameter, it turns out to be positive and significant.

[7] The meaning of the figure in the second raw in table 2.

[8] Frontier cost and scores efficiency are estimated via the maximum-likelihood, through application of the "Stata 13.0" computer program.

Table 3. The Cost Frontier Estimation Results

Parameter	Coefficient	Parameter	Coefficient
trend intercept	15.0185***	tlp13	0.0038
ly1	-2.5917***	tlp23	-0.0076
ly2	1.0291***	cosy1	-0.0081
lp13	1.6876***	siny1	-0.0041
lp23	-0.3647	cosy2	-0.0211**
tt	0.0244	siny2	0.0149
ly12	0.3048***	cosp13	-0.0049
ly22	0.0298	sinp13	0.0033
lp1323	-0.1059***	cosp23	0.0021
lp2323	-0.0327**	sinp23	-0.0054
tt2	-0.0045*	cosy11	-0.0141
ly1y2	-0.0946***	siny11	-0.0054
ly1p13	-0.0185	cosy12	-0.0051
ly1p23	0.0374	siny12	0.0078
ly2p13	-0.0050	cosy22	0.0012
ly2p23	0.0081	siny22	-0.0031
tly1	-0.0119*	cosy1p13	0.0088
cosy1p23	-0.0021	cosp131313	-0.0045
siny1p23	-0.0179*	sinp131313	0.0074
cosy2p13	-0.0022	cosp232323	-0.0213**
siny2p13	-0.0195*	sinp232323	0.0052
cosy2p23	-0.0001	***leqt***	**0.0740****
siny2p23	-0.0022	***bsq***	**-3.309****
cosp1313	0.0151	***concentration***	**0.0306**
sinp1313	0.0038	***gdp***	**0.0039*****
cosp2323	-0.0053	μ	-33.6761**
sinp2323	0.0035	η	0.0451***
cos1323	0.0179*	/lnσ2	2.4388***
sin1323	-0.0239**	/ilgtγ	7.8524***
cosy111	0.0124	σ2	11.4602
siny111	0.0267***	γ	0.9996
cosy222	0.0033	σ_u2	11.4558
siny222	0.0097	σ_v2	0.0044

Notes: * significant at the 1% level**;** ** significant at the 5% level; *** significant at the 10% level**.**

In other words, non-traditional activity or portfolio activity appears to contribute significantly in increasing the production costs of the Tunisian and Moroccan banks. Concerning the positive sign associated with the financial capital price (P_1) coefficient, it indicates well that an increase in this input price should help generate a considerable increase in total banking costs. Noteworthy, however, is that the coefficient associated with the physical capital price (P_2) is discovered to be non-significant. Additionally, the bank's equity position ($leqt$) has a positive impact on banking costs, as expected. This result corroborates those documented in a number of previously conducted studies such as those published by Westman (2011). Overall, one could well conclude that a rise in

equity should necessarily imply higher costs rather than rising deposits. Somewhat counterintuitive is the negative sign associated with bank service quality (bsq). In effect, the Tunisia and Morocco based efficient banks draw most of their income array from commissions in a bid to improve their productivity, since the non-performing loans' levels prove to be unfortunately high. However, market concentration appears to have no noticeable effect on the Tunisia and Morocco located banks' costs. Regarding the gdp related coefficient, it is discovered to be significantly positive, indicating that an increase in GDP helps increase total costs on supplying a given level of services. Our finding appears to corroborate that documented by Grigorian and Manole (2006).

4.4. Principal Component Analysis Results

As already cited, the PCA as applied in this study is intended to construct a single indicator where by both of the host and the home countries relevant institutional quality, could be estimated. Accordingly, the six WGI indicators as, defined by Kaufmann et al. (2010) will turn out to be combined, into a single measure under the label institutional quality index. The present subsection is devoted to depict the PCA reached results. Firstly, the high value associated with the reliability coefficient "Cronbach's Alpha" (0.940) indicates well that the six items prove to display a relatively high internal consistency. In addition, Table 4 reveals that these six indicators are, generally, significantly correlated. Secondly, one could well note that the Kaiser-Meyer-Olkin statistic is of rate of 0.833, exceeding the threshold of 0.5 widely applied as a critical threshold (Kaiser et Rice, 1974). Moreover, the Bartlett's sphericity test turns out to be rejected at the 1% level, confirming well that our applied data are appropriately for factor analysis. In other words, the validity of the PCA is sustained given the fact that the institutional quality index proves to apprehend well the principal common factor of the six individual indicators.

Table 4. Inter-Item Correlation Matrix

	VA	PV	RQ	GE	RL	CC
VA	1.000					
PV	0.217	1.000				
RQ	0.697	0.751	1.000			
GE	0.616	0.860	0.941	1.000		
RL	0.788	0.630	0.955	0.897	1.000	
CC	0.614	0.821	0.944	0.944	0.896	1.000

The results of this analysis showed that the six indicators contribute in the same direction to the construction of the "institution" index. Hence, it is a size effect. In particular, the voice and responsibility (VA), the rules of law (RL) and the quality of regulation (RQ) indicators have participated, respectively, the most at the formation of this index.

4.5. Baseline Results

The reached results, as indicated in Table 5, appear to demonstrate well that five models turn out to be significant at the 1% level, reflecting a good quality of adjustment. Noteworthy, however, it that the heteroscedasticity[9] problem has been corrected by means of robust standard deviations. Moreover, the $roaa$ variable has been excluded from both models **M3** and **M4** due to its strong correlation with the $risk$ variable once the sub-sample dataset[10] is accounted for.

Table 5. Results of Tobit Regressions

Dependent variable: inefficiency score ($ineff$)						
		M1	**M2**	**M22**	**M3**	**M4**
	Number of observations	170	170	170	70	70
	Intercept	0.7932 (4.75)***	0.6724 (4.03)***	0.7984 (4.74)***	0.1032 (0.35)	0.1193 (0.41)
Independent variables	$foreign$	- 0.0524 (-2.75)***	-0.0457 (-2.45)**	-0.0544 (-2.56)**	–	–
	$state$	0.0372 (2.06)**	0.0341 (1.94)*	0.0373 (2.07)**	–	–
	$institution\ host$	–	-0.0479 (-3.09)***	–	–	-0.0474 (-0.94)
	$foreign \times institution\ host$	–	–	-0.0044 (-0.22)	–	–
	$institution\ home$	–	–	–	-0.0319 (-2.08)**	-0.0271 (-2.91)***
	$distance$	–	–	–	-0.028 (-1.85)*	-0.0227 (-2.40)***
Control variables	$risk$	0.3698 (2.53)***	0.2631 (2.39)***	0.3917 (2.55)***	0.3769 (2.16)**	0.1081 (0.58)
	$roaa$	-0.4644 (-0.45)	-0.3851 (-0.38)	-0.4697 (-0.45)	–	–
	$sharmar$	-0.1432 (-1.18)	-0.1598 (-1.36)	-0.1401 (-1.15)	-1.1591 (-2.02)**	-1.6095 (-2.73)***
	$inter$	-0.0825 (-4.96)***	-0.0802 (-4.95)***	-0.0822 (-4.93)***	-0.0068 (-0.80)	-0.0057 (-0.67)
	$size$	-0.0241 (-2.16)**	-0.0158 (-1.42)	-0.0244 (-2.17)**	-0.0064 (-0.28)	-0.0126 (-0.68)
	$crisis$	0.02152 (2.42)***	0.0555 (3.14)***	0.0202 (2.31)**	0.0379 (1.92)**	0.0723 (1.94)**
	Log pseudolikelihood	175.184	179.816	175.208	86.752	88.903
	Prob > F	0.0000	0.0000	0.0000	0.0000	0.0000
	Pseudo R2	0.1719	0.2029	0.1720	0.3983	0.4330

Notes: ***, **and * are the significant level at 1%, 5% and 10% respectively; the value of the t-statistics are in parentheses.

[9] Details about modified Wald test are reported in appendix A.

[10] The correlation matrices are given in Appendix B.

Can be noticed, the coefficient related to the variable "$foreign$" is discovered to be significant at the 1% level in regard of model **M1,** and at the 5% level with regard to models **M2** and **M22**. It appears to have a negative effect on bank inefficiency, denoting that, on average, foreign ownership is discovered to help improves the Moroccan and Tunisian banks' efficiency. This result might well be interpreted to serve as an initial empirical justification for the *global advantage hypothesis,* as developed by Berger et al. (2000), arguing that foreign banks prove to display greater efficiency due mainly to the technological advantage they provide. Their access into the Tunisian and Moroccan contexts appears to help in importing the best of global practices and in introducing high technology. This result provides support for hypothesis H_1. It also corroborates the findings achieved by Weill (2006) and Fries and Taci (2005), highlighting that in developing countries, foreign banks perform more efficiently than domestic banks. More particularly, Ochi and Saidi (2012) outline that, in Tunisia, private banks with foreign capital are discovered to be more efficient than those detaining domestic capital.

As for the state ownership associated impact, it seems to be in line with our expectations. It proves to display associated significance with a positive sign. Thus, state ownership appears to help increase bank inefficiency both in Tunisia and Morocco. A possible explanation justifying the state owners' related inefficiency lies in the fact that, in the developing countries, public banks are generally incapable of selecting the most efficient input combinations, as they do not appear to succeed in ensuring and providing the most profitable services. With respect to the second hypothesis H_2, it has also been validated. The reached result appears to be loosely associated with the finding's attained by Megginson (2005), highlighting that the banks' state ownership is closely linked within inefficiency, as state owned institutions can be targeted to undertake social project, as dictated by political interest.

Concerning the Model **M2**, involving the "$institutional\ host$" variable, it is discovered to have a positive and significant effect. This result can have its interpretation in the fact that the banking systems, generally, need to be sustained by a reasonable level of legal and institutional development. Thus, the legal protections for creditors, credibility and transparency of laws and the control of corruption would certainly result in further enhancing and improving efficiency. This finding is in line with that attained by Lin et al. (2016) in their conducted study involving 12 Asian developing countries.

Contrary to expectations, the coefficient associated with the interaction "$foreign \times institution\ host$", as related to model **M22,** appears to be non-significant, implying that the relationship binding efficiency and foreign ownership does not prove to depend on the host country related institutions. Thus, our hypothesis H_4 turns out to be rejected. As for the sub-sample, involving model **M4**, it also includes the "$institution\ host$" variable. Once again, it appears that the host country's institutional quality does not seem to have any effect on the efficiency of foreign banks operating in Tunisia and Morocco. This finding is inconsistent with that reached by Lensink et al. (2008), who have discovered that good institutions associated with the host country helps improve

the foreign banks' efficiency of relative to their domestic peers. Such dissimilar results might well have their explanation in the differences marking the sample constitution. Indeed, our selected study sample exclusively covers two host countries, while the cited authors' sample is much broader. In addition, both Tunisia and Morocco proved to display nearly the same institutional quality.

Regarding the models **M3** and **M4,** they enclose the home country's institutional quality indicator "$institution\ home$". The relevant estimates suggest that should the home country's associated institutions improve, the foreign banks' related efficiency will certainly increase, which corroborates the finding of Lensink et al. (2008). Such result appears to be remarkably aligned with the *global advantage hypothesis*, stipulating that foreign banks might well draw noticeable benefits from their home countries' relating environments. Most often, they apply more advanced technologies and more qualified labor. In addition, good institutions associated with the home country, such as good regulatory quality and an effective legal system, are likely to bring about highly effective recruitment and training procedures, programs management along with a greater deal of independence from political pressure. As matter effect, such institutional characteristics are usually coupled with a positive impact on the foreign banks' management quality and, subsequently, on their efficiency.

Somewhat counterintuitive is the negative sign associated with the "$distance$" variable, as pertaining to models **M3** and **M4**. In regard of this variable, an increase in value implies larger differences to be registered. Hence, the negative relating sign indicates that differences have a positive effect on efficiency. Surprisingly, the institutional differences noticeable between the home and the host countries turn out to be an advantage contributing to the improvement of the foreign banks' efficiency rather than to their decline. Such an unexpected result is indirectly, contradictory with the theatrical model, as set by Mian (2006). The author assumes that institutional distance between the home and host countries implies information related costs to be incurred by foreign banks. Such a finding could have an explanation in the fact that technical advantages of foreign banks, as associated with their often developed home countries, are sufficiently robust to handle and endure the information related problems relative to the national banks. Overall, in such developing countries as Tunisia and Morocco, where the institutional framework is often inconvenient, even domestic banks appear to be liable to bear informational costs without drawing much benefit from the relational advantage of the domestic economy. In this way, the institutional differences turn out to help improving foreign banks' efficiency, concerning the case in which the home country's related institutions appear to be highly convenient and display better states. This result is inconsistent with that reached by Lensink et al. (2008), stressing that the institutional distance between the home and the host countries is negatively associated with the foreign banks' efficiency. Actually, differences persistent between the samples may stand as the major reason justifying such a divergence, since the empirical results appear to differ significantly, when differences between the dataset and the environments turn out to persist.

As a control variable, "$risk$" stands as highly significant associated with a positive sign, suggesting that banks with high credit risk are more inefficient. Yet, even though this result is in line with the envisaged expectations, the relationship cannot be confirmed in terms of model **M4**, which reveals a non-significant impact of this variable. This finding could have its explanation, in a first place, in the limited number of observations relevant to the sub-sample, and, in a second place, in the foreign owners' aversion to risk. In this respect, Mian (2006) maintains that foreign banks, generally, take a lower level of risk than domestic banks, due mainly to the additional supervision of their home authority. Noteworthy, also, is that our results tend to show that financial performance "$roaa$" does not prove to have a significant effect on the efficiency of the Tunisian and Moroccan banks. It is interesting to note that already recorded insignificant coefficients of the "$sharmar$" variable, with respect to the entirety of the global sample related models turn out to be significant with regard to models **M3** and **M4** of the subsample. A possible explanation of this result may reside in the predominance of a large number of banks within a small market context, characterizing mainly especially the Tunisian banking sector's case. Still, a bigger market share of deposits helps reflect the selection of the most efficient foreign banks. Moreover, it seems that the efficiency in the intermediation process "$inter$" appears to help noticeably improving the Tunisian and Moroccan banks' efficiency. Thus, a low ratio could well reflect the banks' incapacity to transform deposits into loans. On the other hand, one may note that bank size proves to have a significantly positive impact on bank efficiency. So, it appears that, on average, large banks are able to properly minimize their costs and improve their performance due to their relating scale economies. In the same context, Kallel et al (2019) indicates recently that the small size characterizing the Tunisian banks affects negatively their cost efficiencies because they operate with significant unreleased economies of scale. Yet, this variable does not prove to be significant in respect of models **M3** and **M4**. This fact suggests well that the efficiency advantage of foreign banks does not actually stem from their respective sizes. Indeed, the foreign banks, operating in Tunisia and Morocco, are characterized with a relatively small size as compared to their domestic peers. Finally, the influence of the Arab Spring revolutions on the efficiency of the Tunisian and Moroccan banking sector proves to conform well our preconized expectations. The estimates demonstrate well that the "***crisis***" variable proves to be significant with a positive sign concerning the entirety of the models. Accordingly, political and economic instability, as emanating from the revolutionary environment marking the Arab countries, turn out to have a significant and negative impact on the bank efficiency. This finding is consistent with the results released by Bitar at al. (2016), indicating that political instability proves to have a negative impact on bank efficiency in the MENA countries.

4.6. Robustness Check

In this subsection, a robustness assessment of our major reached results is

administrated by means of dynamic panel data models. The aim lies in allowing to account for the temporal persistence of banking inefficiency on investigating the impact of foreign ownership and institutional quality regarding to the Tunisian and Moroccan banks' efficiency. Figure 1 illustrates well that, overall, the efficiency levels associated with the Tunisian and Moroccan banks are discovered to witness a persistent gradual decrease deterioration, justifying the GMM system's estimation as maintained through persistent panel data. Following Matthews (2010), the banks' current performance proves to reflect well their historical decisions and performance levels, which need be accounted for in any study of efficiency determinants. Indeed, this method makes it possible to solve the problems of simultaneity bias, reverse causality and omitted variables.

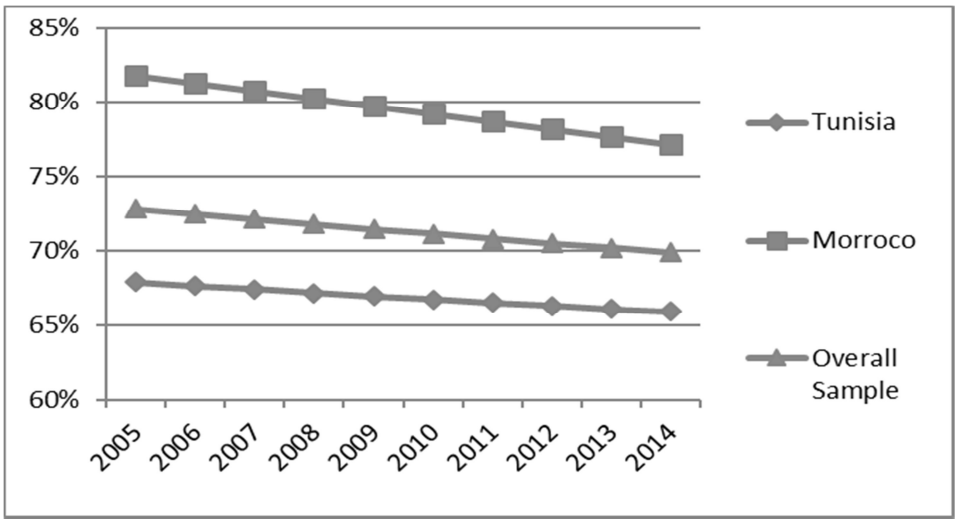

Figure 1. Evolution of the Average Efficiency Scores throughout the Study Period

The dynamic specification is established through the introduction of a lagged variable in our proposed models. Accordingly, the latter turn out to have the following form:

$$y_{i,t} = \alpha + \delta y_{it-1} + \beta x_{i,t} + \gamma C_{i,t} + \varepsilon_{i,t}.$$

The quality of the GMM system estimates proves to depend, particularly, on the validity of instruments and on the assumption that the error term does not reveal autocorrelation. The former condition can be verified through implementation of the Sargan test (Sargan, 1958), while the latter could be assessed via the tests AR (1) and AR (2) (Arellano and Bond, 1991).

The present estimates (table 6) have been reached by means of the GMM system, and the standard deviations are computed through application of the White procedure, which would allow us to correct any possible heteroscedasticity problems[11] likely to befall.

Table 6. Results of Dynamic GMM System Regressions

Dependent variable: inefficiency score ($ineff$)					
	M1	**M2**	**M22**	**M3**	**M4**
Number of observations	170	170	170	70	70
Intercept	0.6911 (2.19)**	1.2905 (4.39)***	0.4515 (1.53)	1.2884 (6.14)***	1.4185 (6.24)***
L1 (y_{it-1})	0.9753 (578.22)***	0.9744 (592.01)***	0.9755 (565.81)***	0.9768 (790.67)***	0.9769 (917.24)***
Independent variables					
$foreign$	-0.0359 (-2.44)*	-0.1076 (-2.03)**	-0.0601 (-2.22)**	–	–
$state$	0.0338 (2.08)**	0.0811 (2.04)*	0.0302 (2.80)***	–	–
$institution\ host$	–	-0.0101 (-1.87)*	–	–	0.0163 (1.54)
$foreign \times institution\ host$	–	–	0.0053 (0.48)	–	-
$institution\ home$	–	–	–	-0.0301 (-1.61)	-0.0634 (-1.26)
$distance$	–	–	–	-0.0177 (-2.09)**	-0.0396 (-2.31)**
Control variables					
$risk$	0.7157 (1.80)*	0.5086 (2.19)**	0.7348 (3.34)***	-0.0158 (-0.18)	-0.1059 (-1.40)
$roaa$	0.5969 (0.94)	0.3763 (0.56)	0.6876 (0.74)	–	–
$sharmar$	-0.2136 (-0.78)	-0.1901 (-0.58)	-0.287 (-1.22)	-0.5563 (-2.88)***	-0.6521 (-2.11)**
$inter$	-0.0273 (-2.08)*	-0.0396 (-3.41)***	-0.0341 (-2.52)**	-0.0396 (-1.99)*	-0.0393 (-2.13)*
$size$	-0.0265 (-2.02)*	-0.0071 (-0.40)	-0.0405 (-2.47)**	-0.0206 (-1.30)	-0.0316 (-1.73)
$crisis$	0.0094 (3.50)***	0.0279 (2.93)**	0.0045 (2.54)**	0.0173 (3.64)***	0.0268 (2.31)**
Sargan test	0.510	0.990	0.561	0.710	0.710
AR(1)	0.349	0.625	0.208	0.020	0.029
AR(2)	0.334	0.935	0.557	0.635	0.863

Notes: ***, **and * are the significant level at 1%, 5% and 10% respectively; the value of the t-statistics are in parentheses.

[11] Details about the modified Wald test are reported in Appendix A.

In general, the diagnostic statistics are discovered to be satisfactorily good. In a first place, the Sargan test does not prove to reject the validity of instruments with respect to the entirety of the sample banks. In a Second place, the Arellano and Bond tests, as figuring at the bottom of the table 6, prove to reveal well that the hypothesis advancing the absence of autocorrelation in the second order cannot be rejected[12].

The coefficient associated with the lagged variable y_{it-1} appears to be significant at the 1% level in respect of the models applied. This affirms well the appropriate application of the GMM model, implying that the previously recorded inefficiencies appear to affect significantly the currently prevailing inefficiency. This finding is consistent with that documented by Al-Gasaymeh (2016). Furthermore, these lagged variable related coefficients tend to approach the unit, highlighting a strong persistence of inefficiencies with respect to the Tunisian and Moroccan banking sectors, particularly noticeable with regard to the foreign banks, highlighting the persistence of a weakly competitive market structure. This finding seems reasonable given the significant heterogeneity noticeable between both of the Moroccan and Tunisian banks, on the one hand, and between the foreign and domestic banks, on the other. As Berger et al. (2000) argue, this heterogeneity can be explained by differences and discrepancies noticeable in cultures, regulations, languages and other barriers.

In general, the GMM system reached results appear to corroborate well the major findings reported on Table 5, already achieved via the Tobit estimator. As can be noted, foreign ownership proves to have a positive effect on bank efficiency. Concerning state ownership, a similar result has been attained through Tobit models, highlighting a negatively associated effect. Additionally, although a better institutional environment would certainly contribute in helping help improve the efficiency of the Tunisian and Moroccan banking sectors, the foreign banks' efficiency does not seem to depend on the host countries' institutional quality. The same finding also applies to the "$distance$" variable. Indeed, the positive impact of the institutional distance between the home and the host countries, on the foreign banks' efficiency is also confirmed by means of dynamic models. Nevertheless, the "$institution\ home$" variable does not appear to be significant with respect to the models **M3** and **M4**, which has not been the case with the Tobit models. This result has a statistical explanation, namely, that institutional quality does not prove vary remarkably over time, especially with respect to those countries enjoying the availability of good institutions. Another perceived difference is that associated with the impact of financial intermediation as a control variable. On applying the first method, it has been discovered that this variable does not appear to have any significant effect on the foreign banks' efficiency. On implementing the GMM model, however, the estimation results prove to indicate well that the financial intermediation associated efficiency appears to contribute noticeably in improving both of the domestic and foreign banks' efficiency.

[12] The AR (2) associated p-values prove to exceed the 10% threshold.

5. CONCLUSION

This paper is designed to investigate cost efficiency associated with the Tunisia and Morocco based banks, assessed through application of the Fourier Flexible Form, within the stochastic frontier approach, relying on balanced panel data. Furthermore, an examination of the effect of the home and host countries' institutional quality as well as the institutional distance prevailing between them in matters of the foreign banks' efficiency has been undertaken. The major reached findings, appears to highlight the following observations and outcomes. In a first place, foreign ownership turns out to improve bank efficiency. In a second place, the foreign banks' related efficiency does not seem to depend highly on the host country's institutional quality. Still, a certain dependence level on the home country's institutional quality is being perceived. In addition, the institutional distance marking the home and the host countries turns out to help in improving the efficiency of foreign banks operating in Tunisia and Morocco, as their home countries are generally more developed and hold more effective institutions. It is actually thanks to these privileges and advantages that foreign banks are able to overcome the encountered linguistic, cultural and regulatory barriers as well as the remote management related difficulties given the knowledge and effective management practices they detain. Hence, the technical advantages these banks enjoy, sustained by their home countries' overall development, turn out to stand as reliable tools, robust enough to help them overcome the information disadvantages they are likely to face, relative to their domestically owned peers. For an effective testing of our reached results' robustness, the entirety of the applied models has been re-estimated by means of the GMM system. The significance associated with the lagged variable coefficient proves to indicate well that the previously lived inefficiencies do actually affect the currently experienced ones. Actually, these achieved findings may well be useful to the implicated policy makers, through providing them with more thorough and brooder understanding of the foreign banks' associated efficiency and the extent of the established institutions' resultant effect. Indeed, policy makers may encourage foreign ownership to pervade within the great Maghreb banking sector, on the ground that it serves to display better corporate governance and greater efficiency, due mainly to the technical advantages associated with their rather developed home countries.

This study could be further extended by undertaking to examine the effect of institutional quality on banking technology, as this factor may well bring about noticeable shifts in the cost frontier. Hence, it may well seem critically important to recognize whether the relevant institutions could well influence banking technologies, and to what extent such an effect could be efficiently significant.

APPENDIX

Appendix A. Heteroscedasticity Test

Table A.1. Results of Modified Wald test

Models	P-value
M1	0.0000
M2	0.0000
M22	0.0000
M3	0.0000
M4	0.0000

Appendix B. Correlation Matrix

Table B.1. Correlation Matrix for The Global Sample

	risk	*roaa*	*sharmar*	*inter*	*size*	*institution host*
risk	1					
roaa	-0.7417***	1				
sharmar	-0.1317*	0.0217	1			
inter	-0.1317	0.0110	-0.2688***	1		
size	-0.2091***	0.1367*	0.7745***	-0.3141***	1	
institution host	0.1979***	-0.1602**	-0.1199	0.0899	-0.3209***	1

Notes: ***, **and * are the significant level at 1%, 5% and 10%, respectively.

Table B.2. Correlation Matrix for the Subsample

	risk	*roaa*	*sharmar*	*inter*	*size*	*institution host*	*institution home*	*distance*
risk	1							
roaa	**-0.8988*****	1						
sharmar	-0.0078	0.1301	1					
inter	-0.0143	-0.0111	-0.5353***	1				
size	-0.1293	0.2583**	0.7488***	-0.5098***	1			
stitution host	0.3192	-0.3211***	-0.1035	0.1474	0.3682***	1		
stitution home	-0.0448	-0.1159	-0.6509***	-0.0794	-0.3865***	-0.0024	1	
distance	-0.0135	-0.0690	-0.0507	0.4270***	0.2845**	-0.2174*	0.6132***	1

Notes: ***, **and * are the significant level at 1%, 5% and 10%, respectively.

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