“Digital banking impact on Turkish deposit banks performance”

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DIGITAL BANKING IMPACT ON TURKISH DEPOSIT BANKS PERFORMANCE

Abstract

The technological developments in the banking sector have significant implications for banks and are dramatically changing the way retail banks conduct their business. Banks can invest in digital banking (DB) services either to acquire a strategic advantage or because doing so has become a strategic necessity. This study is organized to examine if DB service channels have any positive or negative impact on Turkish deposit banks' performance. With this aim in mind, in the first stage of the proposed DEA model, physical assets are used. Then, in the second stage, DB service channels are added to see if they have any impact on banks' performance. The results show that the banks are investing in DB services just to keep the competition as it is. In other words, they invest in DB services as a strategic necessity. DB services do not provide any strategic advantage to any banks in terms of financial performance or efficiency since the banks are already efficient. Investing in DB only helped to preserve their strategic positions. The Turkish deposit banking industry is very competitive and very profitable, and it is necessary to invest in DB services just to keep the competition as it is.

Keywords digital banking, bank performance, strategic advantage, competitive advantage, strategic necessity

JEL Classification G21, L21, L25, O33

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INTRODUCTION

The technological developments in the banking sector, digital banking (DB) in particular, have significant implications for banks and are dramatically changing the way retail banks are conducting their business. Over the last decade DB has had a major impact on customer interfaces. The speed of change has increased because of the introduction of new technologies and evolution of customer needs. Telephone, Internet and mobile banking have become major ways of delivering multi and even omni-digital channel DB services to customers, a shift that is challenging traditional banking services (Cortiñas, Chocarro, & Villanueva, 2010). DB enables customers to conduct banking transactions anytime and anywhere, faster and with lower fees, therefore it is more attractive for customers compared to traditional banking services (Sayar & Wolfe, 2007). Despite the fact that DB has important and valuable advantages for customers, they have embraced DB services to different degrees. Nevertheless, more and more basic banking transactions are shifting from physical channels to digital channels, leading to a major transformation of banks' strategic positions. Most banking institutions invest in IT to improve delivery of financial services on digital channels to keep pace with global competition.

All DB services have distinct advantages to both customers and banks in terms of providing convenience, innovation, accessibility and user friendly platforms, saving time and money, lowering transaction costs, supporting customer relations, increasing and keeping a profitable

customer base, expanding the market share, decreasing the dependence on traditional banking services and branches, and responding quickly and more accurately to the customer's constantly changing needs and expectations.

As customers' behaviors and needs change and expectations increase, preserving the current ones and gaining new ones at the same time as increasing profitability and decreasing costs becomes key, especially in a highly competitive and almost zero (even negative) interest rate global environment. In this regard, DB enables banks to improve services for changing customer needs, minimize costs by reducing physical transactions with customers in branches, reduce the gap between customer expectations and delivered services (Japparova & Rupeika-Apoga, 2017), boost customer loyalty and satisfaction and generate revenue from different consumer segments.

The adoption of information technology (IT) in the banking sector has significantly changed the banking structure from the traditional banking system to the digital banking system. Advances in IT have been the driving force of DB services for banks over the years. Advances in IT can affect the firms in two ways. First, by investing in IT, firms can extend their business models, improve their business processes, efficiency and effectiveness, and increase customer satisfaction. In this way they can acquire competitive and strategic advantage by investing in IT. In this first way firms invest in IT deliberately and proactively to gain strategic and competitive advantage. Goh and Kauffman (2013) define this view as the strategic advantage perspective. Second, firms are forced to invest in IT by their competitors. As technology becomes pervasive and more accessible, sustaining any strategic and competitive advantage becomes a challenge. While competitors move rapidly to invest in IT, which enables them to gain a competitive advantage, some of the firms can face sustained disadvantages in changing environments. Goh and Kauffman (2013) define this view as strategic necessity. Since the market conditions force the firms to invest in IT, in this case the firms are passive and reactive to the environmental conditions. They have to invest in IT because the market conditions force them to. If they don't invest in IT as their competitors do, they can lose their market share, their current customer base and their opportunity to gain new customers. In the first alternative, the firms who invest in IT define the market conditions. If they invest in the appropriate technologies, which give them strategic advantage, they are the winners in terms of customer satisfaction, market share and financial performance. Whatever the reason behind the IT investment, in both cases, banks are trying either to gain the strategic advantage or strategically to sustain their position by investing in DB services. But what would be the impact on the performance or efficiency of the bank? Is it always profitable? Is it always efficient? In this study, DB services impact on banks' performance and efficiency is analyzed. Whatever the reason for adopting DB services, it is essential to look at the impact on bank performance and efficiency. There is a large volume of research into bank performance but much less on the impact of DB services on performance. Despite the importance of measuring bank performance based on the DB strategy, there is not enough empirical research on this issue. Thus, this paper offers a new perspective on measuring bank performance by using Data Envelopment Analysis (DEA) in terms of DB services and is providing a new insight into this issue in terms of theoretical and practical results.

1. LITERATURE REVIEW AND THEORETICAL FRAMEWORK

The use of technology in DB and its impact on meeting customer needs, increasing operational efficiency and financial performance can be understood by taking into account different factors such as: customers' perception about user friendliness and easy use, user interface quality, and Internet and mobile banking service quality (Mbama & Ezepue, 2018).

Some research shows that adoption of online banking technologies is a significant strategic choice for banks' competitive position, since a wider range of online banking services plays a crucial role to

influence the financial performance of a bank by providing more profit than for those with a limited online access (Acharya, Kagan, & Lingam, 2008; Akhigbe & McNulty, 2003; DeYoung, Lang, & Nolle, 2007; Sayar & Wolfe, 2007).

Goh and Kauffman (2013) argue that there are two reasons for IT investments: strategic advantage and strategic necessity. In their case of the US commercial banking industry, strategic necessity affects significantly IT investments and is more critical than strategic advantage. Their research indicates that (Goh & Kauffman, 2013):

- Banks that have IT investments in Internet banking likely have better performance.
- IT investments are affected by bank transaction cost and consumer deposits.
- IT investments that materialized to gain strategic advantage seem to have been diminishing over the years, whereas IT investments as a strategic necessity seem to have been increasing.

DeYoung (2005) mentions that Internet-only banking success primarily depends on attaining necessary economies of scale and having necessary skills to implement management processes. However, some of the studies demonstrate that online banking as an alternative channel of banking services has a favorable impact on retail banking performance (Acharya et al., 2008; DeYoung et al., 2007).

Mbama and Ezepue (2018) analyzed the relations between DB, customer experience and bank financial performance in the UK. To their findings, quality of service and functions, value perception, risk and usability perception and employee-customer relations are the determinants of customer experience in DB. They also found that customer loyalty has a favorable impact on financial performance of UK banks and customer experience, satisfaction and loyalty are all significantly related (Mbama & Ezepue, 2018).

The potential for increasing profitability by satisfying customer expectations and decreasing related costs is the primary driving force behind new information technology adoption and online digital services offerings by community banks (Acharya et al. 2008; Chau & Lai, 2003; DeYoung et al., 2007).

It is vital to understand the channel preferences of the customers. Some of them prefer using a single channel. They use only one channel at a time, e.g. Branch or ATM or Internet banking. Others prefer a multi-channel approach. Some of them use more than one channel, e.g. Internet banking, call center, ATM and branches, etc. Therefore, banks are challenged to integrate all banking services into an omni-channel which is a multi-channel approach that seeks to provide the customer with seamless banking services whether the customer is banking from a PC or mobile device, or ATM, or in a branch, so that customers experience the same level of service regardless of how they are interacting with their banks. Thus, understanding this behavior and integrating all banking services channels consistently not only provide a strategic advantage but also are a competitive necessity for banks to understand customer cross-channel transaction behavior, provide a more robust and consistent customer experience, and manage channels effectively (Liu, 2016).

There are several different studies of the Turkish Banking Industry's financial performance both on a macro and micro level. Some of the papers focus on individual banks (Atan, 2003; Atan & Catalbas, 2005; Çukur, 2005; Kahveci, Celen, & Ekşi, 2013; Kahveci, Ekşi, & Kaya, 2016), while some of them focus on a bank as an industry (İskenderoğlu, Karadeniz, & Atioğlu, 2012; Toraman, Ata, & Buğan, 2015; Tunay & Silpar, 2006).

On the other hand, considerable research has been devoted to using DEA to measure the performance of banks (Çolak & Altan, 2002; Çukur, 2005; Kahveci, 2011; Kisielewska, Guzowska, Nellis, & Zarzecki, 2005), and the performance of individual bank branches (Paradi, Rouatt, & Zhu, 2011; Paradi & Schaffnit, 2004; Sherman & Zhu, 2009; Yavas & Fisher, 2005). Therefore, in this article, we have chosen DEA in order to evaluate the impact of DB on banks' performance and efficiency.

Table 1. The banks' main variables

Source: Authors' calculation. Data from TBA.

Banks	Total assets	Total deposits	Total capital	Net profit	Number of branches	Number of employees
	(Million TL)				(Quantity)	(Quantity)
Türkiye Cumhuriyeti Ziraat Bankası A.Ş.	434,275	266,384	47,010	7,940	1,781	24,554
Türkiye İş Bankası A.Ş.	362,353	203,752	43,093	5,308	1,364	24,868
Türkiye Garanti Bankası A.Ş.	325,232	181,116	41,331	6,344	945	18,850
Akbank T.A.Ş.	316,031	184,904	40,425	6,039	801	13,884
Türkiye Halk Bankası A.Ş.	305,351	193,227	25,377	3,725	969	17,851
Yapı ve Kredi Bankası A.Ş.	297,810	169,347	30,098	3,614	866	17,944
QNB Finansbank A.Ş.	125,857	67,641	12,155	1,603	580	12,007
Total	2,166,908	1,266,372	239,489	34,574	7,306	129,958
Industry total	3,095,039	1,713,185	345,031	47,083	10,550	193,504
Ratio (Total/Industry total)	70%	74%	69%	73%	69%	67%

2. METHODS

The aim of this article is to analyze the effects of digital banking services on banks' performance and efficiency by using DEA as an analytical tool. DEA can be employed to analyze relative efficiency of organizations and/or parts of organizations that are similar in terms of their resources and their results. Multiple inputs and multiple outputs can be utilized for efficiency calculation.

In this regard seven deposit banks in Turkey have been chosen. The deposit banks' second hand data and annual reports were obtained from their web sites and from the Turkish Banks Association (TBA) web site. The seven deposit banks and their main variables are shown in Table 1. As shown, these seven deposit banks make up 70% of assets, 74% of deposits and 73% of net profits of the total banking industry in Turkey.

3. THE MODEL AND SELECTION OF INPUTS AND OUTPUTS

The output variables are related to the banks' service and revenue, while the input variables measure the banks' operating costs. In order to evaluate deposit banks' performance, used models are shown in Figure 1 and Figure 2. In the first model, three inputs that relate to costs and physical banking: total assets (Nath, Nachiappan, & Ramanathan, 2010; Samad & Patwary, 2003; Ulucan, 2000, 2002; Zhu, 2000), number of employees (Kahveci, 2011; Samad & Patwary, 2003; Ulucan, 2000, 2002; Yavas & Fisher, 2005; Zhu, 2000) and number of branches (Soteriou & Zenibs, 1999) in 2017; four outputs that relate to service and revenue: assets growth rate, total deposits, total credits (Kahveci et al., 2013); and net profit, in 2017 are used. Then, in

Figure 1. First stage DEA model

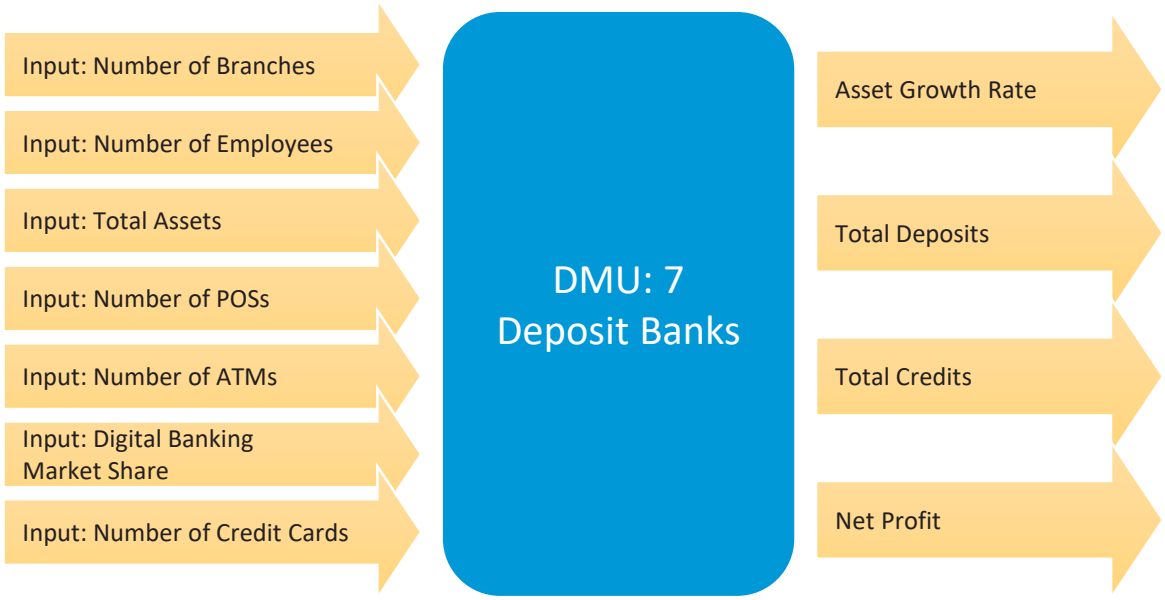

Figure 2. Second stage DEA model

the second stage, DB service channel variables, which are digital banking market share, number of credit cards, number of ATMs (Thanassoulis, 1999), and number of POSs, are included in calculations as inputs. Obtained first and second stage results are then analyzed to measure to what extent DB service channels affect banks' performance. Therefore, it has been evaluated how the DB services have impact on the bank's efficiency scores. Efficiency calculations are made by both MaxDEA and DEA-Solver LV software. Statistics on input and output data is given in Table 2.

4. RESULTS

4.1. Banking industry in Turkey

The banking industry is a major part of the financial system in Turkey, accounting for 82% of total assets. Deposit banks have 91% of all bank employees and 90% of all banks total assets as of December 2017. There are 33 deposit banks in Turkey, nine of them are privately owned, three state-owned, one bank is under the deposit insurance fund and 20 foreign banks, according to the Turkish Banks Association (TBA).

Table 2. Statistics on input and output data

Statistics	Number of Branches	Number of Employees	Total Assets (Million TL)	Number of POSs	Number of ATMs	Digital Banking Market Share, %	Number of Credit Cards	Asset Growth Rate, %	Total Deposits (Million TL)	Total Credits (Million TL)	Net Profit (Million TL)
Max	1,781	24,868	434,275	670,259	7,085	17.84	11,100,000	31.83	266,384	298,258	7,940
Min	580	11,854	125,857	112,000	2,817	4.79	524,554	14.36	67,641	82,672	1,603
Average	1,036	18,544	309,559	411,220	4,868	12.35	631,6679	20.27	180,910	211,178	4,939
SD	371	4,528	86,628	175,382	1,383	4.63	3,325,857	5.62	54,718	63,485	1,952

Banking services in Turkey were mainly delivered in branches until 1987. Turkey Is Bank, Turkey's largest private bank, was the first bank to introduce digital (electronic) banking in Turkey in 1987 by establishing automatic teller machines (ATM) and Internet banking services in 1997, followed by Garanti Bank the same year (Polatoglu & Ekin, 2001). Since 1997, digital banking services in Turkey have been increasingly becoming part of everyday life. Internet banking and ATMs were the main digital banking services at the beginning of the 2000s, and then call centers were added to the digital banking services portfolio. After 2011, mobile applications emerged as a means of digital banking. All these digital options offer different interfaces and choices to customers.

These technological advances and adoption of DB services have shifted the banking industry's historical reliance on branches. As a result, the number of ATMs and POSs, call center employees and Internet and digital banking services has been increasing. On the other hand, the number of bank branches where conventional banking transactions are conducted is either decreasing or at least not increasing at the pace of DB services. Over the years, ATMs, POSs, Internet banking, call centers and mobile applications became a major part of all banking services, and total customers actively using digital banking services reached 35 million as of December 2017. Although, average credits per branch and per population, and average deposits per branch and per population have been constantly increasing over the years (Table 3), average population per branch and average population per bank employee have been pretty much same or decreased over the years. This means that banks have generated new channels (called alternative distribution channels) to offer new products to

Table 3. Turkish deposit banks main variables

Source: Data from TBA's website.

Variables	2010	2011	2012	2013	2014	2015	2016	2017
Number of Branches	9,400	9,760	10,158	10,942	11,142	11,113	10,781	10,550
Number of Employees	178,503	180,777	186,098	197,465	200,886	201,205	196,699	193,504
Number of Call Center Employees	6,508	6,775	7,520	8,007	7,961	8,398	8,971	9,303
Number of ATMs	26,692	30,328	33,374	38,303	41,695	43,755	44,547	45,970
Number of POSs	2,102,585	2,224,032	2,441,597	2,443,514	2,611,571	2,481,688	2,499,320	2,169,471
Number of Member Firms	1,698,510	1,898,431	2,044,851	2,232,009	2,402,150	2,605,680	2,553,167	2,449,900
Average Population per ATM	2,778	2,464	2,279	2,012	1,874	1,809	1,805	1,758
Average Population per Employee	413	413	406	388	387	391	409	418
Average Population per Branch	7,843	7,656	7,445	7,007	6,973	7,085	7,459	7,660
Average Credits per Branch (Thousand TL)	47,928	62,079	70,967	87,592	103,397	124,623	151,609	195,236
Average Deposits per Branch (Thousand TL)	59,521	66,720	71,294	80,618	89,219	105,503	129,698	162,387
Average Deposits per Population (TL)	7,589	8,714	9,576	11,506	12,795	14,890	17,389	21,200
Average Credits per Population (TL)	6,111	8,108	9,532	12,501	14,828	17,588	20,327	25,489
Active Internet Banking Customers	6,693,832	8,606,145	10,551,764	12,435,952	14,315,056	17,420,451	20,398,627	13,125,178
Active Mobile Banking Customesr	–	445,723	1,375,634	3,227,096	6,711,360	12,164,368	19,217,598	29,541,221

meet the customer needs by DB services other than branches. Banks shift their operations from conventional branches to DB services.

When we look at Table 1, it is evident that the number of ATMs, call center employees and active Internet and mobile banking customers have been constantly increasing. However, there was a very significant change in 2017: while active Internet banking customers decreased sharply by 35%, active mobile banking customers increased rapidly by 54%. Constantly increasing active Internet banking customers over the years are shifting to active mobile banking customers. Thus it is worth examining the issue and searching for what DB services impact would be on banks' performance and efficiency.

4.2. Analysis of DEA scores

Firstly, calculations are made for the first stage model by using banks' physical assets, number of employees, number of branches and total assets of 2017 as input; and asset growth rate, total deposits, total credits, and net profit of 2017 as output. Then, DB service channels, number of POSs, number of credit cards, number of ATMs and digital banking market share are included in the model as inputs, and efficiency scores are recalculated for the second stage model. Therefore, adding DB service channels to the model allows to determine how and to what extent DB service channels affect banks' efficiency scores.

There are two traditional DEA models; first one is input oriented, second one is output oriented. The input oriented model aims to minimize inputs while keeping the same outputs level, on the other hand, the output oriented model aims to maximize outputs while keeping the same inputs level. In this study, the output oriented model is the most appropriate one since the main aim of the bank is to maximize deposits and credits and so profit (Kahveci, 2011, 2012).

Although, the Constant Returns to Scale (CRS) model, suggested by Charnes, Cooper, and Rhodes (1978), is used for technical efficiency, the Variable Returns to Scale (VRS) model, suggested by Banker, Charnes, and Cooper (1984), is used for pure technical efficiency. An organization's performance defined by technical efficiency is described by maximizing the produced level of outputs at the given input level (Farrell, 1957). The technical efficiency (CRS) score for a Decision Making Unit (DMU) shows relative performance of particular DMU compared to all other DMUs in that particular sample. However, scale efficiency (SE) expresses whether an organization is operating at its optimal size. The relation between technical efficiency and pure technical efficiency is defined by the equation below (Kahveci, 2011, 2012; Ulucan, 2002).

$$\mathrm{CRS} = VRS \times SE. \quad (1)$$

All the results for the first and second stage models are given in Table 4. When the results are analyzed, almost all the banks are efficient except Türkiye İş Bankası A.Ş. (Isbank) and Yapı ve Kredi Bankası A.Ş. (YKB) in both stages. It is interpreted that they are not efficient in terms of physical service channels and digital service channels. Although both banks are not efficient, they have over 0.9 in

Table 4. Efficiency scores of DMUs in both stages

DMU	First stage			Second stage		
	Technical Efficiency Score (CRS)	Pure Technical Efficiency Score (VRS)	Scale Efficiency (SE) Score	Technical Efficiency Score (CRS)	Pure Technical Efficiency Score (VRS)	Scale Efficiency (SE) Score
Türkiye Cumhuriyeti Ziraat Bankası A.Ş.	1.00	1.00	1.00	1.00	1.00	1.00
Türkiye İş Bankası A.Ş.	0.91	0.93	0.98	0.91	0.91	1.00
Türkiye Garanti Bankası A.Ş.	1.00	1.00	1.00	1.00	1.00	1.00
Akbank T.A.Ş.	1.00	1.00	1.00	1.00	1.00	1.00
Türkiye Halk Bankası A.Ş.	1.00	1.00	1.00	1.00	1.00	1.00
Yapı ve Kredi Bankası A.Ş.	0.93	0.95	0.98	0.94	0.95	0.99
QNB Finansbank A.Ş.	1.00	1.00	1.00	1.00	1.00	1.00

scores in both stages, it means that they are also very close to the efficient frontier. YKB and Isbank are not efficient in the first stage. They would improve their efficiency and they would be efficient in the second stage with DB services, but their DB services did not provide the necessary means for efficiency, yet. On the other hand, five other banks are efficient in both stages; they are all efficient in terms of physical service channels and digital service channels. Although Isbank is not efficient in terms of CRS and VRS scores in both stages, it has scale efficiency in the second stage. On the other hand, the other five banks have also scale efficiency where YKB does not have scale efficiency at either stage.

CONCLUSION

This study is organized to examine if DB service channels have any positive or negative impact on Turkish deposit banks' performance. To the end, in the first stage of the proposed DEA model, physical assets were just used. Then, in the second stage, DB service channels were added to the model to evaluate if they have any impact on banks' performance. In both stages all banks are efficient except two, Isbank and YKB. In other words, with or without DB service channels the five banks are efficient and two banks are not efficient. It can be concluded that the five efficient banks have competitive advantage in terms of physical and DB service channels. These five banks invest enough in DB services to keep their high performance. In other words, if they had not invested in DB as they did, their efficiency would be affected negatively and in the second stage they could not be efficient. The banks are investing in DB services just to keep the competition position as it is. It can be concluded that they invest in DB services as a strategic necessity. DB services do not provide any strategic advantage to any banks in terms of financial performance or efficiency. By investing in DB as they did, they have preserved their strategic advantage. Although YKB and Isbank are not efficient in either stage, they have a high score of over 0.9. They can make some improvements by arranging their assets to their outputs. They have to focus on both physical and digital service channels and to transform their resources to the desired results. In terms of scale efficiency, YKB has to look into the right scale in accordance with its inputs and outputs in both stages whereas Isbank does not have scale efficiency in the first stage without DB services, but in the second stage, with DB services it does have scale efficiency. The other five banks also have scale efficiency, so they do not need any scale arrangements.

Banks could invest in IT for DB services with two main concerns. The first one is saving costs and the second one is satisfying customer experiences and expectations. A successful transformation process should be both cost saving and satisfactory for customers. Either focusing solely on cost saving rather than customer satisfaction or solely on customer satisfaction rather than cost saving could be disastrous for the banks. In the first case, banks can invest in cost saving technologies that do not meet customer needs. In the second case, they can invest in customer satisfactory technologies that are not profitable or are costly. In both cases it results in non-efficient investments and the financial performance of banks can be negatively affected. In Turkish deposit banks' case, the two stages of DEA scores show that DB service channels do not have any negative or positive impact on banks' performance and efficiency. But, overall, the Turkish deposit banks examined in this research are highly efficient in terms of physical channels and DB channels since they are efficient in both stages. If the banks continue to invest in DB services in the same way as in the past they will keep their position and their efficiency. Isbank and YKB can increase efficiency by arranging DB services.

The Turkish deposit banking industry is very competitive and it is necessary to invest in DB services just to keep the competition as it is. It could be concluded that in the Turkish case investing in DB services is just a strategic necessity since the competition is fierce. The banking industry is already profitable and all banks in this study have a good amount of profit. That is why almost all of them are efficient in both stages. When we look at the capital/profit ratio, the average ratio of all seven banks is 14%, whereas YKB and Isbank have a 12% capital/profit ratio, lower than the other five banks. Thus, this also explains why

those two banks are not efficient compared to the others.

Despite the importance of measuring bank performance based on the DB strategy, there is not enough empirical research on this issue. Thus, this paper gives a new perspective on measuring bank performance by using DEA in terms of DB services. For further research, with more detailed DB data, banks' past performance could be compared and how well developed their DB performance was over time could be analyzed. Besides, Turkish banks' DB applications and strategies can be compared with other countries' banks, thus international comparisons could also be made by using the suggested DEA model.

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