

Role of Women Director on Productivity Performance: A Study on Listed Private Commercial Banks of Bangladesh

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Abstract

Efficiency measurement and productivity performance analysis now become a point of interest for many researchers'. Because it is established that efficient and productive banks could ensure superior performance by achieving the objective of wealth maximization. Board of Directors issues have also become an integral part of corporate governance studies. This study is conducted to know the bank efficiency and productivity change for the representation of women directors on board. This study examines the productivity and efficiency performance of twenty-two (22) listed private commercial banks in Bangladesh based on the Malmquist Productivity Index (Total Factor Productivity) over the period of 2007 to 2016. A low degree of relationship found between women directors representation in a board and productivity performance. But, there are significant differences found in productivity performance among the different generation banks.

Keywords: Women Director, Productivity Changes, Malmquist Productivity Index, Total Factor Productivity, Bank Performance.

1. Introduction

Efficiency and productivity analysis is considered as a central point to measure the business performance because it includes the productive process, business profitability, and market value of the companies (Sheu & Yang, 2005; Sufian, 2011; Sufian & Kamarudin, 2014). Bank efficiency is considered to be an important factor for economic growth in a country. It is established that efficient and productive banks could generate superior performance by achieving the objective of profit maximization through wealth maximization (Jahan, 2019).

Efficiency and Productivity change can be measured by two approaches – one is an econometric estimation of cost, production and the other one is a construction of index using of non-parametric approach (Guarda & Rouabah, 2009). The non-parametric approach is most popular among the researcher in the application of measuring the efficiency of financial institutions, i.e. banks. The bank is a multiproduct company with multiple inputs and outputs. Malmquist Productivity Index (MPI) is a kind of productivity analysis (based on non-parametric data envelopment analysis techniques) shows both the changes in technological and efficiency from one time period to

another period (Clarke, Cull, D'Amato, & Molinari, 2000; Bhattacharya, Lovell, & Sahay, 1997; Isik & Hassan, 2002; Kirikal, 2005).

This study is motivated to know bank efficiency and productivity change concerning the board of directors (BODs). It is believed that board composition as a central aspect of corporate governance mechanism by academic researchers, investors, and policymakers. They believe that board members have a direct influence on determining firm value (Claessens & Yurtoglu, 2013). Although it is said that management is responsible for operating efficiency, revenue efficiency, and cost efficiency, BODs set objectives, monitor performance, ensure equitable distribution of resources and made management accountable to every action (Uribe-Bohorquez, Martínez-Ferrero, & García-Sánchez, 2019)

Studies on board aspects of gender diversity are also given equal importance now a day. Women director in a board provides evidence of higher productivity and superior performance of an organization (Depren & Depren, 2016). Thus, Norway and Spain have made mandatory to have at least 40% women for all listed companies and Malaysia has imposed to have 30% women director in a board (Von Bergen, Soper, & Parnell, 2005; Mohamed, Clayton, & Isa, 2015). It has been assumed that women are better at maintaining ethical standards strictly and strongly assume their responsibilities. Women are also more sensitive to all the perspectives and needs of stakeholders (Post & Byron, 2015; Campbell & Mínguez-Vera, 2008; Erhardt, Werbel, & Shrader, 2003). It is also a belief that women on the board will ensure more gender equality (Campbell & Mínguez-Vera, 2008).

Lee, Lan, and Rowley (2014) said that women directors could assist companies in retaining and developing relationships with investors, customers, and different stakeholders which leads to improving the performance of the company. Based on these perspectives, this study is conducted to know the performance of the banking industry of Bangladesh based on gender diversity (the presence of women in board structure). Some studies found relating the board performance with efficiency estimation (Erhardt, Werbel, & Shrader, 2003; Campbell & Mínguez-Vera, 2008; Mahadeio, Soobaroyen, & Hanuman, 2012; Post & Byron, 2015; Uribe-Bohorquez, Martínez-Ferrero, & García-Sánchez, 2019) All those studies are mostly conducted in developed countries and cross-country perspectives.

This paper contributes to the existing literature by showing the effect of representation of female directors in a board and bank performance in case of the developing countries like Bangladesh. The rest of the paper is structured in the following ways. Section two is the literature review and the subsequent section describes the methodology, data and variable measurement issues, and findings and analysis.

2. Literature Review and Hypothesis Development

Corporate governance aspects ensure the accountability of management by an effective monitoring system, building investor confidence, reducing agency costs, and improving organizational efficiency (Organization for Economic Co-operation and Development, 2015). There are number of studies conducted on showing the positive impact of corporate governance mechanism on corporate performance (Mohan & Chandramohan, 2018; Yilmaz & Buyuklu, 2016; Alam & Akhter, 2016; Zelenyuk & Zhaka, 2006). The concept of gender-diverse board entails the perspective of age, gender, ethnicity, religion, professional background, skill, and technical know-how, experience, and values (Van der Walt & Ingle, 2003).

Several kinds of literature are found on productivity analysis in the banking industry. One of the most recent studies found in Kalluci (2018). This study uses the MPI technique in the Albanian banking industry from 2006 to 2017. The study found that efficiency had improved in medium-size banks than the large and small banks. Depren and Depren (2016) studied the efficiency and total factor productivity of the Turkish banking sector using DEA and MPI techniques for the years 2014 and 2015. Based on the production approach and intermediate approach, they found that overall performance is increased in terms of production approach but opposite found under the intermediate approach.

Varesi (2015) measured the Albanian banking sector productivity using of Malmquist DEA method. The results showed that medium and small size banks were more productive than large banks. Marković, Knežević, Brown, and Dmitrović (2015) studied the productivity changes in Bank of Serbia using DEA and MPI. Studying from the period of 2007 to 2010, they claim that productivity in the banking sector was decreased. Kao and Liu (2014) also studied on banking industry using the MPI method to measure the performance of the Taiwanese banking industry from 2005 to 2010. The results showed that the performance of the commercial bank has improved.

Sufianand and Habibullah (2014) studied on impact of globalization on bank's productivity in the Malaysian banking sector over the period of 1998 to 2007 using of MPI method. It was found that personal contacts, political globalization, and information flow have a significant impact on the bank's total factor productivity. Evaluated on total factor productivity and the impact of market development on bank efficiency in China over the

period of 1999 to 2008. Their study found that the productivity growth of Chinese banks can be attributed to improvement in technical efficiency and technical change.

Sufian (2011) studied on Malaysian banking industry over the period of 1995 to 2004 based on the MPI method. The study found that the banking sector exhibit decline in productivity due to technological efficiency. Angelidis and Lyroudi (2006) used the MPI on Italian banks and found that the total factor productivity has increased during that period. Isik and Hassan (2002) examined the financial reforms in the banking industry of Turkey using MPI for the period 1981 to 1990. The study opined that there were efficiency changes rather than technological advancement. Chu-Fen (2004) studied productivity changes in Germany over the period of 1992 to 2000. They found that the foreign banks were more productive because of improvement in technology and efficiency.

In Bangladesh, researches related to efficiency and productivity analysis for the financial industry are found but in a limited number. Jahan (2019) studied the productivity of private commercial banks is conducted over the period of 2011 to 2015 using MPI techniques. A comparative study is conducted between Islamic banks and conventional banks and found that Islamic banks showed less variability in the index than the conventional banks. Baten, Kasim, and Rahman (2015) studied nationalized commercial banks (NCBs) and private commercial banks (PCBs) based on cost DEA, profit DEA, and MPI based on DEA method. Their study found that PCBs are efficient from the NCBs in terms of cost and profit.

In Bangladesh, the literacy rates for females are much lower than they are in developed countries, and positions of female directors are simply an ornamental post. Hence, it is likely that views and opinions held by a female director are given less attention (Ahmed & Liza, 2013). This raises the question of whether female in the board is only a sign of symbolic effort or raises the productivity performance of any firm. Studies of the presence of the female director and bank performance are hard to find in the case of Bangladesh. Based on this research gap, this study is conducted to know about the impact of women in board and productivity changes in private commercial banks (PCBs) of Bangladesh. Following hypotheses have been made based on the research gap –

H₁: There is a change in the productivity performance of private commercial banks having women directors in their board structure.

H₂: There is a gap in productivity performance among different generations of private commercial banks in Bangladesh.

3. Research Methodology

The Malmquist productivity index (MPI) was first developed by Malmquist in 1953 by Stan Malmquist and further it was developed by Fare, Grosskopf, Lindren, and Roos (1994); Tatjé and Lovell (1995); Bjurek (1996); Färe, Grosskopf, and Russell (1998); Thrall (2000); Kirer (2013). Malmquist index measures the efficiency change over time. The MPI is another format of Data Envelopment Analysis (DEA). The DEA is defined as the method used for efficiency analysis of a complex business unit with multiple inputs and outputs (Yang, 2009). The MPI is calculated under the assumption of constant return to scale (CRS) with output orientation. The input or output orientation is the same for the MPI method (Coelli, 1996; Thanassoulis, 2001).

MPI methods have several advantages and mostly used in the case of financial industries. The index is used to identify productivity change of entity with multiple inputs and outputs. It does not need input/output prices (Krikal, 2005). Total factor productivity (TFP) change is another name uses for MPI. It is the outcome of the multiplication of two ratios of technical efficiency and technological change. Technical Efficiency change can be decomposing into two components - scale efficiency change and pure technical efficiency change. All the components are calculated based on the geometrical average of MPI (Fare, Grosskopf, Lindren, and Roos (1994). The output-oriented CRS based MPI following the Fare, Grosskopf, Norris, and Roos (1994) is as follows-

$$M_0 = \left[\frac{d_0^t(x_0^t, y_0^t)}{d_0^t(x_0^{t+1}, y_0^{t+1})} \frac{d_0^{t+1}(x_0^t, y_0^t)}{d_0^{t+1}(x_0^{t+1}, y_0^{t+1})} \right]^{1/2} \quad (1)$$

M_0 measures the productivity from two different periods. 'x' stands for inputs and 'y' stands for output. The index uses technology for the 't' period and the next period 't+1'. To quantify the productivity change, MPI uses the distance function of a variable. Further, this index is decomposed into two components- Technical Change and Technical Efficiency Change.

$$\overline{M}_0 = \frac{d_0^t(x_0^t, y_0^t)}{d_0^{t+1}(x_0^{t+1}, y_0^{t+1})} \left[\frac{d_0^{t+1}(x_0^{t+1}, y_0^{t+1})}{d_0^t(x_0^{t+1}, y_0^{t+1})} * \frac{d_0^t(x_0^{t+1}, y_0^{t+1})}{d_0^t(x_0^t, y_0^t)} \right]^{1/2} \quad (2)$$

In the above equation, the first ratio measures the technical efficiency (Catch-up effect –‘C’) as of Farrell and Hersch (2005) for the period t to $t+1$. The second ratio (inside the bracket) is the geometric average of two ratios used to measure the change in technology – technical change (Frontier –shift effect – ‘F’).

$$M_0 = C * F$$

Productivity is increased if $MPI > 1$. It can be said that technical efficiency improvement ($C > 1$) and technical progress occurred ($F > 1$). Productivity is decreased if $MPI < 1$ when technical efficiency decreases ($C < 1$) and technical progress has not occurred ($F < 1$). 3. Productivity is stable if $MPI = 1$. It can be said that both technical efficiency and technical progress remain for the time being (Depren & Depren, 2016; Thanassoulis, 2001). DEAP 2.1 is the computer program used to measure the MPI using DEA methods developed by Coelli (1996).

4. Data Collection, Variable Selection, and Measurement Issues

In the case of Bangladesh, a large data set is not readily available. It is very difficult to collect data because of market imperfection and a restrictive legal environment. In this respect, the Non-parametric method is appropriate techniques to estimate the best practice firms (Bhattacharya, Lovell, & Sahay, 1997). The population of this study is all the listed private commercial banks of Bangladesh on the Dhaka Stock Exchange (DSE). The study period for the sample is considered from the years 2007 to 2016. The reasons for the selection of the period are:

- (a) Corporate governance guidelines came in a structured way since 2006. All the listed companies have to comply with those guidelines.
- (b) In 2016, some major reforms were made in corporate governance guidelines subject to changes in the composition of BODs and different committees.

Among the thirty (30) private commercial banks, only twenty-two (22) is selected based conventional banking perspective and ten years of data availability. DEA based MPI technique requires the input and output variables to be specific. This specification for input variables and the output variable is crucial. For the present study, Constant Return to Scale (CRS) is assumed for measuring the efficiency. According to Grifell-Tatj'e and Lovell (1995), MPI does not provide an accurate measure of productivity change with the non-constant scale. The advantage of the CRS method is that the results are coincidental for the input and output-oriented approaches.

Table 1. Input and Output variables for MPI Analysis

Input	Description
Board Quality	Percentage of women director to the total number of directors
	Percentage of women independent director to the total number of directors
	Percentage of women director in the Audit Committee
Cost of Fund	Total interest expense to total deposit
Capital Intensity	Total assets to the total number of employees
Output	
Growth	Percentage change in the book value of total assets
Profitability	ROA (net profit after tax to total assets)
Tobin's Q	The total Market value of the firm/ Total Asset value of the firm

Corporate governance aspect - ‘board *quality*’ is considered for this study. Under the board quality - the percentage of women independent directors, the percentage of women directors in the audit committee, and the percentage of women directors are taken and all the values are equated to total members of the board of directors. For input prices/cost, two other variables, cost of fund (total interest expense/total deposit) and capital intensity (total asset/total number of employees), are considered. Bank performances are measured here with three variables: growth (percentage changes in the book value of total assets), profitability (ROA) and Tobin's Q (Kumbhakar & Lozano-Vivaz, 2005; Casu, Girardone, & Molyneux, 2004; Wang & Kumbhakar, 2009; Robin, Salim, & Bolch, 2017).

5. Findings and Analysis

The following Table 2 shows the descriptive summary of the inputs and outputs variables of two hundred and twenty (220) observations for the twenty-two (22) PCBs over 10 years from the Year 2007 to the Year 2016.

Table 2. Descriptive Statistics

Variables	Percentage of women Director	Percentage of women INDP Director	Percentage of Women Director in the Audit Committee	Cost of Fund	Capital Intensity	Growth	ROA (%)	Tobin's Q
Mean	10.77	1.16	4.92	0.73	61.84	20.54	1.58	3.28
Std. Dev.	9.88	4.52	11.44	6.73	29.82	11.15	1.18	3.93
Minimum	0.00	0.00	0.00	0.00	4.64	-5.87	0.21	0.01
Maximum	44.44	28.57	60.00	72.88	139.78	56.18	10.08	30.72

Source: Author's calculation

Considering the corporate governance variables, board quality is measured through the presence of women directors on the board. The percentage of women directors to the total number of BODs is about 10.77% and the percentage of women independent directors is only 1.16%. It is also found that there is no presence of women directors at all in the different bank whereas maximum women director is found about 44.44% in some cases. Three output variables are considered here—growth in book value of total assets (GROWTH), return on assets (ROA) and Tobin's Q. On average, 20.54% growth is observed in the PCBs of Bangladesh over the study periods, whereas, ROA is found, on average, at 1.58%, with a standard deviation of 1.18. Tobin's Q is found 3.28% with a standard deviation of 3.93.

Cost of Fund (COF) is measured using total interest expense to the total deposit. It is found that COF is, on average, 73.39% for all the PCBs with a standard deviation of 6.73. It is normal to have a high COF because a majority of the banks' funds are collected from using different deposits accounts. Most banks' expenditures occurred due to interest given on deposit accounts. Capital intensity (CI) is measured through the total assets to the total number of employees. All the PCBs are using, on average, and 61.84% of their assets per employee.

Table 3 shows the total factor productivity change (TFPCH) along with its components efficiency change (EFFCH) and technological change (TECHCH), and two other subcomponents of efficiency change—pure technical efficiency change (PECH) and scale efficiency change (SECH). It has been found that the PCBs of Bangladesh do not experience much improvement from the Year 2007 to the Year 2016. The mean TFPCH/MPI is at found 1.0%. TECHCH/MPI is characterized by the development of new products or technologies which result in improvement and shift the production frontier upfront. Due to the stock market crisis, financial market development and banking crisis may not have the opportunity to develop new products and services to the PCBs. Rather, PCBs are more concerned with their survival.

Conversely, reverse results are experienced in the case of EFFCH. Most of the banks improved their efficiency using their existing offers and services. The lowest value in TECHCH was observed in 2009 and it may be attributed as the outcome of financial crises that took place at that particular time. The result of this study is similar to the findings of other studies in different countries (Kalluchi, 2018).

Table 3. Malmquist Productivity Index Summary of Annual Means (Year wise)

Year	EFFCH/ Catch-up Effect	TECHCH/ Frontier- shift Effect	PECH	SECH	TFPCH/MPI
2007	1.087	0.961	1.011	1.075	1.045
2008	1.097	0.931	1.035	1.06	1.022
2009	0.892	1.532	0.0882	1.012	1.367
2010	0.95	1.185	0.994	0.955	1.125
2011	1.096	0.56	1.078	1.017	0.548
2012	0.768	0.967	0.96	0.8	0.743
2013	1.173	0.714	1.08	1.086	0.837
2014	1.043	1.155	0.983	1.061	1.204

2015	0.932	1.242	0.868	1.074	1.157
2016	1.118	0.859	1.144	0.978	0.96
Mean	1.0156	1.0046	0.92412	1.0118	1.0008
Std. Dev.	0.125643	0.29034	0.303263	0.086518	0.239816
Minimum	0.768	0.5	0.0882	0.8	0.548
Maximum	1.173	1.532	1.144	1.086	1.367

Source: Author’s calculation

To analyze the relationship between female director and productivity performance of PCBs, rank correlation is conducted. Few studies are found employing Spearman's rank correlation to show the rank similarity among different parametric and non-parametric methods. Since all the methods are based on the same concept. This study uses the rank correlation to test hypothesis 1 – generalize the relationship between women on board and productivity performance. In Table 4, it has been found that there is a low degree of correlation found between women director on board and productivity performance of PCBs in Bangladesh. From the results, there is no relationship of consistency found among the PCBs rank in the case of Bangladesh likewise Mahbub (2016). The result from the rank correlation is shown in the following table –

Table 4. Correlation between the percentage of women director and MPI

Spearman's rho		
		Percentage of Women Director
Malmquist Productivity Index	Correlation Coefficient	.176
	Sig. (2-tailed)	.432
	N	22

Source: Author’s calculation

In Bangladesh, PCBs are classified into generations in the following ways, though banking laws do not mention specific generations in practice (Ahmed & Liza, 2013). Table 5 shows the results of different generations of banks in Bangladesh.

Table 5. Generation-wise Productivity Performance Change of Private Commercial Banks

Banking Generation	1st Generation		2nd Generation		3rd Generation	
	% of Total Women Director	TFPCH/ MPI	% of Total Women Director	TFPCH/ MPI	% of Total Women Director	TFPCH/ MPI
Mean	10.39%	0.88	8.72%	1.01	12.23%	1.02
Std. Dev	7.12%	0.07	8.38%	0.08	10.30%	0.32
Minimum	1.48%	0.82	0.00%	0.88	1.50%	0.81
Maximum	20.95%	1.02	22.55%	1.10	29.83%	1.93

Source: Author’s calculation

Based on these generations of banks, it has been found that from 1st generation to 3rd generation the percentage of women directors was increased from 10.39% to 12.23%. The ratio of female director to total director is found lower in the case of second-generation banks. The 2nd generation banks are holding only 8.72% of women directors. The productivity performance of all three generation banks is not improved in that significant way. But, it

is also found that with the increase of women director total productivity of the banks also increasing from 0.88 to 1.02 from 1st generation to 2nd generation PCBs.

Table 6. Kruskal Wallis Test

Test Statistics ^{a,b}	
Chi-Square	6.090
Asymp. Sig.	0.048
a. Kruskal Wallis Test	
b. Grouping Variable: Banking Generation	

Source: Author's calculation

Kruskal - Wallis Test is conducted to know whether any relationship among the different generations of PCBs and productivity changes in Bangladesh (hypothesis 2). From Table 6, it is found that the Chi-Square test statistics of 6.090 with a significance level of 0.048 reject the null hypothesis. There is a gap in productivity performance among three generations of PCBs in Bangladesh.

6. Conclusion

There are some implications of women director in a board, particularly in case of control and monitoring activities of management by reducing the agency cost and creating the value by increasing the firm performance (Uribe-Bohorquez, Martínez-Ferrero, & García-Sánchez, 2019). This study is conducted to examine the relationship between women director on board, efficiency, and productivity changes of private commercial banks in Bangladesh. A low degree of relationship found with the presence of women directors on board, bank efficiency, and productivity changes. The generation-wise banking system shows significant differences among different generations. Third generation banks are generating different results (superior performance and increased number of women directors on board) than the results of first-generation banks. The future direction of research could be extended by considering the impact of ownership structure, legal and social structure on productivity and efficiency analysis of the banking industry.

References

- Alam, F. M., & Akhter, F. (2016). Impact of Corporate Governance on Performance of Commercial Banks in Banks in Bangladesh. *The Cost and Management*, 45(4), 1-8.
- Angelidis, D., & Lyroudi, K. (2006). Efficiency in the Italian Banking Industry: Data Envelopment Analysis and Neural Networks. *International Research Journal of Finance and Economics*, 5, 155-165.
- Ahmed, M. S., & Liza, F. F. (2013). Efficiency of Commercial Banks in Bangladesh-A Data Envelopment Analysis. *European Journal of Economics, Finance and Administrative Science*, 56, 130-152.
- Bhattacharya, A., Lovell, C. A. K., & Sahay, P. (1997). The Impact of Liberalization on the Productive Efficiency of Indian Commercial Banks. *European Journal of Operations Research*, 98, 332-345.
- Baten, A., Kasim, M. M., & Rahman, M. (2015). Cost and profit efficiency of online banks: Do national commercial banks perform better than private banks?. *Journal of Internet Banking and Commerce*, 20(3), 1-6.
- Campbell, K., & Minguez-Vera, A. (2008). Gender Diversity in the boardroom and firm financial performance. *Journal of Business Ethics*, 83(3), 435-451.
- Casu, B., Girardone, C., & Molyneux, P. (2004). Productivity Change in European Banking: A Comparison of Parametric and Non-Parametric Approaches. *Journal of Banking & Finance*, 28, 2521-2540.
- Clarke, G., Cull, R., D'Amato, L., & Molinari, A. (2000). The Effect of Foreign Entry on Argentina's Domestic Banking Sector.
- Claessens, S., & Yurtoglu, B. B. (2013). Corporate governance in emerging markets: A survey. *Emerging Markets Review*, 15, 1-33.
- Coelli, T. J. (1996). A Guide to DEAP version: A Data Envelopment Analysis (computer) Program, *Centre for Efficiency and Productivity Analysis, Working Papers 96/08*, Department of Econometrics, University of New England, Armidale, Australia.
- Chu-Fen, L. (2004). Inefficiency, technical progress and productivity change in German banking: a category-based empirical study. *The 4th International Symposium of DEA: Data Envelopment Analysis and Performance Management*, Birmingham, UK, 206-212.
- Depren, S. K., & Depren, O. (2016). Measuring Efficiency and Total Factor Productivity using Data Envelopment

- Analysis: An Empirical Study from Banks of Turkey. *International Journal of Economics and Financial Issues*, 6(2), 711-717.
- Erhardt, N. L., Werbel, J. D., & Shrader, C. B. (2003). Board of Director diversity and financial performance. *Corporate Governance: An International Review*, 11(2), 102-111.
- Farrell, K. A., & Hersch, P. L. (2005). Additions to corporate boards: the effect of gender. *Journal of Corporate Finance*, 11(1-2), 85-106.
- Färe, R., & Grosskopf, S. (1992). Malmquist productivity indexes and Fisher ideal indexes. *The Economic Journal*, 102(410), 158-160.
- Färe, R., Grosskopf, S., Lindren, B., & Roos, P. (1994). Productivity change in Swedish hospitals: a Malmquist output index approach.
- Färe, R., Grosskopf, S., & Russel, R. (1998). Index numbers: Essays in honour of Sten Malmquist. Boston: *Kluwer Academic Publishers*.
- Griffell-Tatj, E., & Lovell, C. A. K. (1995). A note on the Malmquist productivity index. *Economics Letters*, 47, 169-175
- Guarda, P., & Rouabah, A. (2009). Bank Productivity and Efficiency in Luxembourg: Malmquist Indices from a Parametric Output Distance Function. *SUERF Studies: 2009*, 4, 151-166.
- Isik, I., & Hassan, M. K. (2002). Cost and profit efficiency of the Turkish banking industry: An empirical investigation. *Financial Review*, 37(2), 257-279.
- Idris, A. (2014). Measuring efficiency of Islamic banks in Bangladesh: An application of data envelopment analysis. *Manarat International University Studies*, 4(1), 12-24.
- Islam, J., Rahman, A. M., & Hasan, H. M. (2013). Efficiency of Islamic Banks-A Comparative Study on South-East Asia and South Asian Region. *Proceedings of 9th Asian Business Research Conference*, 20-21.
- Jahan, N. (2019). Productivity Analysis of Commercial Banks of Bangladesh: A Malmquist Productivity Index Approach. *International Journal of Economics and Financial Issues*, 9(1), 108-115.
- Kirer, H. (2013). Malmquist Indices of Productivity Change in Turkish Banking Sector for the Period Between 2002-2011. *Journal of Social Policy*, 64-65(1-2), 75-86.
- Kalluci, I. (2018). Albanian banking sector productivity using malmquist index. *Research Journal of Finance and Accounting*, 9(12), 1-8.
- Kao, C., & Liu, S. T. (2014). Measuring performance improvement of Taiwanese commercial banks under uncertainty. *European Journal of Operational Research*, 235(3), 755-764.
- Kirikal, L. (2005). Productivity, the Malmquist Index and the Empirical Study of Banks in Estonia. *PhD thesis*, Tallinn University of Technology. <https://digi.lib.ttu.ee/archives/2006/2006-07/1153225915.pdf>, 2005.
- Kumbhakar, S. C., & Lozano-Vivas, A. (2005). Deregulation and Productivity: The Case of Spanish Banks. *Journal of Regulatory Economics*, 27, 331-351.
- Lee, J. S., Lan, L. L., & Rowley, C. (2014). Why might females say not to corporate board position? The Asia Pacific Comparison. *Asia Pacific Business Review*, 20, 513-522.
- Mahbub, T. (2016). The performance of Bangladeshi Commercial Banks: The Role of Corporate Governance. *A thesis submitted to fulfillment of Degree of Doctor of Philosophy* at University of Manchester.
- Mahadeio, J. D., Soobaroyen, T., & Hanuman, V. O. (2012). Board composition and financial performance: Uncovering the effects of diversity in an emerging economy. *Journal of Business Ethics*, 105(3), 375-388.
- Marković, M., Knežević, S., Brown, A., & Dmitrović, V. (2015). Measuring the productivity of Serbian banks using Malmquist index. *Management: Journal of Sustainable Business and Management Solutions in Emerging Economies*, 20(76), 1-10.
- Mohamed, Z., Clayton, G. J., & Isa, M.Y. M. (2015). Embedding Economics Excellence: A Transformational Definition of ‘Corporate Governance’ for Malaysia. *Journal of Mod. Account. Audit*, 11, 124-129.
- Mohan, A., & Chadramohan, S. (2018). Impact of Corporate Governance on Firm Performance: Empirical Evidence from India. *International Journal of Research in Humanities, Arts and Literature*, 6(2), 209-218.
- Post, C., & Byron, K. (2015). Women on boards and firm financial performance: A meta-analysis. *Academy of Management Journal*, 58(5), 1546-1571.
- Robin, I., Salim, R., & Bolch, H. (2017). Cost efficiency in Bangladesh baking: does financial reform matter?. *Applied Economics*. <http://dx.doi.org/10.1080/00036846.2017.1346361>.
- Sheu, H. J., & Yang, C. Y. (2005). Insider ownership and firm performance in Taiwan’s electronics Industry: a technical efficiency perspective. *Managerial and Decision Economics*, 26(5), 307-318.
- Sufian, F. (2011). Banks total factor productivity change in a developing economy: Does ownership and origins matter?. *Journal of Asian Economics*, 22(1), 84-98.

- Sufian, F., & Kamarudin, F. (2014). Efficiency and returns to scale in the Bangladesh banking sector: Empirical evidence from the slack-based DEA method. *Engineering Economics*, 25(5), 549-557.
- Sufian, F., & Habibullah, S. M. (2014). Banks' total factor productivity growth in a developing economy: does globalization matter?. *Journal of International Development*, 26, 821-852.
- Thanassoulis, E. (2001). Introduction to the Theory and Application of Data Envelopment Analysis: A Foundation Text with Integrated Software, *Boston, USA: Kluwer Academic Publishers*.
- Uribe-Bohorquez, M. V., Martínez-Ferrero, J., & García-Sánchez, I. M. (2019). Women on boards and efficiency in a business-orientated environment. *Corporate Social Responsibility and Environmental Management*, 26(1), 82-96.
- Varesi, L. (2015). Measuring the productivity of a mainly foreign owned banking sector using non- parametric approach; Case of Albania. *The 2015 WEI International Academic Conference Proceedings, Athens, Greece*, 37-56.
- Von Bergen, C. W., Soper, B., & Parnell, J. A. (2005). Workforce diversity and organizational performance. *Equal Opportunity International*, 24, 1-16.
- Van der Walt, N., & Ingley, C. (2003). Board dynamics and the influence of professional background, gender and ethnic diversity of directors. *Corporate Governance: An International Review*, 11(3), 218-234.
- Wang, D., & Kumbhakar, S. C. (2009). Strategic groups and heterogeneous technologies: An application to the US banking industry. *Macroeconomics and Finance in Emerging Market Economies*, 2(1), 31-57.
- Yilmaz, C., & Buyuklu, A. H. (2016). Impacts of Corporate Governance on Firm Performance: Turkey with Panel data Analysis. *Eurasian Journal of Economics and Finance*, 4(1), 56-72.
- Zelenyuk, V., & Zheka, V. (2006). Corporate governance and firm's efficiency: the case of transitional country. *Ukrain. Journal of Production Analysis*, 25, 143-157.

Appendix

Banking Generation

First-Generation: Banks established between Year 1982 to Year 1990.

Second-Generation: Banks established between Year 1991 to Year 1998.

Third-Generation: Banks established between Year 1999 to Year 2011.

Fourth-Generation: Banks established after Year 2011.

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