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The Effects of Innovations on Bank Performance: The Case of Electronic Banking Services

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Abstract

In this study, we investigated the effects of the bank's profitability performance of electronic-based banking services. The effects of ROA and ROE performance were analyzed the data, which are 23 developed and developing countries' electronic banking services through 2005 to 2013, by dynamic panel data methods. Due to the innovative nature of electronic banking services will show the bank performance significantly. Both the analyzing method and involving of developed and developing countries' banking data are the most obvious differences of the study from similar studies in the literature. Result show that bank profitability of developed and developing countries affected from the ratio of the number of branches to the number of ATMs is highly significant and electronic banking services in significant. Results show that some variables were found to be in contrast to the expected negative relationship, because of diversity in the level of development of the countries, the socio-cultural structure and electronic banking infrastructure.

Keywords: : Innovation, elektronic banking, profitability, dynamic panel data.

1. Introduction

Banking is one of the sectors that the technological progress is monitored closely and used widespread. It is difficult to develop new products and services for banking market as in many financial markets. Hence, the new

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forms of existing banking products offered to customers is great important. Technology-based applications such as internet banking, mobile banking, telephone banking, ATM and POS network brings significant advantages to customers in the delivery of existing products. The most important of these advantages is available to every banking products with lower cost banking operations for 24 hours to 7 days. Consequently, the dependency to branches is decline. All of these features encourage banks to take electronic-based services for customers which are increasing day by day The increasing demand for such services enforced to banks invest a great deal of investment to this field. On the other hand, it is expected to continue in the future.

Technology-based products give opportunities to have significant cost advantages, increasing profitability and facilitate lower risk than traditional banking products. In addition, studies show that if there is enough customer demand the technology-based products of the bank there will be the return of investment on this field in short time. Empirical studies made on various countries, reveals that electronic banking services improve the performance of banks. However, the expected results is not seen in some less developed and developing countries because of infrastructure investment could not do enough and customers prefer traditional branch-based banking.

From the perspective of findings and assessments, the applications of electronic banking in 23 advanced and emerging country on banks performances effects are analyzed. In the analysis, we investigated the effect on the profitability of the various electronic-based banking services. The most important difference of our study from other experimental studies is the use of a sample consisting of a large number of countries. In addition, electronic banking infrastructure in many countries taking in to account is developed and the services of the bank performance will be able to monitor more accurately. Dynamic panel data method was used as an analysis method. So it will be possible to take into account the dynamic effects on the time.

2. Literature Review

The importance of electronic based banking products is increasing day by day. It is undoubted that electronic based banking provides relatively low risk, high return and low cost advantages. It can be said that there are many studies adressing the impact of the performance based on the profitability of banks which offer electronic banking products. These studies can be divided into two groups according to the level of development of the countries. These are some of the studies dealing with the electronic and internet banking applications that effect bank's performance. For example Sullivan (2000), DeYoung (2001), Hasan (2002), Pigni et al. (2002), Kagan (2005), Arnaboldi and Claeys (2008), Ciciretti et al. (2009), Weigelt ve Sarkar (2012). These studies showed that electronic banking applications required advanced technology increasing the overall profitability of the banks' in the US and European countries. It is esentially obtained that internet banking has a significant positive contribution to development of competition in the banking sector and banks' performance. Therefore, internet banking applications make bank to build the orientation of technological innovations up (Arnaboldi and Claeys, 2008, Ciciretti et al. 2009). It has been observed that technology-based and in particular internet banking products reduce the operational risk of the banks (Hasan 2002, Ciciretti et al., 2009). Internet banking applications increase the asset quality of banks and therefore increase the operational profitability and ROE performance directly (Kagan 2005).

Al-Samadi and Al-Wabal (2011), Khrawish and Al-Sa'di (2011), Sumra et al. (2011), Hosein (2013), Malhotra and Singh (2006, 2007, 2009), Gutu (2014) studies upon developing countries such as India, Pakistan, Jordan and Romania. Many of these studies show that electronic banking applications diminishing operational costs and increasing profitability performance of banks. It is necessary relatively short time to cope with and exceed initial setup cost of internet banking and other electronic-based activities. This situation is encouraging electronic banking activities in developing countries. However, customer portfolia must be expanded in order to increase the bank performance (Sumra et al., 2011).

Overall results concerning developing countries are consistent with those obtained from developed countries. On the otherhand, for Jordan banks Khrawish and Al-Sa'di (2011), Al-Samadi and Al-Wabal (2011), for Asian countries Hosein'in (2013), and for Romania Gutu (2014) findings show that the impact on the profitability of some electronic banking is negative. Al-Samadi and Al-Wabal (2011) determined that the impact of the negative

performance of electronic banking operations in Jordan, costumers still depending on traditional distribution channels. Khrawish and Al-Sadi (2011), Hosein (2013) and Gutu's (2014) studies show high infrastructure costs of internet banking despite lack of sufficient number of customers effects the profitability of the banks in negatively in developing countries Gutu (2014) has determined that even higher advertising budget for internet banking has not changed this situation. It is shown that the customers in these countries where still demand the traditional branch-based banking services. Therefore, the profitability of electronic banking services are adversely affected on account of not providing the expected cost reduction.

In developing countries, the lack of electronic banking infrastructure block impacts of the expected cost-effectiveness and profitability. In some developing countries, It is not avaliable strong effects on the profitability of electronic banking activities because of inadequate information technology infrastructure of the branch and ATM network are limited. The case is also real for online banking activities. Internet infrastructure based on relatively old technology blocks the achievement of expected performance of banks in developing countries (Alam et al., 2007, Gutu 2014).

On the other hand, internet banking generally has been activited by large banks in some of the developing countries (Malhotra and Singh, 2006, 2009). It is observed that large-scale private-owned banks had deposit volume is high, low branches and less fixed assets tend to internet banking. Generally, these are aimed to boost of the low market share. As a result of banks tends to internet banking, rivals accelerates the orientation of competitive activity in this field (Malhotra and Singh, 2007).

On the other hand, many recent studies on the effectiveness of electronic banking activities on performance of the banks in African countries that relatively lower level of development. For example, Abaenew et al. (2013), Hassan et al. (2013), Oyewole et al. (2013), Okiro and Ndung (2013) made studies on Nigeria and Adua and Kingoo (2012) and Nguyen Gakur Connection (2013) made studies on Kenya The electronic banking activities increase profitability on banks where in the majority of countries handled by the researchers.

On the basis of a positive impact on the performance of the role of providing the cost-effectiveness of Internet banking is great. The cost of a transaction performed at the branch can be reduced by 40 to 80% when the same transaction did at web site, or ATM. The internet and other electronic banking services costs reduce average operational costs and overhead physical expenses suffering by the banks (DeYoung, 2001). Banks using electronic banking services as intensive is classified as "innovative" and their distribution channels more than and their costs are below the sector average (Pigna, 2002). So, the importance of the electronic infrastructure used by banks is the great deal of the cost per transaction decreasing along with developed infrastructure. However, such as the level of education of the customer and including the functionality of the bank's website are base of factors contribute to the success of internet banking services. The costumers with high level of education demand internet banking services too much according to the ordinary bank customers (Sullivan, 2000). The number of bank customers using internet and other electronic banking services has not been increased, as long as the costs of such services will effect profitability of the banks.

Some research has been conducted on customers who prefer electronic banking show that customers develop skills in the use of such services. On the other hand, use of electronic banking services of customers also affects the cost and revenue structure of the bank. All banks have not increased profitability in the sector, when the banks used similar electronic-based services and not taking into account the sales capacity mutually. In contrast, when banks provide complementary services banks then operational expenses reducing and revenues increasing (Dubois et al. 2011, Brush et al., 2012).

How to increase the efficiency they use outsourcing firms in the promotion stage of technological innovation is an important issue. An optimal governance approach should be followed when event-related problems are quite complex . Some research based on a survey showed that providing resources from out of the bank increasing the effectiveness of online banking. On the otherhand, a high level of technology caused efficiency adaptability in a trade-off betweeen them. Banks are required to reflect technological developments to their services consistent with

changing customer needs (Weigelt and Sarkar, 2012). It is also takes time to accustomed to new technological products for customers. In this context, it is important the design and presentation of the product.

3. Methodology

3.1. Research Goal

The goal of the study is to determine the effects of electronic banking products on bank performance. For this purpose, it can be analyzed the impact of electronic banking products on their profitability performance by using the dynamic panel data model:

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\begin{aligned}
Per_{it} = \alpha_{it} + \lambda Per_{it-1} + \beta_1 Cards_{it} + \beta_2 POS_{it} \\
+ \beta_3 (ATM / Branch)_{it} + \beta_4 IntBnk_{it} + \varepsilon_{it}
\end{aligned}
\tag{1}
$$

where Per_{it} i^{th} country's banking system ROA or ROE in terms of profitability performance, $Cards_{it}$ period t^{th} , i^{th} the country issued a total of bank cards (credit cards, debit cards, etc.), POS_{it} existing POS terminal number $(ATM/Branch)_{it}$ the ratio of ATMs to the number of branches and $IntBnk_{it}$ represents the number of customers who benefit from internet banking activities. Here, α_{it} equation constant, λ persistency coefficient, β are the coefficients of the explanatory variables and ε_{it} the error term which represents white noise characteristics.

In this research, system dynamic panel data method used as an analysis method. This method which is developed by Arellano and Bover (1995) and Blundell and Bond (1998), widely used to analyze bank performance. The system in which both lagged levels and lagged differences of instrument variables based on GMM estimator. In finite samples, the system GMM estimator is preferred to reduce potential biases. (Goddard et al, 2011). It is required to prove that, both instruments validity and second-order autocorrelation in error terms are not valid to ensure for consistent estimations. For this purpose two test is performed, respectively: A Hansen (1982) test for instrument validity, which is robust to heteroscedasticity in the disturbance term; and a Arellano-Bond test of the null hypothesis of no second-order autocorrelation in the disturbance term (Roodman, 2006, 2008; Goddard et al, 2011).

3.2. Sample and Data Collection

In this study, 23 developed and developing countries data were used for the period 2005- 2013. Electronic banking data of those countries obtained from BIS (Payment Systems Statistics), World Bank's (World Development Indicators) and bank performance data from the IMF (Financial Soundness Indicators). Descriptive statistics of the variables are presented in Table 1. It is observed that descriptive statistics of some variables showed significant variation because of the different structure of countries taken in to accounted as a sample (See in appendix A.1 for country names).

Table 1. Descriptive statistics

Variable	Mean	Std. Dev.	Min	Max
ROA	1.056	0.843	-1.300	4.000
ROE	13.652	8.651	-35.700	43.400
Cards	486.853	1088.427	0.000	8427.800
POS	971.010	1497.976	0.000	10632.100
ATM / Branchs	0.335	0.474	0.000	3.905
Internet Banking	13.870	23.776	0.000	82.000

3.3. Analyses and Results

In the first stage of the analysis, the relationships of the variables were examined by using correlation coefficients (See, Table 2). It is not surprising that ROA and ROE are in a high positive correlation due to the similarity of the performance metrics calculation. The number of internet banking customers is a strong relationship with almost all variables except (ATM / Branch), but it is show that a remarkable negative correlation with all other variables. In addition, there is no significant relationship was determined between the other variables out of $Cards_{it}$ and $(ATM/Branch)_{it}$ which are in negative correlation, %14.

GMM system estimations are based on the equatin (1) ABBB estimator is presented in Table 3. In this table, both ROA and ROE estimated separately for the dynamic model (1). All coefficients of the model is statistically significant. Wald tests indicate that overall significance of the model is high and Sargan test results also indicate that the right set of instrumental variables selected for the models. In addition, there is no problem with the residues in the Arellano-Bond test in second order autocorrelation and GMM estimator is effetive by technically.

Table 2. Correlation matrix

	ROA	ROE	Cards	POS	ATM / Branch	Internet Bnk.
ROA	1.0000					
ROE	0.7950	1.0000				
Cards	0.0001	0.0102	1.0000			
POS	0.0911	0.0230	0.6705	1.0000		
ATM / Branch	-0.0301	-0.0483	-0.1422	-0.0881	1.0000	
Internet Bnk.	-0.4767	-0.3683	-0.1862	-0.1415	-0.0014	1.0000

Table 3. Estimations of system dynamic panel data

	ROA			ROE		
	Coefficient	z Test		Coefficient	z Test	
Per_{it-1}	0.47879	34.850	***	0.37709	16.020	***
Cards	0.00007	2.330	**	0.00256	7.350	***
POS	-0.00010	-12.500	***	-0.00159	-12.520	***
ATM / Branch	0.16901	3.660	***	3.30776	3.120	***
Internet Banking	-0.00464	-1.740	*	-0.06540	-3.330	***
Constant	0.56749	10.780	***	7.69259	12.420	***
Observations	184			184		
Wald Test	1455.20	[0.0000]		677.94	[0.0000]	
Sargan Test	19.45826	[0.9784]		21.2305	[0.9570]	
Arellano-Bond Tests						
AR(1)	-2.5846	[0.0097]		-1.7717	[0.0764]	
AR(2)	-1.3599	[0.1739]		-1.3777	[0.1683]	

*** represents significance at 1%, while ** represents significance at 5% and * represents significance at 10% z tests.

The results also indicate that a strong persistency in a consistent manner for both dependent variables. All variables affect bank performance in a positive way except POS_{it} and $IntBnk_{it}$. See diagram negative impact on the profitability of the changes that may occur in these two variables will be seen from quite a small coefficient values close to zero. POS_{it} and $IntBnk_{it}$ effect profitability in negative way as a result of the different structural characteristics of analyzed countries. Results shows that (ATM / Branch) affects profitability at maximum. It is known that of the increase in the number of ATMs is to increase their profitability by reducing operational expenses

of banks based on branches significantly so the result is not more surprising. ATMs are higher used by customers than other electronic-based banking tools due to for a long time uses. However, both habits of customer and lack of infrastructure in countries are used not more other banking products. In this study, many variables except for $(ATM/Branch)_{it}$ are weak relation with profitability because of different development and cultural levels in different countries. In addition, the bank card is relatively weak and positive impact on the profitability, along with an indirect interaction is extremely important for banks.

4. Conclusion

In this study, the effects of the electronic banking products on performance data were analyzed by using dynamic panel data methods for 23 developed and developing countries banking data The most important differences of the study from other studies in the literature are both method and considered a large number of countries data. GMM estimator is used in the analysis to provide a more reliable and effective results The coefficients of all the variables are statistically significant in the models used as an alternative profitability analysis of the two measures of ROA and ROE. The estimated models also successfully ensured diagnostic tests.

The findings indicate that almost all the banking services under consideration affect the profitability. However, the number of POS terminals and the number of customer using internet banking service are determined to effect profitability negatively. This situation can be interpreted as the sample had differences in electronic banking infrastructure and socio-cultural characteristics of customer behavior in the countries. In addition, balance corrupted income statment in some developing countries due to high infrastructure costs and high advertising expenses factors.

On the other hand, the number of issued bank cards (credit cards, debit cards, etc.) and the ratio of ATM to the number of branches effects profitability positively. The ratio of the number of branches to number of ATM impact on profitability highest from other variables. Almost in every countries, customers are most familiar with electronic banking applications as ATMs which reducing operational costs in branch office based. On the other hand, lagged profitability ratios yielded notable results in the estimated dynamic models. These variables show that profit persistence is also high. The profit persistence in electronic banking services is exceptional by considering exogenous variables. It is observed that developing and developed electronic banking services affect bank performance significantly on the basis of the profitability when the results are collectively evaluated. The effects of electronic banking services on performance on account of the innovative structure explain innovations on bank performance significantly.

A.1. Countries considered in the analysis

Australia	Mexico
Belgium	Netherlands
Brazil	Russia
Canada	Saudi Arabia
China	Singapore
France	South Africa
Germany	Sweden
Hong Kong SAR	Switzerland
India	Turkey
Italy	United Kingdom
Japan	United States
Korea	

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