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Efficiency and Competition in QISMUT Banking Sector

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Abstract: Research Question: Theoretically, the rapid growth of the banking sector fosters competition and eventually competition influences the efficiency performance of the banks. The issue that we would like to highlight, whether efficiency and competition are interrelated in the QISMUT banking sector. **Motivation:** In the context of QISMUT, these countries recorded 80 percent of shares of the global Islamic banking industry (Ernst and Young, 2014). Due to the rapid growth of Islamic banks in QISMUT, it is important for them to operate efficiently in their performance to compete with conventional banks. Hence, this study aims to assess the nexus of efficiency and competition of QISMUT (Qatar, Indonesia, Saudi Arabia, Malaysia, United Arab Emirates and Turkey) banking sector. Interestingly, there is no study related to investigating the nexus of efficiency and competition of the QISMUT banking sector. **Idea:** Competition and efficiency are important as it is reflecting the performance of the banking sector. Since competition causes the banks to perform better in terms of efficiency. It can be seen that there is a relationship between competition and efficiency. **Data:** The period of the data is from 2006 to 2016. It consists of 60 conventional and 32 Islamic banks. **Method/Tools:** The measurement to measure the efficiency is Data Envelopment Analysis (DEA) whilst for the competition, Lerner Index is used. In order to test the relationship between competition and efficiency, the Generalized Method of Moments (GMM) is employed due to its advantages such as overcoming the endogeneity problem. **Findings:** The findings indicate Islamic banks are more efficient than conventional banks in QISMUT. The results also show there is an insignificant competition-efficiency whereas efficiency-competition is significant for the conventional banking sector in QISMUT. The results imply that the banking authorities should monitor the conventional banking sector as the finding shows a high concentration compared to Islamic because these countries aim to become an Islamic international financial hub. **Contributions:** This study contributes to the new evidence of QISMUT banking sector regards on efficiency, competition and the impact of banks-specific variables.
Keywords: Competition, efficiency, Islamic banks, conventional, banking.
JEL Classification: X10, X12, X14

1. Introduction

QISMUT Islamic banking sector signifies the rapid growth market in Islamic finance and services (Ernst and Young, 2016). As a result, it triggers competitiveness in the banking sector. Interestingly, conventional banks are also established in QISMUT even the population

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of QISMUT is a Muslim majority. This increases competition among Islamic and conventional banks. Furthermore, penetration of foreign banks is one of the factors that affect the banking sector. This statement has been supported by Rajan and Zingales (2003) which mentioned the entry of foreign banks can trigger competition in the countries. In addition, competition affects the performance of the banks in terms of efficiency (Andries and Capraru, 2012). Apergis and Polemis (2016) mentioned that the efficiency of banks has been triggered by competition in the European banking scenario. Efficiency reflects on how banks manage their cost and inputs to produce outputs. The efficiency of the banks is influenced by the competition which also affects the market power (Arrawatia and Mishra, 2012; Pruteanu-Podpiera *et al*., 2008). Competition and efficiency are important as it is reflecting the performance of the banking sector. Since competition causes the banks to perform better in terms of efficiency. It can be seen that there is a relationship between competition and efficiency. In the context of QISMUT, these countries recorded 80 percent of shares of the global Islamic banking industry (Ernst and Young, 2014). Due to the rapid growth of Islamic banks in QISMUT, it is important for them to operate efficiently in their performance to compete with conventional banks. Hence, the competition in the banking sector of QISMUT is affected. This is the issue that we would like to highlight, whether efficiency and competition are interrelated in the QISMUT banking sector. Another contribution of this study is to examine whether efficiency causes competition or vice-versa. In this study, we investigate a similar relationship in the context of QISMUT banking sectors due to both sectors operating simultaneously in respective countries. QISMUT was selected in this study due to its rapid growth in the global Islamic banking industry, hence, this hampers the performance in terms of the efficiency and also the competition.

The structural approach mainly consists of traditional structure-conduct-performance (SCP), concentration ratio (CR), Herfindahl-Hirschman Index (HHI) and the efficiency-structure (ES) hypothesis. Secondly, non-structural approaches are developed from the structural approach and consist of the Panzar-Rosse model and the Lerner Index (LI). The structural approach mostly used by the researcher to analyze the market structure is the structure-conduct-performance (SCP) paradigm. Mason (1939) is the researcher that developed SCP paradigm. SCP gained more attention from researchers including Bain (1951, 1956). In SCP, the performance was influenced by conduct. The measurements consist of concentration ratios (CR), Herfindahl-Hirschman Index (HHI) and 'efficiency structure hypothesis (ES)'. The non-structural approach is the new method known as the New Empirical Industrial Organisation (NEIO) that is related to the SCP paradigm. NEIO shows that conduct such as in SCP leads to pressure in the competition. Under NEIO, there are several measures to examine the competitive environment and determine the market structure. However, the market structure determined by market shares cannot reflect the competitiveness level in the industry. Two common non-structural assessments are Panzar and Rosse (PR-H) also known as H-statistics and Lerner Index.

According to Hicks (1935) in the 'quiet life hypothesis', firms or banks that have market power tend to neglect the activities of the organization and this causes the firms or banks inefficient. However, in contrast, Demsetz (1973) came out with an 'efficient structure hypothesis (ES)'. This gist of the ES is the efficient banks or firms would create high profits which reflects the extraordinary performance. Mkrtchyan (2005) studied the competition in Armenia by using the Panzar-Rosse approach. The author found that the banking sector in Armenia is under monopolistic competition from the year 2001 to 2003. Bhatti and Husain (2010) assessed the structure-conduct-performance (SCP) of commercial banks in Pakistan. It was found that concentration ratio and profitability are a positive relationship. Apart from that, the author found that market share and profitability are a negative relationship which does not support the ES hypothesis. Gajurel and Pradhan (2012) studied the concentration and

competition in the Nepal banking sector. The results show that there was high competition in the interest-based market compare to the total market. Besides, Macit (2012) found Turkish banking sector is under monopolistic competition and it consistent with Sekmen *et al*. (2015). In another region such as Africa, Simatele (2015) also found the African banking sector operates under monopolistic competition by using similar methodology from previous studies which are Panzar-Rosse (PR-H) and the concentration ratio (CR). As for Middle East and North Africa (MENA), Anzoategui *et al*. (2010) used PR-H and Lerner Index (LI) to determine the market competition. The findings indicate the banking sector in MENA is under monopolistic competition and concentrated. An extended study by Hamza and Kachtouli (2014) shows conventional and Islamic banking sector is also under monopolistic competition. Besides, the authors used LI to examine the market power and it was found that Islamic banks have market power. The finding was consistent with Ariss (2010) and Weill (2011) which also found Islamic banks are concentrated compared to conventional. Other than that, numerous studies examine the conventional and Islamic banking sector over the period of the global financial crisis. Kabir and Worthington (2017) found competition in conventional banks lower during the financial crisis. In contrast, Islamic banks were found to perform better compared to conventional during the crisis.

Hassan *et al*. (2009) studied the efficiency in Middle East banks consists of Islamic and conventional. The result from this study is conventional and Islamic banks reported no significant differences between the overall efficiency score. The banks in the organization of the Islamic Conference (OIC) are more efficient in cost efficiency compare to profit and revenue efficiency. Ahmad *et al*. (2010) examine the efficiency of Islamic banks. It was found that Islamic banks' pure technical efficiency (PTE) more efficient compare to their scale efficiency (SE). Apart from that, the authors found from the results that in determining the technical efficiency, it was pure technical efficiency affecting it. Kablan and Yousfi (2011) studied the efficiency of conventional and Islamic banks in 17 countries in the Middle East. The authors found that the size of the banks insignificant meanwhile for market power and profitability had a negative impact on efficiency. Ab-Rahim *et al*. (2013) found that Islamic domestic banks are inefficient compare to Islamic foreign banks in terms of allocative efficiency and pure technical efficiency. In addition, the authors also found that allocative efficiency is the main contributor to cost-efficiency for Malaysian Islamic banks. Sillah and Harrathi (2015) examine the banks' efficiency in Gulf Cooperation Council Countries (GCC) from the year 2006 to 2012. The method that the authors use to analyzed the efficiency is Data Envelopment Analysis (DEA) which is a non-parametic approach. The authors found that conventional banks perform well in terms of their efficiency score during the financial crisis in 2008 compare to Islamic banks. It is consistent with Alqahtani *et al*. (2017) and Srairi (2010) findings which show that Islamic banks experienced cost-efficient during the global financial crisis compare to conventional. Moreover, Safiullah and Shamsuddin (2020), Albaity *et al*. (2019), Batir *et al*. (2017) and Abdul-Majid *et al*. (2010) also examine the efficiency of conventional and Islamic banks, the findings indicate Islamic banks recorded inefficient compared to its counterparts. In the Asian region, the majority of Islamic banks were found more scale inefficient (Rosman *et al*., 2014).

Ningaye *et al*. (2014) found that competition affected profit efficiency positively than cost efficiency. Andries and Capraru (2012) examined the competition and efficiency in European banking systems. The authors used Granger causality to investigate the relationship between competition and efficiency. In this study, it was found that efficiency positively affected competition or granger causes competition. Ab-Rahim (2016) studied the competition and efficiency of commercial banks for the year 1996 to 2011. The author found that there was an increase in concentration faced by Malaysian commercial banks with a low level of competition and is a positive effect of competition towards the efficiency in terms of technical

efficiency and pure technical efficiency. In addition, there are recent studies examining the market structure and efficiency specifically in the QISMUT banking sector by Mortadza *et al*. (2019). Since these countries are dual banking sectors, the conventional and Islamic banks have to compete and perform better. The authors found that the conventional banking sector in QISMUT is concentrated compared to its counterpart. As for the performance, the authors found that Islamic banking sector is more efficient compared to the conventional. From the study, it indicates that a less competitive environment influences inefficiency. Meanwhile, as for Islamic banking sector, it shows that competition leads to better performance in terms of efficiency. Other past studies on QISMUT have tended to focus on efficiency performance but none has focused on the relationship between competition-efficiency in the QISMUT banking industry. For instance, Mammadov and Mukhtarov (2018) assessed the impact of prices of oil in QISMUT's Islamic banking industry and Yildirim (2015) focused on the efficiency of Islamic banks in QISMUT.

On the contrary, Pruteanu-Podpiera *et al*. (2008) found negative causality from competition to efficiency by using Granger causality analysis. Furthermore, Casu and Girardone (2009) assessed a similar study and the findings indicate negative for efficiency to competition whilst positive from competition to efficiency. This result consistent with Apergis and Polemis (2016) which is also found negative causality from efficiency to competition in the MENA banking sector. Repkova and Stavarek (2013) studied the efficiency and its relationship with the competition in the banking industry. It was found that efficiency and competition are a positive relationship which also contradicts to 'Quiet Life Hypothesis'. Mugume (2007) examines the performance and the market structure in Uganda's banking sector. The author found that efficiency causes market share and concentration which also affects the probability of the banks.

Previous studies had focused on efficiency and competition in the banking sector in a specific region, especially Islamic banking (Yildirim, 2015). As an illustration, the previous studies investigate the Islamic banking sector in the Middle East and North Africa (MENA) and Asian countries. There are a few studies focused on the QISMUT banking sector. According to Ernst and Young (2016), QISMUT recorded rapid growth in compound annual growth rate (CAGR) and this reflects that QISMUT is strived and compete which affects the performance of the banks. According to Mongid *et al*. (2012) emphasized that the efficiency of the banks is important for financial stability. More specifically, this study focuses on the relationship of efficiency and competition due to several issues. First, the rapid growth of Islamic banks in QISMUT influences the performance and the competition in the banking sector. Other than that, conventional banks in QISMUT also will be affected due to the growth of Islamic banking sector. Second, efficiency and competition are the important factors in the banking industry. Based on theories such as 'Efficient-Structure', efficient banks have the benefits and influence the market structure of the banking sector. On the contrary, in 'Quiet-Life Hypothesis', it states that dominant banks tend to become inefficient due to their negligence on the organization's management. Moreover, competition is also known as the factor that affects the performance of the banking sector such as in theory of 'competition-stability/fragility'. Based on the theoretical studies, it indicates that efficiency and competition play a significant role in the banking sector. The questions of this study are whether competition and efficiency have a significant relationship? Interestingly, there is no study related to investigating the nexus of efficiency and competition of the QISMUT banking sector.

2. Methodology

The measurement to examine the efficiency score of pure technical efficiency (PTE), technical efficiency (TE) and scale efficiency (SE) are by using Data Envelopment Analysis

(DEA). In order to know the degree of the market power in the banking sector, Lerner Index (LI) was also used in this study and Generalized Methods of Moments (GMM) for testing the relationship of efficiency and competition. The period of the study involved is from the year 2006 to 2016 and the data are extracted from Orbis Database. It involved 60 conventional and 32 Islamic banks in QISMUT.

2.1 Efficiency

In efficiency measurement, inputs and outputs variables are includes. The intermediation approach is used for Data Envelopment Analysis (DEA). The efficiency score is the maximum ratio of outputs to inputs (Ab-Rahim *et al*., 2013). Variables involved as input and output are similar to the previous studies such as in Apergis and Polemis (2016), Giustiniani and Ross (2008), Castellanos and Garza-Garcia (2013), Ab-Rahim (2015), Abdul-Majid and Hassan (2011) and Abdul-Majid *et al*. (2010). The variables for inputs are deposits including short-term funding and personnel expenses whereas variables for outputs are total loans and other earnings assets.

$$\begin{aligned}&\text{Max } u,v\ (u'yi/v'xi),\\&\text{s.t } uyj/v'xj \leq 1\\&u, v \geq 0\ j=1,2,\ldots N\\&xi = \text{virtual inputs (single)}\\&yi = \text{virtual outputs (single)}\end{aligned} \tag{1}$$

Decision-Making Units (DMU) will be evaluated from the number of different inputs (K) that will produce different outputs (M). DEA and DMU measure efficiency in terms of overall technical efficiency. xi and yi are the K times N input matrix and K times M output matrix for ith DMU. X which is K times N and Y is K times M for all data, N of DMUs. Finding the value of u and v are to prevent the problem of the infinite number if the efficiency of ith DMU is maximized.

$$\begin{aligned}&\text{Constant constraint } (pxi = 1).\\&\text{Max}u, v\ (u'yi),\\&\text{s.t } p\ xi = 1\\&u\ yj - p'xj \leq 0\\&j=1,2,\ldots N\\&u, p \geq 0\end{aligned} \tag{2}$$

u and p are from the transformation value of u and v. Linear programming difficulties from the envelopment are shown as below:

$$\begin{aligned}&\text{Min}\theta, \theta\\&\text{s.t. } yi + Y\lambda \geq 0,\\&\theta_{xi} - X\lambda \geq 0\\&j=1,2,...N\end{aligned} \tag{3}$$

θ is a scalar while λ is N times 1 which is vector of constants. The efficiency of the score in ith DMU represent by the value of θ and this can be solved by N.

$$\begin{aligned} &\min\lambda, \text{ xi} * \text{wixi}, \\ &\text{s.t. } -\text{yi} + Y\lambda \geq 0, \\ &\text{xi} - X\lambda \geq 0, \\ &\text{N1 } \lambda = 1 \\ &\lambda \geq 0, \end{aligned} \tag{4}$$

N1 is an N time 1. Technical efficiency (TE) scores are from constant return to scale (CRS) model and pure technical efficiency (PTE) scores are from a variable return to scale (VRS). Scale efficiency (SE) is from CRS to VRS.

2.2 Lerner Index

Lerner Index (LI) is used to measure the degree of market power of competition in the banking sector. Leon (2014) stated that LI is great at measuring market power in banking. The variables involved in computing the LI depends on the approach that the researcher use. In this study, the variables are chosen based on the intermediation approach.

$$\begin{aligned} &Ln(\text{TC}t_{it}) = \beta_0 + \beta_1 \text{LnQ}_{it} + \frac{\beta_2}{2}\text{Ln}(\text{Q}^2_{it})\sum_{k=1}^{3}\gamma_{kt}\,\text{Ln}(\text{W}_{k,it}) + \sum_{=1}^{3}\varphi_k \text{LnQ}_{it}\,\text{Ln}(\text{W}_{k,it}) \\ &+ \\ &\qquad \sum_{k=1}^{3}\sum_{j=1}^{3} Ln(\text{W}_{k,it})\text{Ln}(\text{W}_{j,it}) + \varepsilon_{it} \\ &\text{MC}_{it} = \frac{TC_{it}}{Q_{it}}\left[\ \beta_1 + \beta_2 \text{LnQ}_{it} + \sum_{k=1}^{3}\gamma_{kt}\,\text{Ln}(\text{W}_{k,it})\ \right] \\ &\text{LI}_{it} = \frac{P_{it} - MC_{it}}{P_{it}} \end{aligned} \tag{5}$$

TC = Interest expense and Non-Interest expenses;
W_L = Personnel expenses / Total assets = Labour costs;
W_F = Interest expenses / Total deposits = Costs of funds;
W_P = Non-Interest expenses / Total assets = Costs of capital;
P = Total revenue / Total assets; and
Q = Total Assets.

All the variables listed above are similar to the previous studies by Weill (2004), De Guevara *et al*. (2005) and Hamza and Kachtouli (2014). W_L, W_F and W_P are the prices of inputs (W_k) according to the intermediation approach which involved the labour, funding and capital to create the outputs.

2.3 Generalized Method of Moments (GMM)

In order to measure the relationship of competition and efficiency, the Generalized Method of Moment (GMM) by Arellano and Bover (1995) is used in this study. Below is the general estimation for GMM.

$$\text{Efficiency} = C + \gamma\ \text{Efficiency}_{t-1} + \beta_1\ \text{Competition} + \beta_2\ \text{banks variable} + \beta_4\ \text{Macro variable} + \varepsilon_{it} \tag{6}$$

$$\text{Competition} = C + \gamma\ \text{Competition}_{t-1} + \beta_1\ \text{Efficiency} + \beta_2\ \text{banks variable} + \beta_4\ \text{Macro variable} + \varepsilon_{it} \tag{7}$$

Efficiency and competition are the dependent variables for the estimation of the QISMUT banking sector. Efficiency represents the efficiency score measured by DEA meanwhile Lerner Index is used as competition. The bank variables are equity to total assets (EQTA),

total deposits to total assets (TDTA) and total loans to total assets (TLTA). These variables have been used from previous studies by Coccorese and Pellechia (2010), Chortareas *et al*. (2011), Bakour and Gallali (2013), Schaeck and Cihak (2008) and Giustiniani and Ross (2008). The macro variable for this study is Gross Domestic Products (GDP) per capita similar to Ariss (2010) and Liyanagamage (2014).

Dynamic panel data is used in this study because of the nature of the sample which is dynamic. The are several advantages of using system GMM in estimations such as the regression would be less biased. This is because system GMM overcome several problems that occurred in ordinary least square estimates. For instance, the problem of endogeneity and simultaneity. Since this study examine the relationship of efficiency and competition, system GMM is used to overcome potential bias in the estimations. Besides, based on the theoretical studies such as 'Efficient-Structure Hypothesis' and 'Quiet-Life Hypothesis', competition, and concentration of the market structure influence the efficiency of the banks and vice-versa. This is another reason why this study employ system GMM.

3. Results

3.1 Efficiency

Table 1: Efficiency of banking sector (Qatar)

Year	Pure Technical Efficiency (PTE)		Technical Efficiency (TE)		Scale Efficiency (SE)	
	CB	IB	CB	IB	CB	IB
2006	75.70	87.39	69.62	86.74	89.90	98.94
2007	72.83	76.93	68.13	72.40	92.02	93.43
2008	70.40	84.95	67.43	79.74	92.95	93.13
2009	70.43	83.89	67.99	79.50	93.28	94.26
2010	73.35	79.49	70.49	76.37	94.84	95.85
2011	74.84	92.30	73.63	92.08	96.76	99.72
2012	78.38	93.76	77.44	88.92	97.72	94.93
2013	76.19	96.38	92.85	91.64	99.37	95.19
2014	76.96	90.59	76.29	86.70	98.31	95.77
2015	79.87	94.63	79.34	91.10	98.50	96.26
2016	78.68	97.74	77.77	94.72	98.25	96.98
Mean	75.24	88.91	74.63	85.45	95.63	95.86

Notes: CB is conventional banking sector and IB is Islamic banking sector.

Table 1 shows the efficiency score of both banking sectors in Qatar. In terms of PTE, it was found that Islamic banks are more efficient compare to conventional. This shows their mean where conventional recorded 75.24 and Islamic is 88.91. In addition, it indicates that Islamic banks are utilized their inputs efficiently compared to conventional. For TE, it still Islamic banks that score the highest mean of TE with 85.45 compared to 74.63. This means that the conventional waste a lot of inputs by 25.37 percent compared to 14.55 percent for Islamic. In terms of SE, the mean of Islamic and conventional are not much different which both are operate efficiently in Qatar.

Table 2: Efficiency of the banking sector (Indonesia)

Year	Pure Technical Efficiency (PTE)		Technical Efficiency (TE)		Scale Efficiency (SE)	
	CB	IB	CB	IB	CB	IB
2006	55.33	82.08	47.39	80.97	86.14	98.72
2007	56.33	96.62	49.97	87.18	89.18	90.08
2008	62.15	93.10	56.59	87.87	91.45	93.93
2009	59.49	86.73	52.25	76.06	89.01	87.40
2010	64.79	89.20	57.80	74.85	90.74	84.53
2011	65.31	87.79	55.86	65.42	85.77	75.29
2012	65.69	89.47	56.23	77.34	86.20	86.04
2013	73.97	87.58	62.83	63.84	84.46	74.42
2014	73.01	87.79	61.94	65.54	85.00	75.90
2015	70.46	90.35	61.28	67.95	87.12	75.27
2016	70.41	92.58	58.37	68.82	88.92	74.58
Mean	65.18	89.39	56.41	74.17	87.64	83.29

Notes: CB is conventional banking sector and IB is Islamic banking sector.

For Indonesia, it was found that Islamic banks are efficient compare to conventional in terms of PTE and TE. Conventional banks in Indonesia recorded the highest PTE in the year 2013 (73.97) meanwhile for Islamic banks is 96.62 in 2007. This shows that conventional have improved from the year 2009 to 2013 whereas Islamic banks show a decrease from the year 2008 to 2009 due to crisis. In terms of TE, the highest TE scored by conventional with 62.83 (2013) whereas for Islamic is 87.87 in 2008. For SE, the highest SE is 91.45 for conventional in 2008 and 98.72 in 2006 for Islamic banks. From the value of the mean, it shows that Islamic banks are more efficient in managing their inputs whereas conventional are more efficient in their operating.

Table 3: Efficiency of banking sector (Saudi Arabia)

	Pure Technical Efficiency (PTE)		Technical Efficiency (TE)		Scale Efficiency (SE)	
Year	CB	IB	CB	IB	CB	IB
2006	95.01	100.00	89.15	100.00	94.08	100.00
2007	93.52	100.00	89.92	100.00	96.34	100.00
2008	95.11	100.00	93.83	93.17	98.66	93.17
2009	92.01	100.00	88.25	88.99	96.12	88.99
2010	95.48	99.97	91.34	91.91	95.77	91.94
2011	94.88	100.00	92.87	96.22	97.94	96.22
2012	95.25	100.00	93.66	97.67	98.36	97.67
2013	96.46	100.00	95.86	100.00	99.40	100.00
2014	97.58	100.00	97.03	100.00	99.38	100.00
2015	96.84	100.00	95.37	99.73	98.48	99.73
2016	97.72	100.00	96.49	99.19	98.69	99.19
Mean	95.44	100.00	93.07	95.54	97.57	95.54

Notes: CB is conventional banking sector and IB is Islamic banking sector.

Next, for Saudi Arabia, Islamic banks score a perfect 100 from the year 2006 to 2016 in PTE except the year 2010. Surprisingly, the conventional banking sector of Saudi Arabia PTE above 90 percent which is also efficient. This indicates that conventional and Islamic are efficient in managing their inputs. In terms of TE, Islamic banks still recorded the highest efficiency score compare to conventional. For SE, the mean shows that conventional is more efficient compare to Islamic banks in Saudi Arabia.

Table 4: Efficiency of banking sector (Malaysia)

Year	Pure Technical Efficiency (PTE)		Technical Efficiency (TE)		Scale Efficiency (SE)	
	CB	IB	CB	IB	CB	IB
2006	72.50	69.65	49.58	57.58	70.30	85.78
2007	69.86	63.18	49.14	56.75	70.40	90.66
2008	74.09	81.89	51.27	75.21	70.17	92.84
2009	72.88	79.14	50.79	72.36	70.70	91.91
2010	71.91	81.74	49.57	76.53	69.29	94.02
2011	74.89	71.73	51.58	65.85	68.58	89.84
2012	76.82	80.61	52.58	76.17	69.53	91.99
2013	75.88	84.35	51.93	80.94	69.28	96.26
2014	80.11	90.74	53.29	87.26	68.21	96.22
2015	82.06	88.26	57.19	85.05	69.00	96.50
2016	82.22	91.14	56.91	87.18	68.93	95.46
Mean	75.75	80.34	52.16	74.71	69.49	92.80

Notes: CB is conventional banking sector and IB is Islamic banking sector.

In Malaysia, the efficiency score trend is almost similar to Qatar, Indonesia and Saudi Arabia which shows that Islamic banks are efficient than conventional. The efficiency score of PTE of the conventional show an improvement towards the year 2016 meanwhile for Islamic is inconsistent throughout the year. In terms of TE, Islamic banks still efficient whereas conventional is inefficient where the score is only below 60 percent. For SE, it is obvious that Islamic banks are efficient compare to conventional banks.

Table 5: Efficiency of banking sector (UAE)

	Pure Technical Efficiency (PTE)		Technical Efficiency (TE)		Scale Efficiency (SE)	
Year	CB	IB	CB	IB	CB	IB
2006	87.67	94.98	77.03	91.47	87.90	96.47
2007	80.98	84.07	72.49	82.71	89.15	98.35
2008	83.00	95.05	77.29	85.12	93.70	88.41
2009	78.89	91.67	73.15	90.60	93.29	98.86
2010	78.58	90.64	73.80	89.82	94.25	99.05
2011	78.62	78.01	73.30	71.42	93.29	87.50
2012	76.99	88.73	71.27	86.27	93.01	97.13
2013	77.61	87.91	71.53	85.36	93.09	97.08
2014	78.99	92.84	73.55	88.98	93.92	95.93
2015	79.21	94.13	74.06	90.75	94.24	96.44
2016	86.33	94.48	79.91	91.96	92.94	97.22
Mean	80.62	90.23	74.31	86.77	92.62	95.68

Notes: CB is conventional banking sector and IB is Islamic banking sector.

For UAE, the efficiency score in terms of PTE shows that once again Islamic banks are efficient except in the year 2011 where the conventional banks efficient. For TE, the situation also similar where the conventional is efficient in 2011 compare to Islamic. In terms of SE, it was found that Islamic is efficient in operating. Overall, for the mean, it is obvious that Islamic banks are efficient in managing their inputs.

Table 6: Efficiency of banking sector (Turkey)

Year	Pure Technical Efficiency (PTE)		Technical Efficiency (TE)		Scale Efficiency (SE)	
	CB	IB	CB	IB	CB	IB
2006	66.74	99.01	53.40	78.38	83.77	79.20
2007	60.68	98.18	49.57	87.89	85.39	89.46
2008	57.20	93.15	47.99	84.74	85.48	90.85
2009	64.90	88.64	57.15	80.84	88.40	90.87
2010	64.40	89.03	57.09	82.47	89.02	92.81
2011	64.89	94.33	55.50	88.10	88.58	93.28
2012	61.38	84.15	51.63	81.75	87.22	96.99
2013	50.59	88.94	43.71	85.43	88.23	95.96
2014	48.01	91.43	42.71	88.90	90.61	97.31
2015	56.97	90.34	46.93	88.79	87.72	98.22
2016	61.45	96.02	46.98	94.13	81.96	97.86
Mean	59.75	92.11	50.24	85.58	86.94	92.98

Notes: CB is conventional banking sector and IB is Islamic banking sector.

The Turkish banking sector in Table 6 shows that conventional banks quite inefficient in PTE compare to Islamic banks. In terms of TE, Islamic banks score the highest efficiency score compare to conventional which the score is below 60 percent. It shows that conventional waste inputs more than Islamic banks. In terms of SE, Islamic recorded the highest score compared to conventional.

Table 7: Efficiency of banking sector (QISMUT)

	Pure Technical Efficiency (PTE)		Technical Efficiency (TE)		Scale Efficiency (SE)	
Year	CB	IB	CB	IB	CB	IB
Qatar	75.24	88.91	74.63	85.45	95.63	95.86
Indonesia	65.18	89.39	56.41	74.17	87.64	83.29
Saudi Arabia	95.44	100.00	93.07	95.54	97.57	95.54
Malaysia	75.75	80.34	52.16	74.71	69.49	92.80
UAE	80.62	90.23	74.31	86.77	92.62	95.68
Turkey	59.75	92.11	50.24	85.58	86.94	92.98
Mean	75.33	90.16	66.80	83.70	88.31	92.69

Notes: CB is conventional banking sector and IB is Islamic banking sector.

Table 7 shows the efficiency of QISMUT. In terms of PTE, the highest efficiency score is from CB in Saudi Arabia (95.44) followed by UAE (80.62), Malaysia (75.75), Qatar (75.24), Indonesia (65.18) and Turkey (59.75). This shows that conventional banks in Saudi Arabia successfully managing their inputs efficiently whereas Turkey inefficient in organizing their inputs to creates the outputs. In the case of Islamic banks, once again Saudi Arabia recorded a perfect 100 percent, meanwhile, Malaysia is scored the lowest efficiency score compare to other countries. For TE, the most efficient in the banking sector is Saudi Arabia with 93.07 in CB followed by Qatar (74.63), UAE (74.31), Indonesia (56.41), Malaysia (52.16) and Turkey (50.24). Meanwhile, for IB, the highest score in TE is Saudi Arabia (95.54) followed by UAE (86.77), Turkey (85.58), Qatar (85.45), Malaysia (74.71) and Indonesia (74.17). Indonesian Islamic banks waste more inputs than other countries. For SE, the highest score for CB is by Saudi Arabia again with 97.57 followed by Qatar (95.63), UAE (92.62), Indonesia (87.64), Turkey (86.94) and Malaysia with 69.49. In contrast, for IB, the highest SE is by Qatar with 95.86 followed by Saudi Arabia (95.54) and UAE (95.68), Turkey (92.98), Malaysia (92.80) and Indonesia with only 83.29. Conventional banks of Malaysia and Indonesian Islamic banks are inefficient in operating. Overall, Saudi Arabia recorded the highest efficiency score in PTE and TE compare to other QISMUT countries.

3.2 Competition

Table 8: Lerner Index (LI) of banking sector

Year	Qatar		Indonesia		Saudi Arabia		Malaysia		UAE		Turkey	
	CB	IB	CB	IB	CB	IB	CB	IB	CB	IB	CB	IB
2006	0.78	0.32	0.27	0.10	0.62	0.94	0.66	0.08	0.75	0.48	0.49	0.42
2007	0.73	0.25	0.28	0.10	0.68	0.53	0.68	0.08	0.72	0.70	0.51	0.13
2008	0.79	0.26	0.31	0.54	0.70	0.65	0.65	0.10	0.71	0.54	0.49	0.14
2009	0.80	0.20	0.33	0.41	0.52	0.16	0.69	0.09	0.60	0.38	0.65	0.14
2010	0.88	0.21	0.35	0.48	0.31	0.20	0.70	0.09	0.56	0.26	0.59	0.13
2011	0.30	0.38	0.45	0.47	0.45	0.24	0.68	0.15	0.51	0.21	0.57	0.16
2012	0.28	0.40	0.37	0.14	0.47	0.50	0.61	0.12	0.56	0.20	0.61	0.15
2013	0.24	0.56	0.35	0.15	0.31	0.29	0.67	0.19	0.40	0.21	0.60	0.34
2014	0.22	0.42	0.43	0.33	0.35	0.26	0.64	0.15	0.29	0.22	0.60	0.45
2015	0.17	0.37	0.57	0.15	0.34	0.25	0.37	0.14	0.39	0.18	0.53	0.44
2016	0.46	0.28	0.58	0.24	0.35	0.33	0.32	0.14	0.31	0.18	0.54	0.44
Mean	0.51	0.33	0.39	0.28	0.46	0.39	0.61	0.12	0.53	0.33	0.56	0.27

Notes: CB is conventional banking sector and IB is Islamic banking sector.

According to the mean in Table 8, the highest LI for CB is from Malaysia with 0.61 followed by Turkey (0.56), UAE (0.53), Qatar (0.51), Saudi Arabia (0.46) and Indonesia with only 0.39. The higher the Lerner Index, it reflects lower competition in the banking sector. From the results, it was found that Malaysia CB has the market power meanwhile Indonesian CB is competitive than others. For IB, the highest mean is from Saudi Arabia with 0.39 followed by Qatar and UAE (0.33), Indonesia (0.28), Turkey (0.27) and Malaysia (0.12). Saudi Arabia recorded the highest Lerner index in IB among others, however, it still shows that the Islamic banking sector is facing high competition whereas Malaysia, is more competitive than other QISMUT.

Table 9: Relationship of competition-efficiency based on GMM

Dependent: Efficiency	CB	IB	All Banks
Efficiency (t-1)	0.493**	0.056	0.209**
	(2.45)	(0.25)	(1.72)
Lerner Index	0.005	-0.049	0.01
	(0.26)	(-0.58)	(0.71)
EQTA	-0.127	-0.476	-0.09
	(-0.87)	(-1.49)	(-0.74)
TDTA	-0.224**	-0.387**	-0.512**
	(-2.56)	(-3.25)	(-5.55)
TLTA	0.202**	0.663**	0.479**
	(2.42)	(3.48)	(5.44)
TA	0.014	0.005	0.007
	(1.35)	(0.22)	(1.01)
GDP	0.023	0.025	-0.015
	(1.05)	(0.85)	(-0.77
Constant	0.144	0.524	0.842**
Wald Test	42.35**	18.02**	89.91**
AR(1)	-2.394**	-1.196	-2.687**
AR(2)	1.238	0.621	1.490
Sargan Test	50.61	25.57	56.93
N	598	294	892

Notes: Asterisks denote the significance ** (0.05) level, figure in parentheses are t-statistics.

Table 10: Relationship of efficiency-competition based on GMM

Dependent: Lerner Index	CB	IB	All Banks
Lerner Index (t-1)	0.437**	0.579**	0.508**
	(3.76)	(3.45)	(4.72)
Efficiency	0.362**	-0.156	0.126
	(2.01)	(-0.66)	(0.72)
EQTA	0.993**	-0.399	0.865
	(1.98)	(-0.55)	(1.90)
TDTA	0.673**	0.659**	0.383**
	(3.28)	(2.52)	(2.22)
TLTA	-0.661**	0.015	-0.387**
	(-3.39)	(0.08)	(-2.49)
TA	0.004	-0.022	-0.005
	(0.15)	(-0.68)	(-0.32)
GDP	-0.196**	0.005	-0.103**
	(-2.86)	(0.09)	(-1.74)
Constant	1.617**	-0.224	0.943
Wald Test	99.32**	63.22**	60.76**
AR(1)	-2.990**	-2.131**	-3.464**
AR(2)	0.8095	1.571	1.034
Sargan Test	55.14	26.73	73.77**
N	598	294	892

Notes: Asterisks denote the significance ** (0.05) level, figure in parentheses are t-statistics.

Table 9 shows the results of relationship competition-efficiency by using GMM. The lag dependent shows significant for conventional and all banks. Variables TDTA and TLTA have a significant relationship to efficiency. TDTA has negative and significant on efficiency for conventional, Islamic and all banks meanwhile TLTA has positive and significant for all three models. The LI has positive coefficients for conventional and all banks meanwhile it is negative coefficients for the Islamic. In Table 10, we also tested the relationship of efficiency on market power which is represented by LI. The lag dependent results show positive and significant which current Lerner index has been impacted by the previous year. For conventional, efficiency was recorded positively and significantly on LI. It means that with the higher efficiency, the Lerner index would be higher (less competition). Variable such as EQTA also found significant and positive for conventional. TDTA is significant and also positive for conventional, Islamic and all banks whereas TLTA is negative and significant for conventional and all banks. The macro variable which is GDP per capita shows negative and significant for conventional and all banks which implies to higher GDP led to lower market power (high competition).

In this study, we focus on the relationship of efficiency and competition in QISMUT. Based on the regression results in Table 9 and Table 10 for conventional (CB), it was found that efficiency had a significant impact on the LI whilst LI was found insignificant on the efficiency. In other words, efficient banks have a negative influence on the competition as the higher value of LI indicates lower competition (higher market power). This finding is consistent with 'Efficient-Structure' where it states that efficient banks can gain higher market share, hence, it affects the market power. In the context of QISMUT, it shows that efficient dominant conventional banks influence the market structure or competition in the banking sector. In contrast, the regression results for Islamic (IB) and all banks were found insignificant for the relationship between efficiency and competition. The results indicate that both factors such as competition and efficiency are independent. It means that competition and efficiency do not have significant influence on each other in the QISMUT Islamic banking sector. From the regression results, it was only conventional to have significant results between the relationship of efficiency and competition.

Next, as for the banks-specific variables, only certain variables show significance on the efficiency and competition. In Table 9, for CB, TDTA was recorded significant and negative

on the efficiency whilst in Table 10, it was recorded positive and significant on LI. From this finding, it indicates that the share of total deposits has a significant role in efficiency and competition although the signs of coefficient are different. More specifically, TDTA is recorded to have a negative impact on the efficiency in Table 9 for CB and negative influences on competition in Table 10. In other words, higher shares of total deposits lead to lower efficiency and competition in the conventional banking sector in QISMUT. Following variables such as TLTA and EQTA in Table 10 (CB), both variables were found positive and significant on LI. It reflects that share of total loans and capitalization in CB have a negative influence on competition. Conventional banks in QISMUT that recorded higher share of total loans and were well-capitalized tend to increase the market power and shares. Hence, the competition in conventional banking in QISMUT is reduced. Meanwhile for IB, TDTA and TLTA recorded significant on the efficiency whilst only TDTA was found significant on the competition. As or IB, total share of deposits was found negative and significant on efficiency meanwhile share of total loans recorded positive. Based on these results, in order to achieve efficiency, Islamic banks have to increase the share of their total loans and reduce the shares of total deposits. In addition, increasing the total deposits also can lead to lower competition, based on results of IB in Table 10. It indicates that dominant Islamic banks may record the highest share of total deposits as it can exercise their market power in the banking sector.

The regression results of all banks in Table 9 and Table 10 recorded that banks-specific variables such as TDTA and TLTA have significant impact on the efficiency and competition. More specifically, banks in QISMUT that recorded a high share of total loans and low share of total deposits improve the efficiency. As for the competition, high share of total deposits and low share of total loans owned by the banks in QISMUT lead to a concentrated market (less competition). It proves that banks that own the highest deposits are dominant banks and cause the banking sector in QISMUT to become concentrated. Based on the regression results, the relationship of efficiency and competition are significant in the conventional banking sector in QISMUT. As for Islamic banking sector, the insignificant result shows that there is an insignificant impact between efficiency and competition. The results consistent with with Apergis and Polemis (2016), Ab-Rahim (2016), Andries and Capraru (2012), Ningaye *et al*. (2014) and Ajisafe and Akinlo (2014) for conventional banking in QISMUT. Besides, this study does not support 'Quiet Life Hypothesis' by Hicks (1935) and also previous studies by Casu and Girardone (2009) which stated that firms that have market power would lead to inefficiency of the firms. However, it was not found that there is a relationship of competition on efficiency as shown in Table 9 and the results in line with Fungacova and Weill (2012) where the authors do not find the relationship between two variables. Furthermore, in this study, we also examine the efficiency and competition of conventional and Islamic banks in QISMUT by using DEA and LI. It was found that Islamic banks are likely to score higher efficiency scores than conventional. As for competition, the finding indicates the Islamic banking sector faced higher competition than conventional.

4. Conclusion

This study contributes to the new evidence of QISMUT banking sector regards on efficiency, competition and the impact of banks-specific variables. Due to the excellent performance of the Islamic banking sector in QISMUT, our study examines the competition and efficiency for both banking sectors. It was found that the competition in QISMUT is not affected by the performance (efficiency) of the banks as we expect that competition could influence the efficiency of the banks and vice-versa. Based on our findings, we found that the significant relationship between efficiency and competition only occurs in the conventional banking sector. The insignificant relationship between efficiency and competition may be due to factors such as government support and assistance which we did not include in the regression.

This might be our limitation of the study. The policymakers in QISMUT should monitor both banking sectors as they efficiently have a significant role in competition. Excessive competition may contribute to financial stability or instability.

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