WHY BANKS ADOPT MOBILE BANKING: THE CASE OF TURKEY

YASEMİN EZGİ ÖZTAŞ

BOĞAZİÇİ UNIVERSITY

2018

WHY BANKS ADOPT MOBILE BANKING: THE CASE OF TURKEY

Thesis submitted to the

Institute for Graduate Studies in Social Sciences

in partial fulfillment of the requirements for the degree of

Master of Arts

in

Management Information Systems

by

Yasemin Ezgi Öztaş

Boğaziçi University

2018

DECLARATION OF ORIGINALITY

I, Yasemin Ezgi Öztaş, certify that

- I am the sole author of this thesis and that I have fully acknowledged and documented in my thesis all sources of ideas and words, including digital resources, which have been produced or published by another person or institution;
- this thesis contains no material that has been submitted or accepted for a degree or diploma in any other educational institution;
- this is a true copy of the thesis approved by my advisor and thesis committee at Boğaziçi University, including final revisions required by them.

Signature .....

Date 04.07.2018

ABSTRACT

Why Banks Adopt Mobile Banking: The Case of Turkey

Majority of literature on e- banking (electronic banking) has conducted studies on internet banking adoption either by banks or by customers. Mobile banking differs from internet bankingbecause it is available free of location and hence enables access to financial services anytime anywhere. However, why banks adopt mobile over and above internet banking has been neglected so far. This study investigates the determinants of mobile banking adoption from banks' perspective. Using a sample of 14 retail banks from Turkey, we show that banks adopt mobile banking when the proportion of loans to assets increases and when profitability decreases. Larger, private and local banks are more likely to adopt mobile banking while mobile banking complements the branch network of the banks.

ÖZET

Bankalar Neden Mobil Bankacılığı Kabul Ediyor: Türkiye Örneği

Elektronik bankacılık ile ilgili literatürün çoğu, bankalar veya müşteriler tarafından internet bankacılığının benimsenmesine odaklanmıştır. Mobil bankacılık, finansal hizmetlere her an her yerden erişime olanak sağlayabilmesi sebebi ile internet bankacılığından farklıdır. Bununla birlikte, bankaların internet bankacılığı sonrası, mobil bankacılığı neden benimsedikleri ve uyum sağladıkları bugüne kadar gözardı edilmiştir. Bu çalışma, mobil bankacılığın benimsenmesinin belirleyicilerini bankaların bakış açısıyla incelemektedir. İlgili çalışmada, Türkiye'den 14 perakende bankasından oluşan bir örneklem seti kullanılmıştır. Bankaların kredilerinin aktiflere oranı arttıkça ve karlılık düştükçe bankaların mobil bankacılığa daha kolay uyum sağladığı görülmüştür. Ek olarak, mobil bankacılık, bankaların şube ağına tamamlayıcı bir bileşen olarak eklenirken; büyük, özel ve yerel bankalar da mobil bankacılığa daha kolay uyum sağlamaktadır.

ACKNOWLEDGEMENTS

I really appreciate my thesis advisor Assoc. Prof. CeylanOnay's continuous support and positive feedbackduring my thesis. I am also thankful to my jury memberAssoc. Prof. Gökhan Aydın. I cannot forget the contributions and positive feedback and support of Prof. Aslıhan Nasır to my thesis.

This thesis is dedicated to my family for their encouragement, endless trust in me and understanding. I feel so grateful to my family for their unconditional love and support. It was with their faith in me that I gained the ability to welcome new challenges. I also give special thanks to my close friends for being there for me at all times. Finally, Iwould like to thank all my colleagues for their support.

TABLE OF CONTENTS

LIST OF TABLES

DEFINITIONS

Listed	Listed dummy equals one if the bank is listed on the local stock exchange and zero otherwise.
Foreign	Foreign dummy equals one if the bank is foreign owned and zero otherwise. (We define a bank as foreign if the share of the foreign ownership exceeds 50.01% following IFRS standards.)
Large	Large dummy equals one if the bank is bank's total assets are in the fourth quartile within the sample and zero otherwise.
Private	Private dummy equals one if the bank is private owned and zero otherwise.
Logbranch	Log of number of branches per year.
Depositta	Depositta is the ratio of total deposits to total assets.
Loansta	Loansta is the ratio of total loans to total assets.
Nonperfta	Nonperfta is the ratio of total non-performing loans to total loans.
Roa	Return on Assets calculated as Net Profit/Period Average Total Assets.
Intinc	Interest Income calculated as Total InterestIncome/Total Assets.
Nonintinc	Non-Interest Income calculated as TotalNon-Interest Income/Total Non-Interest Expense.
Mobile Dummy	Mobile dummy is dummy variable defined in terms of the time of adoption of mobile banking.
Internet Dummy	Internet dummy is dummy variable defined in terms of the time of adoption of a transactional website.
Crisis	Crisis dummy equals 1 if there is a systematic banking crisis and zero otherwise.
Market Share	Market Share is the ratio of total asset of a bank to total assets of all banks within a given year.

CHAPTER 1

INTRODUCTION

Financial institutions are profit-seeking enterprises that try to maximize revenues and reduce their cost of production simultaneously. However, competition in financial services is fiercer than ever due to information technologies that bring increased transparency; lower switching costs and higher disintermediation(Claessens et al., 2013;Claessens et al., 2001). We see disappearance of boundaries between banks and ICTcompanies, emergence of start-ups that enable peer-to-peer lending, and new payment infrastructures such as blockchain technology that challenge the value proposition banks deliver. Compared to banks these new financial services providers are much less regulated and far more flexible. These developments point out to higher competition for not only retaining the existing customer base but also for protecting the margins. Banks are challenged to create new revenue sources such as service fees and commissions(Adizes, 2013).Hence, importance of creating value-added services that leverage information technology becomes even more important(Wonglimpiyarat, 2014).

Developments and innovations in information technologies have affected all sectors including the banking sector. Information Technologies provides banks an opportunity to support and enhance the relationships with their customers through cross-selling of customized products anddelivery of innovative services (Anderson, 2006). Intense competition have leadbanks to focus on increasing customer satisfaction. Accordingly banks have diversified into digital banking services and aim to produce solutions that provide their customers fastest and most convenient access to their services.Across the developed and developing nations, branch banking

has left its place to online and mobile banking(Demirel, 2017).Mobile banking should be considered as a better digital alternative to the other traditional banking channels such as ATMs, physical branches and internet banking. In this regard, mobile banking represents the next step of financial institutions towards providing new services to customers and seizing technological opportunities in terms of new business models (Riquelme & Rios, 2010). To our knowledge, this is the first study to explain the factors that affect financial institutions' decisions to adopt mobile banking particularly in an emerging economy. Penetration of mobile banking has been fast and new technology penetrates even faster in emerging economies due to leapfrog effect (Claessens et al., 2001; Ratten, 2011). However, studieson electronic banking mostly focused on online/internet banking, while research on mobile banking is relatively less and receive underrated attention (Laukkanen & Pasanen, 2008; Puschel et al. 2010; Suoranta & Mattila, 2004).

Previous research shows that internet banking adoption enables banks to decrease operating expenses while increasing profitability and productivity(Chang-Soo & Davidson, 2004; Ciciretti et al., 2009; DeYoung, 2007; Hernando & Nieto, 2007; Onay and Ozsoz, 2013). Yet, mobile banking is different than internet banking and banks continue to invest in mobile banking over and above internet banking channel. Mobility is the most noteworthy difference of mobile from internet banking as it enables customers to interact with their banks regardless of time or location, and to access details of their financial transactions whenever and wherever necessary (Laukkanen, 2007;Suoranta & Mattila, 2004). Furthermore, transactions carried out via mobile are more cost-effective as they involve less time and fewer people (Laukkanen & Lauronen, 2005). However, the academic research on mobile banking is limited to adoption literature, which focuses on customers'

decision making and neglects banks' decision making. Why banks adopt mobile banking is the question we address in this study.What does mobile banking promise? What are the main drivers of adoption?

In thisstudy, we follow a similar strategy toFurst et al. (2002),Singh (2007), Dandapani, (2017)and Hernández-Murillo (2010), who analyze internet banking adoption determinants of banks.Our research is novel as it focuses on mobile banking adoption over and above the internet banking channel. We use 14 retail banks as a sample over a period of 20 years from 1995 to 2014.We show that the level of deposits, the level of loans, profitability, particularly interest income, and market share are the main determinants of mobile banking adoption. Banks adopt mobile astheir deposits and loans increase and as their profitability, interest income and market share decrease. Banks utilize mobile for better asset & liability management and for generating new sources of income and expanding their customer base. We alsoconsider the impact of bank characteristics such as size, ownership and capital structure on banks' decision making and find that probability to adopt mobile banking is higher for large, unlisted, private and local banks. Finally, we find that as branching intensity increases, banks' probability to adopt mobile also increases suggesting complementary effects. Our results remain robust to alternative definitions of mobile banking adoption and various empirical estimations.

We contribute to several literature streams. First of all, we contribute to the electronic banking literature by showing that banks use mobile strategically to deliver value-added products/services to their customers both on asset and liability management as well as achieving operational efficiencies. We contribute to the debate on the impact of ICT on competitionby showingthat banks use mobile banking to generate new revenue sourcesin response to depressed interest margins

(Claessens et al., 2002). Finally, we contribute to financial inclusion literature by showing thatbanks adopt mobile to extend their market share (Demirguc-Kunt&Klapper, 2012; Bose, 2016; Klein, 2011).

The thesis is organized as follows:Chapter II provides the literature review and Chapter III provideshypothesis development. Chapter IVbriefly describes development of internet and mobile banking in Turkey. Chapter V introduces the datawhileChapter VIpresentsthe research design.Chapter VIIdiscusses the empirical findings whileChapter VIIIpresents robustness tests.Chapter 9 gives details related to limitations of the study and further research directions. Chapter Xconcludes our analysis with an overview of the main results.

CHAPTER 2

LITERATURE REVIEW

Penetration of the information technology in the banking sector had transformed banking activities into digitized already. Electronic banking with its two major components,Internet banking and mobile banking, has been the most striking innovations in the banking sector.Lin, (2010)states that "Mobile banking can perform account balances and transaction history inquiries, funds transfers, and bill payments via mobile devices such as cell phones, smartphones, and PDAs (personal 15 digital assistants)". Crabbe et al. (2009) defines mobile banking as "the ability to perform banking transactions online on portable mobile devices via Short Messaging Services (SMS) or Wireless Application Protocol (WAP)". Cruz et al. (2010) mentions about mobile banking as "the evolutionary step following the internet banking that provides services, like SMS banking, downloaded applications or direct access to online banking with fewer choices and restricted graphics."Luo (2010) defines mobile banking as an" innovative method for accessing banking services, where a customer interacts with a bank via a mobile device."While different authors make different definitions of mobile banking, all agree on and emphasis mobility as its foremost feature. On the other hand, 85% of mobile banking innovations come from developing economies and 50% of them are user-driven innovations (Oliveira & Von Hippel, 2011; Van der Boor et al., 2014).

Mobility is the most valued and differentiating feature of mobile banking over internet banking(Suoranta & Mattila, 2004). While internetbanking requires users to have access to a computer with internet access, mobile banking can be accessed via smartphones or tablets that are connected to the internet through mobile data

transmission or Wi-Fi hotspots (Riquelme & Rios, 2010; Zhou et al., 2010).Accordingly, mobile banking enables customers to be on the move and utilize their devices to perform the financial activities they need without the previous limits associated with traditional banking or internet banking. With mobile banking customers can check their account balance, transfer money, pay bills and make investments even faster than before independent of the time and place. The fast penetration of mobile devices combined with easier and cheaper access to internet, has alsocontributed to the high adoption rates of mobile banking by customers (Ratten, 2011).

In the meantime, visiting the traditional branches by financial services customers has become less important. Customers today are less loyal, more receptive to new electronic channels and more sophisticated in demanding better service quality including 24hour service availability (Coelho & Easingwood, 2003). While they value compatibility, perceived usefulness, and trust in their decision to adopt mobile banking (Hanafizadeh et al., 2014; Shaikh & Karjaluoto, 2015; Shaikh et al., 2015; Shih & Lin, 2015), they also perceive mobile banking as a competitive advantage that affects their decision to switch banks (Koenig-Lewis et al., 2010). The advantages of mobile banking are not limited to users of this service; it can be considerably profitable to the service providers and the society as well. Accordingly, mobile banking is important for banks in building relationships with customers to retain and develop their customer base (Belousova and Chichkanov, 2015) as well as to increase customer satisfaction and loyalty (Thakur, 2014).Customer loyalty and retention has gained importance over customer acquisition for long-term profitability as a new customer cost up to five times more than the cost of retaining an existing customer(Mittal & Lassar, 1998; Bansal, 2004). Furthermore, higher transparency

and lower switching costs has put pressure on the interest margins forcing banks to create new sources of non-interest income(Onay & Ozsoz, 2013).Technological improvements in the services provided by financial intermediaries help increase income and reduce costs in several ways: for example the non-interest income: By making more non-loan products available to customers through the computers/mobile phones to customers such as letters of credit and commercial paper and derivatives (Hakimi, Hamdi, & Djelassi, 2012). In fact, Mobile Banking provides banks with reduction in costs and improvement in non-interest income, as well as the efficiency across interactions with customers (Kundu and Datta, 2012). Banksproduce both traditional banking services and non-traditional financial servicesand started to earn noninterest income with that. They can extract fee income from customers willing to pay a "convenience premium" for doing their banking at ATMs or over the Internet. De Young and Rice (2004) found that relationship banking tends to generate increases in noninterest income and that some technological advances, for example cashless transactions, contribute to increased earnings from non-interest income. They posit that deregulation has fostered competition between banks and in response to these competitive threats and opportunities, many banks have embraced new technologies which has drastically altered their production and distribution strategies and resulted in large increases in non-interest income. According to the findings of De Young and Rice (2004), it is shown that large banks generate relatively more noninterest income, while well-managed banks rely less heavily on earnings from non-intermediation.

Mobile devices add value by enabling ubiquity, convenience, localization, and personalization (Clarke, 2001; Kuo & Chen, 2006). Accordingly, mobile banking has the potential to assist Customer Relationship Management (CRM) activities of the

banks, thereby encouraging more transactions while preventing users from switching to different service providers(Riivari, 2005). Today, many financial services organizations havestarted to become more customer oriented. A key component of many initiatives is the implementation of Customer Relationship Management software. The challenging business process in the financial services pressurized banks to introduce alternative delivery channels to attract customers and improve customers' perception. Many banks have started to implement Internet and mobile banking to provide their customers various online services with more convenience for accessing information and making transactions. Customer satisfaction and customer retention can be seen as key success factors in e-banking in the increasingly developing world(Bauer, Hammerschmidt, & Falk, 2005). Mobile banking can be tailoredto provide information and services in a suitable way to a specific user (Clarke, 2001). This featurecan improve customer relationship management, preventing users from switching to different service providers(Kuo& Chen, 2006). Mobile banking provides a direct marketing channel for their products and services, which can be customized to the specific needs of customers. Proactive functionality makes it possible forbanks tosend immediate and tailoredinformation (push) to the customer's mobile devices (Tiwari et al., 2006). For instance, banks can notify their customers when the account falls below a certain threshold. This feature brings the advantage of being up to date at all times without requesting information from a pull system. Localization through GPS technology offers new opportunities to determine the user's location and subsequently tailor and communicatebetter offers and services to customerssuch as the location of the closest ATM (Tiwari & Buse, 2007).

CHAPTER 3

HYPOTHESIS DEVELOPMENT

In order to understand mobile banking, which has improved delivery of financial services (Cruz et al., 2010) it is important to distinguish between mobile banking and Internet banking.There is a difference between these two significant technologies in their main customer segmentation (Dasgupta et al., 2011). Online Banking is used by customers through computer connected to Internet and Mobile Banking is used by customers through wireless devices (Riquelme& Rios 2010).The lack of mobility in the use of internet banking became a main concern for users as they had to use only local area network (LAN) or WI-FI connections to access internet banking. In addition they needed a personal computer (PC) like desktop or laptop to do their transactions. So the banks found there was still a need to enhance customer satisfaction by providing flexible services to customers whenever and wherever they want them(Rahmani, 2008).Mobile banking attempted to solve these issues by enabling customers to be on the move and utilize their devices to perform the financial activities they need without the previous limits associated with traditional banking or internet banking(Al-Qirim, 2007).Compared to online banking, mobile banking represents an extension with its major difference in the devices used to conduct banking tasks. Customers prefer internet-banking for basic banking services such as eft or utility payments, while they prefer and show a higher degree of satisfaction for mobile banking for value-added services (Kundu & Datta, 2012).

The value of customer relationship management has become apparent in this competitive era of technological innovation. Customer loyalty and customer retention has importance over customer acquisition as successful strategy in terms of

customer retention or enhancement ultimately leads to the profitability(Puschel, Mazzon, & Hernandez, 2010). Rapid development of information technology has made banking tasks more efficient and cheaper. Adoption of mobile banking has significant impact on reducing costs and facilitating change in retail banking (Laukkanen and Lauronen, 2005). As discussed by Kerem (2003:5) "being on mobile has allowed banks to cut costs on transactions, improve their image on the market, and respond better to the demands of the market. Banks have used their sites also successfully to promote and cross sell their new services and products among existing customers. Mobile banking also allows banks to collect additional and detailed information about their customers online without having to use printed questionnaires or interviews. The information collected can help banks to easily design new, customised products and services for their clients. Mobile banking makes it easier to facilitate for quick questions and answers(Simuchimba, 2012).Porteus (2006) and Ndung (2011) show that mobile banking has increased access to banking services while the transaction costs have been lowered for both banks and customers. This led to higher profitability.At the same time banks commission income increased as more customers preferred digital channels for their transactions(Aytar, Yeğen, & Erdemir, 2012).Accordingly, while Furst et al. (2002) and Ciciretti et al. (2009) find that more profitable banks adopt internet banking,we expect banks to adopt mobile as their profitability,particularlyas their interest income decreases to create new revenue sources via value-added services. We also expect banks to adoptmobile as the deposits increase tosurgecustomers'satisfaction and loyalty.

H_1: Lower the profitability, higher will be the likelihood to adopt mobile banking.

H_2: Lower the interest income, higher will be the likelihood to adopt mobile banking.

H_3: Higher the deposits, higher will be the likelihood to adopt mobile banking.

A bank's product mix can also affect the adoption of technological innovations as information technology may help create more customized products/services (Dandapani, 2017; Hannan & McDowell, 1984). Dandapani et al (2016) discuss that a higher proportion of consumer loans would increase likelihood of internet banking adoption as such loans would require more interaction with the consumers. With mobile banking, providers can expand their services portfolio and promote their brands. This helps them to increse their reputation, create strategic marketing differentiation and to attractnew customers. On the other hand, Hernandez-Murillo et al (2010) and Dow Jr. (2007) discuss that a higher ratio of loans to assets and a lower ratio of nonperforming loans imply better financial health and such banks are more likely to adopt internet banking.More recently, Cadena and Schoar (2011) showed that SMS/mobile application reminders have a reasonable impact on the repayment behaviour of borrowers.Particularly mobile enables banks to be more customer-driven by collecting information about customers' payment behaviour, update campaigns and deliver relevant offerings. Accordingly, mobile banking also has the potential to improve the asset side of the banks' balance sheet through improved customer relationship,design of customized products and services as well as better monitoring of risk. Thus, we hypothesize that banks would be more likely to adopt mobile banking as their loansand nonperforming loans increase.

H_4: Higher the loans, higher will be the likelihood to adopt mobile banking.

H_5: Higher the non-performing loans, higher will be the likelihood to adopt mobile banking.

Mobile banking also provides an opportunity for financial institutions to extend banking services to new customers (Lee et al., 2007). Porteous (2006)

deliberates that mobile banking could be additive to the existing retail channels or could be transformational if it reaches to unbanked segments. Anderson (2010) notes that mobile banking creates access to financial services for unbanked customers in the developing markets, particularly forpeople who live in rural areas, have already access to mobile phones and have greater familiarity and trust with mobile phone companies than formal banking institutions(Matos J. C., 2010). Furthermore, a mobile handset can easily be adapted to handle banking transactions(Wambari, 2009). According to Dasgupta et al. (2011), the emergence of mobile banking may be a good commercial opportunity for banks to provide their services to rural people who are unable to access the Internet. Also, having mobile phones instead of ATMs/branches for their banking services accessible at anytime and from anywhere also generates revenue through higher service usage and reduces operating expenses. The low cost of using remote banking services is an important reason for switching to mobile apps (Luarn, 2005). Cruz et al. (2010) and Dasgupta et al. (2011) suggest that mobile banking has great potential to provide reliable services to people living in remote areas where internet facility is limited. Additionally,higher competition forces banks to adopt internet banking to increase their penetration (Dandapani et al., 2016). The main reason for banks to invest money in mobile apps is that customers perceive mobile banking as a competitive advantage (Koenig-Lewis et al., 2010; Belousova & Chichkanov, 2015). Competitive banks haveimportant investments in adopting new technology in accordance with their business strategies(Anckar & D'Incau, 2002).Opportunities to keep existing customers and attract new ones encourage banks to use mobile devices to build relationships with customers (Belousova, Veronika and Chichkanov, Nikolay 2015). Delivering value-added services to customers is critical for obtaining a competitive edge in the mobile market by

strengthening relationships with customers (Wang et al. 2009).Anderson (2010) noted that "mobile banking has the potential to provide simple banking and electronic transaction services for non-banking customers in the development of markets."Mobile banking provides an opportunity for financial institutions to extend banking services to new customers so it helps increasing their market share (Lee, Lee and Kim, 2007).Accordingly, we expect banks to adopt mobile banking to increase their market share.

H_6: Lower the market share, higher will be the likelihood to adopt mobile banking.

Simpson (2002) states that mobile banking is used for cost minimization, nevertheless adopting technology-based innovation can be costly as institutions face high fixed costs for development of these technologies. Adopting technology-based innovation can be costly as institutions require a complete setup of computers, network coverage and skilled workers(Saleem & Rashid, 2011). Rogers and Sinkey (1999) suggests that "bank/firm size have a positive relationship with the level of non-traditional activities that larger banks are better equipped to use new technology."In this regard, large banks, who are more financially stronger and technically efficient, would be betterequippedtoadopt such new technologies (Drake & Hall, 2003; Hasan&Marton, 2003; James P. Dow, 2007; Miller &Noulas, 1996, Rogers & Sinkey,1999). The study of Drake and Hall (2003) provides empirical evidence on the existence of a strong relationship between bank size and technical efficiency and scale efficiency in Japan. Miller and Noulas (1996) arrived to establish a significant positive correlation between the size and pure technical efficiency of banks. The largest banks have appeared to be relatively more efficient technically in the study of Hasan and Marton (2003) on Hungarian banks. On Turkish banks, Isik and Hassan (2002) have arrived to similar results about the

dominance of technical inefficiency.Large banks have adopted internet banking earlier than small banks,while banks with higher branching intensity have adopted internet bankingas a complementary channel (Ciciretti et al, 2009; Furst et al., 2002; Dandapani et al, 2016). On the other hand, Hernandez-Murillo et al. (2010) find an inverse associationbetween internet banking and branching intensity, proxied by the number of branches of a bank per year,suggesting a substitution effect. Furthermore, Vesala (2000) discusses that mobility creates value to the customers by reducing costs mainly through digitalization of activities and labour savings and hence it is facilitating change in retail banking by bringing location-free access to financial services(Laukkanen & Lauronen, 2005). The cost of establishing new technologies is much lower than the cost of establishing a physical branch outlet. Technology innovation has reduced the requirement of staff at the branch, thus reducing the salaries given to them. The office setup required and other utilities are removed, thus saving firms investment, which is now used to establish computer infrastructure that operates automatically under the supervision of few skilled IT professionals, saving time and money(Lewis, Palmer, & Moll, 2010). Accordingly, while we expect to find a higher likelihood to adopt mobile for larger banks, we expect a lower likelihood for banks with higher branching intensity due to substitution effect.

H_7: Larger the bank, higher will be the likelihood to adopt mobile banking.

H_8: Higher the branching intensity, lower will be the likelihood to adopt mobile banking.

Similar to large banks, listed banks could have more financial means to undergo the investments required to adopt new technologies. A stream of literature compares listed and unlisted companies in relation to their capital structure choices. Unlisted companies, who are moreopaque, are found to be credit constraint, whereas

listed companies with access to public and international capital markets are not (Brav, 2009; Faulkender & Petersen, 2006; Giannetti, 2003). Accordingly, listed banks with greater access to finance could be faster toundergo the required investments to adopt new technologies than unlisted counterparts. Accordingly, we expect listed banks to be more likely to adopt mobile banking.

H_9: Listed banks have a higher will be likelihood to adopt mobile banking.

The organizational structure of financial institutions plays a pivotal role in new technology service adoption(Daghfous & Toufaily, 2007). The foreign banks have advanced more than domestic banks in terms of technological progress; Levine (1996) indicates that "the foreign banks' entry has improved the quality and availability of financial services in the domestic financial market by increasing bank competition and by enabling the greater application of more modern banking skills and technology."Foreign banks are found to be leading public and private banks in terms of Information Technology use(Sensarma, Rudra, 2006)." Foreign banks bring more competition and supress profitabilityof domestic banks, while improving the quality and availability of financial services mainly through technology spillovers (Claessens et al., 2001; Luo et al., 2015; Levine, 1996;Unite and Sullivan, 2003). Predominantlyimprovements in technology spur productivity growth for banks (Casu et al., 2016). Accordingly, foreign banks would enable technology transfer and may adopt new technologies sooner than their local counterparts. On the other hand, in emerging markets, local banks could build their infrastructure with the latest technology and accordingly technology spillover may not be evident. These local banksenjoy leapfrog benefits as these technologiesenablenot only lower costs that are passed onto customers but also increase access to credit (Claessens et al., 2001; Onay &Ozsoz, 2013). Recent studies emphasize a "leapfrogging"element in using

Information and Communication Technologies (ICTs) in developing country contexts. With “leapfrogging” these countries may increase access to information and knowledge andreduce bureaucracy by bypassing older, less appropriate and less affordable forms of ICTs. Accordingly, we expect local banks to be more likely to adopt mobile banking to enjoy leapfrog benefits.

H_{10}: Local banks have a higher likelihood to adopt mobile banking

Regarding the ownership of banks, private sector banks are found to make use of low cost innovative strategies to achieve penetration, while the public-sector banks rely on traditional high cost means. (Byers & Lederer, 2001; Cho &Pucik, 2005; Kumar & Gupta, 2009; Kumar et al., 2013; Peterson et al., 2002). Accordingly, while one-fifth of the total business of public sector banks come from rural businesses, only one-seventh of the total business of private sector banks is from rural areas suggesting lower penetration (Merwin, 2015). Cicciretti et al. (2009) finds that Italian public banks are more aggressive in adopting internet banking compared to private banks, however we expect private banks to be more likely to adopt mobile banking to increase their penetration as mobile is a low-cost means of increasing penetration.

H_{11}: Private banks have a higher likelihood to adopt mobile banking.

CHAPTER 4

INTERNET BANKING AND MOBILE BANKING IN TURKEY

4.1 Internet banking in Turkey

With the development of the secured electronic transaction technologies, Internet banking has evolved into a “one stop service and information unit” that promises great benefits to both banks and consumers(Tan & Teo, 2000). Internet banking enable users toperform common banking transactions such as writing checks, paying bills, transferring funds, printing statements, and inquiring about account balances. Internet banking in Turkey was launched in 1997 by Is Bank. Then most of the banks such as Garanti Bank, Akbank, YapıKredi Bank, Vakıfbank, Denizbank, HSCB, Finansbank have started to provide internet banking through years(Pala & Kartal, 2010).

In the report that was provided by Banks Association of Turkey, as of 2017 there are more than 20 million active users that logged into mobile banking at least once in the last three months. The volume of EFT transactions has reached 277million TL, signifying a more than 100-fold increase in the past 5 years (Table 1). So, internet banking is an active delivery channel for banks in Turkey.

Table 1.Active Internet Banking Customers, Number and Volume of EFT Transactions

Year	# of Customers	# of Transactions (Thousands)	Transaction Volume (Million TL)
2011	8.606.145	46.424	277.861
2012	10.551.764	54.914	332.320
2013	12.435.952	61.025	410.797
2014	14.315.056	63.281	488.705
2015	17.420.451	68.534	600.081
2016	20.398.627	77.091	773.651

Source: Banks Association of Turkey (2017)

4.2 Mobile banking In Turkey

Adoption of Mobile banking in Turkey began in the first half of 2000with access to internet banking services via Wireless Area Protocol (WAP) from mobile devices. WAP is defined as "an industry initiated world standard that allows the presentation and delivery of information and services to wireless devices such as mobile telephones or handheld computers" (Ashley, Hinton, & Vandenwauver, 2001).Evolution of the WAP has integrated into the banking sector as well. Banks also have been using the WAP in order to provide banking services to customers. As a mobile form of internet banking, WAP banking communicates with its customer via mobile devices. WAP banking customers' access their banks‟ WAP related website over the internet from mobile phone browser with a mobile phone that support WAP. In Turkey many banks provided WAP Banking services through websites.However, its penetration was slow as customers found it hard to use.

Although responding to the mobile environments changes quickly is not always possible, banks put the innovation in their agendas since the innovation taking place in retail banking is being driven by the move to mobile. So, banks give weight developing mobile banking services to their customers in order to adopt to this dynamic environment.

Mobile banking adoption accelerated only after introduction of mobile banking platforms by banks in the second half of 2000s. These platforms enabled easy and user-friendly access to mobile banking services. After being launched, mobile banking has gained incremental importance in Turkey.Mobile penetration in Turkey has an increase trend since 2010. By the end of 2017 mobile penetration has reached to 96.3% percent with more than 75 million mobile subscribers(BTK, 2017).Therefore, we define mobile banking adoption as banks' mobile banking platform rather than WAP based access. Nevertheless, we do alternative estimations with WAP adoption dates to confirm our main findings in Section 7.

In the report that was provided by Banks Association of Turkey, as of 2017 there are more than 19 million active users, who logged into mobile banking at least once in the last three months, and the volume of EFT transactions has reached 197 million TL, signifying an approximately 100-fold increase in the past 5 years (Table 2). So, mobile banking is an active delivery channel for banks in Turkey.

Table 2.Active Mobile Banking Customers, Number and Volume of EFT Transactions

Year	# of Customers	# of Transactions (Thousands)	Transaction Volume (Million TL)
2011	445.723	1.360	2.232
2012	1.402.938	3.503	6.464
2013	3.227.096	7.842	15.985
2014	6.711.360	17.528	42.851
2015	12.164.368	37.162	104.032
2016	19.217.598	68.194	197.212

Source: Banks Association of Turkey (2017)

CHAPTER 5

DATA AND METHODOLOGY

In the report that was provided by the Banks Association of Turkey, as of 2016there are 34deposit banks that include public, private and foreign banks.More than half of them are offering mobile banking.

Table 3.Bank Types in Turkey

Bank Number	1995	2000	2005	2010	2015	2016
Deposit Banks	**55**	**61**	**34**	**32**	**34**	**34**
Public Banks	5	4	3	3	3	3
Private Banks	32	28	17	11	11	9
Banks in Saving Deposit Ins.Fund	-	11	1	1	1	1
Foreign Banks	18	18	13	17	19	21
Dev. and Inv. Banks	**13**	**18**	**13**	**13**	**13**	**13**
Total Bank Number	**68**	**79**	**47**	**45**	**47**	**47**

Our sample includes the banks only which we have detailed information of the services provided via transactional mobile banking. The information was gathered from the banks' websites. Accordingly, we have gained data from 14 deposit banks in Turkey that have adopted transactional WAP and transactional mobile banking between 1995 and 2014. Following Ciciretti et al, (2009) and Onay and Ozsoz (2013) "the banks in our sample offered a similar package of Mobile banking products, services, and transactional capabilities at the time of adoption: 1) Information inquiries, 2) Account balance checking and maintenance, 3) Fund

transfers, 4) Automatic Bill and Credit Card Payments, 5) Savings and investments transactions, 6) Retail and commercial banking transactions, and 7) Online trading.”The variables which are specific for banks are collected from the year-end consolidated aggregate income statements and balance sheets compiled by the Banks Association of Turkey. These variables are also adjusted for inflation by using the Consumer Price Index (CPI) published by the World Bank. These variables include total assets, total deposits, total loans, nonperforming loans, interest income, non-interest incomeand net profit to construct standard measures of financial healthand profitability such as deposits-to-assets ratio, loans-to-assets ratio, the proportion of nonperforming loans, and return on assets. We also collect the ownership information, listing dates and number of branches from the annual reports and websites of the banks. Our dataset covers a 20 years period. Also the dataset is unbalanced panel since the unavailability of data for some of the banks in our sample.

Our sample has three public banks, six private banks and also five foreign banks. The total asset size of the banks in our sample represents 89% of the total banking sector as of 2016. The transition to mobile was a sequential process for all the banks in our sample as they first adopted internet banking channel, which was then followed by the adoption decision for WAP-based mobile and finally a mobile platform. In our sample, we are able to observe this transition and hence, we are able to analyse what particularly drives mobile banking adoption for banks. Table 4 provides the establishment date, asset size, and both transactional WAP and transactional mobile banking adoption dates of the list of banks included in our analysis.Table 5showsthe descriptive statistics of our sample. The mean Return on Assets (ROA) is 2.1% of the 14 deposit banks in our sample. Although it could be

maximum 28% for some banks, the ratio of non-performing loans to total loans has also an average of 1.9%. An average loan to asset ratio is 50% and an average deposit to total assets ratio is 65% of our banking sample. The average ratio of banks' non-interest income to total non-interest expense is around 57%.In Table 6we present the correlation matrix for all of the variables we use in our analysis.

Table 4.List of Deposit Banks, Establishment Dates, Total Asset Size, WapBanking and Mobile Banking Adoption Dates

Bank	Established in	Total Assets (ml TL)	WAP Adoption Date	Mobile Banking Adoption Date
STATE BANKS				
TürkiyeCumhuriyetiZiraatBankası A.Ş.	1863	357.761	2007	2009
TürkiyeHalkBankası A.Ş.	1938	231.441	2004	2011
TürkiyeVakıflarBankası T.A.O.	1954	212.540	2000	2011
PRIVATE BANKS				
TürkiyeİşBankası A.Ş.	1924	311.626	2002	2007
TürkiyeGarantiBankası A.Ş.	1946	284.155	2000	2007
Akbank T.A.Ş.	1948	271.016	2000	2008
YapıveKrediBankası A.Ş.	1944	252.820	2000	2009
Şekerbank T.A.Ş.	1953	23.819	2011	2011
TürkEkonomiBankası A.Ş.	1927	79.727	2008	2012
FOREIGN BANKS				
Denizbank A.Ş.	1997	103.159	2005	2013
Finans Bank A.Ş.	1987	101.503	2010	2010
ING Bank A.Ş.	1984	49.688	2007	2011
HSBC Bank A.Ş.	1990	24.369	2006	2013
ICBC Turkey Bank A.Ş. (Tekstil Bank)	1986	8.218	2011	2011
Total Assets of Banks in our Sample as of 2016		2.311.842		
Total Assets of All 34 Deposit Banks in Turkey as of 2016		2.595.348		

Source: Banks' Association of Turkey

Table 5.Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Mobile	280	0.239	0.427	0	1
WAP	280	0.496	0.5	0	1
depositta	196	0.652	0.081	0.486	0.857
loansta	196	0.502	0.174	0.069	0.753
nonperf	196	0.019	0.045	0.000	0.28
roa	196	0.021	0.017	0.001	0.126
intinc	196	0.127	0.075	0.062	0.553
nonintinc	196	0.575	0.589	-3.153	1.717
Market Share	260	0.062	0.049	0.001	0.187
Branchno	278	485	392	1	1707
Crisis	280	0.1	0.301	0	1
Internet dummy	280	0.721	0.449	0	1
Listed	280	0.646	0.479	0	1
Foreign	280	0.196	0.398	0	1
Large	280	0.25	0.434	0	1
Private	280	0.786	0.411	0	1

Table 6.Correlation Matrix

	mobile	WAP	depositta	loansta	nonperf	roa	intinc	nonintinc	marketshare	logbranch	crisis	internetdummy	listed	foreign	large	private
mobile	1															
WAP	0.478	1														
depositta	-0.2679	-0.2642	1													
loansta	0.4352	0.3227	-0.5672	1												
nonperf	-0.1864	-0.1666	0.2942	-0.3828	1											
roa	-0.2124	-0.1463	0.3102	-0.3663	0.2903	1										
intinc	-0.4293	-0.4849	0.4255	-0.6572	0.4689	0.4504	1									
nonintinc	0.145	0.2414	-0.1885	0.1574	-0.3402	-0.3359	-0.5718	1								
marketshare	0.2419	0.5305	-0.0385	-0.1001	-0.1068	0.0098	-0.1669	0.2645	1							
logbranch	0.3848	0.5415	-0.0885	-0.0088	-0.0491	-0.0848	-0.1914	0.2858	0.5641	1						
crisis	-0.2062	-0.2429	0.2773	-0.4851	0.64	0.4451	0.6823	-0.6513	-0.0594	-0.2054	1					
internetdummy	0.1886	0.3945	-0.3404	0.5421	-0.3143	-0.2629	-0.6986	0.2521	0.1161	0.0423	-0.3766	1				
listed	0.1906	0.132	-0.3312	0.4171	-0.1206	-0.0406	-0.3048	0.0382	0.1094	-0.07	-0.113	0.3158	1			
foreign	-0.0295	0.0893	-0.3286	0.4398	-0.098	-0.1176	-0.1662	-0.0781	-0.401	-0.0288	-0.1428	0.1306	-0.0982	1		
large	0.608	0.4445	-0.1333	0.2123	-0.2473	-0.1068	-0.3877	0.2462	0.5066	0.6427	-0.2243	0.1574	0.1456	-0.2112	1	
private	0.0216	-0.0992	-0.4726	0.2974	-0.034	-0.0277	-0.1666	-0.077	-0.4377	-0.3565	0.0026	0.2426	0.4423	0.2826	-0.2317	1

CHAPTER 6

RESEARCH METHODOLOGY

There may be different reasons for financial institutions to adopt mobile banking. In this regard, understanding the root cause is an empirical issue. To have comprehensive knowledge of the parameters that affect the financial institutions' decisions, we use financial and accounting based ratios alongside indicators about the characteristics of the banks. More specifically, based on our hypotheses, our statistical model specifies the probability of a financial institution adopting mobile banking is a function of bank-specific performance and controlvariables.

$$Mobiledummy_{it} = \alpha_0 + \beta_1 Deposita_{it} + \beta_2 Loansta_{it} + \beta_3 Nonperf_{it} + \beta_4 ROA_{it} + \beta_5 Marketshare_{it} + \beta_6 Internetdummy_{it} + \beta_7 Crisis_{it} + \sum_{k=1}^{4} \gamma_k \, Control_{it}^{k} + \varepsilon_{it}$$

Our main dependent variable is mobile banking adoption dummy coded as one when the bank adopts transactional mobile banking and zero otherwise.[1]Deposittais the ratio of total deposits to total assets, Loanstais the ratio of total loans to total assets, Nonperfis the ratio of total non-performing loans to total loans, ReturnonAssets is the ratio of net profit to average total assets, Marketshare is the ratio of total asset of a bank to total assets of all banks within a given year. InternetDummyInternet dummy is a dummy variable which can be described as the

[1]Dates of transactional WAP adoption and transactional mobile banking adoption are compiled from the financial statements of the banks.

time of adoption of a transactional website. Crisis dummy equals one if there is a systematic banking crisis and zero otherwise.[2]

$CONTROL_k$is a matrix of exogenous control variables including the following:

Listed :dummy equals one if the bank is listed on the local stock exchange and zero otherwise.

Foreign :dummy equals one if the bank is foreign owned and zero otherwise.[3]

Large : dummy equals one if the bank's total assets are in the fourth quartile within the sample and zero otherwise.

Private: dummy equals one if the bank is privately owned and zero otherwise.

Initially we start estimating equation (1) in the panel with OLS fixed effects model. We first enter explanatory variables individually to explore their impact on the mobile banking adoption decision and then estimate pooledOLS (Table 7, columns 2-9). Then, we respectively do a probitestimation with robust standard errors(Table 7, column 10) and a logistic fixed effect estimation of equation (1) in the panel to verify our findings (Table 7, column 11). OLS FE and Logit FE estimations are done with firm fixed effects controlling for omitted variables bias. As suggested by Petersen (2009), the standard errors are clustered at the firm level.

In the second step, we continue with probitestimation of our extended model includingthecontrol variables,where we explore (i) the impact of number of branches the bank ownsand (ii) the impact of profitability by breaking it into two main components; interest and non-interest income on mobile banking adoption decision by introducing them to equation (1) respectively (Table 8). We control for the number of branches to understand whether mobile banking complements or

[2]Dates of internet adoption and systemic crisis periods are taken from Onay and Ozsoz (2012).

[3]We define a bank as foreign if the share of the foreign ownership exceeds 50.01% following IFRS standards.

substitutes the physical branches. For this we use the log ofnumber of branches per year (Logbranch). Interest Income is calculated as the ratio of interest income to total assets (Intinc) and non-interest Income is calculated as the ratio of non-interest income to total non-interest expense (Nonintinc). All unbounded explanatory variables are winsorized at the 1% level at both tails.[4]Finally, we re-estimate equation (1) by including all of our explanatory and control variables with a one period lag to tackle any possible endogeneity problems in Tables 8,9 and 10.

[4]Our results remain same if we use raw values.

CHAPTER 7

EMPIRICAL FINDINGS

In Table 7, we present our initial estimations.[5]In OLS FE estimations, we first explore the impact of each determinant individually on mobile banking adoption and find that mobile banking adoption is positively related to loans to assets ratio and internet adoption dummy, and negatively related to deposits to assets, nonperforming loans to assets, profitability ratios and crisis dummy (Table 7, columns 2-9). However, as our dependent variable is a binary outcome variable, we continue our analysis with probitand logit estimationswith firm fixed effects and controls for internet adoption and crisis dummies (Table 7, columns 10-11).[6]Initial probit and logit estimations show that probability to adopt mobile banking is higher when loans to assets ratio increases and when profitability decreases.This confirms our H_1 and H_4that banks use mobile banking as a means of managing its assets more efficiently with closer monitoring of customer behaviour data and as a means of creating new revenue sources. While our results are similar toDandapani et al. (2016), who shows that credit unions are more likely to adopt internet banking when a higher proportion of their loans are customer loans, our results regarding profitability differ considerably from Dandapani, (2017); Furst et al., (2002); Hernández-Murillo, (2010) and Singh, (2007), who show that profitable banks adopt internet banking. We find that banks rely on mobile banking to increase profitability possibly via delivering more customized products/services and to increase customer satisfaction and loyalty.

[5]We check the stationarity of our data with Levin, Lin, & Chu (2002) and Im, Pesaran, & Shin (2003) tests for unbalanced panel data and confirm that all of our variables are stationary at the 1% level.

[6]In probit estimation, internet and crisis dummies predict failure perfectly and thus was automatically dropped and in total 19 observations are not used in the empirical estimations.

Table 7.Initial Regression Analysis

	OLS FE								Probit	Logit FE
VARIABLES	mobile	mobile	mobile	mobile	mobile	mobile	mobile	mobile	mobile	mobile
depositta	-2.658**							0.0221	-1.37	-6.439
	0.981							*1.067*	*4.373*	*6.114*
loansta		1.687***						2.039***	12.78***	28.47***
		0.225						*0.363*	*2.681*	*5.766*
nonperf			-2.096***					-0.349	-6.949	11.03
			0.333					*0.848*	*15.91*	*27.63*
roa				-6.956***				-1.163	-84.44**	-174.6***
				1.716				*2.302*	*38.37*	*52.3*
marketshare					2.635			0.65	12.35	-1.531
					2.485			*1.94*	*9.409*	*38.44*
internetdummy						0.334***		-0.235		15.91
						0.0367		*0.161*		*2.990*
crisis							-0.266***	0.252**		-13.99
							0.0293	*0.0993*		*3.070*
Constant	2.075***	-0.505***	0.381***	0.485***	0.0861	-0.00188	0.266***	-0.47	-5.716*	
	0.639	*0.113*	*0.00626*	*0.0354*	*0.147*	*0.0265*	*0.00293*	*0.768*	*2.917*	
Observations	196	196	196	196	260	280	280	179	160	177
R-squared	0.133	0.324	0.04	0.061	0.028	0.121	0.037	0.36		
Number of bankno	14	14	14	14	14	14	14	14	14	13

Table 8 presents our main findings;the first three columns give estimation results of our extended model,which includes bank-level controls and branch intensity,and last three columns give the lagged analysis for endogeneity.[7]We find that the effect of loans to assets and profitability ratios are similar across different model specifications and enter significantly once again with the expected signs confirmingH_1 and H_4. However, breaking down the profitability into interest and non-interest income components makes banks' motivation to adopt mobile clearer. We find that interest income is significantly negatively related to mobile banking adoption. Accordingly, we confirm H_2that banks probability to adopt mobile increases particularly when interest income decreases. As these new technologies enable lower costs that can be passed onto customers, competition gets fierce and this brings a pressure on revenues of the banks mainly on interest margins (Claessens et al., 2002). Accordingly, increasing interest income becomes a priority for banks and a main driver for adopting mobile banking. The coefficient estimate for deposits to assets ratio is positive and significantconfirming our H_3. This makes sense as banks' customer base expand, the need to interact with the customer in order to retain and increase their loyalty increases.Accordingly, banks make use of mobile banking to deliver value-added services to their customers.While loans to assets ratio continues to be a significant determinant of adoption as we expect in H_4, the significance of the negative coefficient of non-performing loans ratio in Table 7 disappears in probit estimations. Another notable finding is thatbanks adopt mobile when their market share decrease. So, we confirm $H_6$and contribute to the financial inclusion literature by showing that in response to higher competition banks use

[7]As internet dummy and crisis dummy predicts failure perfectly, we exclude them in our model in Probit analysis.

mobile banking to attract new customers,to target unbanked segments or to reach customers in remote areas where their branch network is scarce.

Consistent with previous research on internet banking adoption,we find thatlarger banks adopt mobile banking earlier confirming our H_7. However, contrary to our H_8 banks adopt mobile when their branch intensity increases.Accordingly, mobile banking complements the branch network.We also find negative and significant coefficients for listed and foreign dummiesindicating that unlisted and local banks are more likely to adopt mobile banking(H_9 and H_{10}).While Onay and Ozsoz (2013) report that listed and foreign banks adopt internet banking, our results give support tothe prediction of Claessens et al., (2001) that banks in emerging economies already acquire the latest technology. Hence,we find no technology spill-over effect from foreign banks. This finding also relates to the discussion that foreign firms acquire already productive and profitable firms in emerging countries (Micco et al., 2007). In our case this translates to firms who have the most recent technologies. Finally, we find a significant positive coefficient for private dummy suggesting that private banks are more likely to adopt mobile confirmign our final hypothesis 11 that banks use mobile as a low-cost means of penetration. Our results remain robust once we lag all right-hand side variables one period to tackle endogeneity. In the rest of the thesis, we discuss our robustness tests results with respect to lagged results.

Table 8. Probit Estimation (Mobile)

VARIABLES	mobile	mobile	mobile	mobile	mobile	mobile
depositta	0.654	7.997**	-0.646			
	4.143	*3.571*	*4.519*			
loansta	12.51***	12.66***	11.32**			
	2.916	*2.899*	*4.559*			
nonperf	-0.498	-10.41	5.392			
	6.417	*44.03*	*5.418*			
roa	-76.99**					
	31.41					
marketshare	-5.855	-8.176**	-6.617			
	4.402	*3.718*	*4.356*			
listed	-1.379*	-2.246**	-1.155			
	0.759	*0.876*	*0.828*			
foreign	-1.829**	-2.327***	-1.640**			
	0.765	*0.771*	*0.677*			
large	1.553***	1.231**	1.678***			
	0.499	*0.592*	*0.544*			
private	1.246	2.771***	0.939			
	0.779	*0.798*	*0.764*			
logbranch	3.530**	3.724***	2.426			
	1.489	*1.357*	*1.692*			
intinc		-66.13***				
		14.83				
nonintinc			-0.32			
			0.677			
L.depositta				3.822	22.49***	2.71
				5.303	*8.548*	*5.628*
L.loansta				16.37***	23.48***	12.11**
				5.104	*6.773*	*5.775*
L.nonperf				-4.435	-35.1	3.718
				8.055	*38.04*	*4.545*
L.roa				-109.0**		
				49.57		
L.marketshare				-5.104	-5.059	-5.04
				7.625	*5.998*	*5.038*
L.listed				-1.554	-3.462**	-0.953
				1.147	*1.565*	*0.964*
L.foreign				-2.166*	-3.712*	-1.676*
				1.304	*1.94*	*0.911*
L.large				1.527*	0.5	1.532*
				0.865	*01.06*	*0.835*
L.private				1.871*	4.613***	1.349
				1.007	*1.604*	*0.918*
L.logbranch				5.311**	7.700***	2.919
				2.687	*2.209*	*2.487*
L.intinc					-93.00***	
					18.97	
L.nonintinc						-0.199
						0.744
Observations	179	179	179	166	166	166
Number of bankno	14	14	14	14	14	14

CHAPTER 8

ROBUSTNESS TESTS

For robustness, first, we re-estimate equation (1) with WAP adoptiondummy and secondly, we repeat probit estimations with logistic regression, where we include internet adoption and crisis dummies and use firm fixed-effects to control for omitted variable bias.

In Table 9we present the results of probit estimation of equation (1) where the dependent variable is WAP adoption dummy.Results confirm our main findings that banks are more likely to adopt mobile as loans to assets increase and as profitabilitydecrease. However, neither interest income nor non-interest income had an impact on WAP adoption. While we observe a positive coefficient for deposits, the impact is not significant.These could be due to the fact that adoption of WAP by customers was not widespread and the products/services that could be delivered via WAP was relatively primitive compared to mobile platforms.Accordingly, banks have not fully utilized the advantages of mobile. On the other hand,results confirm that local, large and private banks had higher likelihood to adoptWAPbanking, while branching intensity had apositive impact. WAP estimations furthermore contribute to our main findings by showing that nonperforming loans and market share were also significant determinants for banks in introducing mobile channels. However, contrary to our previous findings we find a significant positive coefficient for market share indicating that banks were initially more likely to adopt mobile banking when their market share increases. This could be due to the "stock effect" Hernandez-Murillo et al. (2010) report that banks were likely to adopt internet banking since

their peers were adopting. However, as banks realize the potential of mobile banking to reach new customers the sign of this coefficient turns to negative and banks adopt mobile as their market share decrease (Table 8). On the other hand, we find a positive coefficient for non-performing loans indicating a higher likelihood to adopt WAP when nonperforming loans increase. This is contrary to what has been documented so far for internet adoption, which discusses that banks are unlikely to make IT investments when their financial situation deteriorates (Dandapani et al.,2016 ; Hernández-Murillo, 2010). This shows that mobile banking is different than internet banking and because of its proactive push functionalities banks used itinitially as a medium of tackling delinquent loans.

Table 10 presents the results of our logit firm fixed effect estimation where dependent variable is the mobile banking adoption dummy.[8]As before results confirm the impact of loans to assets and profitability ratios on banks' likelihood to adopt mobile banking. Higher branch intensity is also associated with higher likelihood to adopt. However, once we include firm fixed-effects the significant impact of bank characteristics and deposits to assets ratio disappear. On the other hand, while internet adoption and crisis dummies enter with expected signs, their impact on adoption is insignificant. Nevertheless, our results regarding loans, branching intensity and profitability remain robust even after we control for the impact of banks' internet adoption and crisis periods in our estimations.

[8]Private dummy drops out as there is no within group variation. The model also does not converge when we insert interest income to the model so we cannot present results regarding it. Nevertheless, when we estimate the model without internet and crisis dummies, we confirm our probit estimation results regarding the interest income variable. Results can be provided upon request.

Table 9.Probit Estimation (WAP)

VARIABLES	wap	wap	wap	wap	wap	wap
depositta	4.633	3.638	5.55			
	6.59	*6.344*	*50.01*			
loansta	31.03***	31.45**	33.81			
	10.44	*13.17*	*33.99*			
nonperf	-3.115	-0.186	-15.37			
	15.45	*13.46*	*253.1*			
roa	-86.05**					
	41.53					
marketshare	172.6*	179.4**	224.1			
	99.52	*72.85*	*402.9*			
listed	-1.029	-2.162	-1.66			
	2.894	*1.925*	*12.92*			
foreign	-3.623*	-3.789	-3.999			
	2.076	*2.469*	*5.061*			
large	1.405	-0.408	1.874			
	1.666	*1.121*	*35.66*			
private	2.345	0.244	5.745			
	7.293	*05.07*	*163.5*			
logbranch	9.701	8.918	10.73			
	6.225	*5.876*	*38.03*			
intinc		-48.63***				
		14.24				
nonintinc			0.415			
			8.03			
L.depositta				5.052	12.04	6.191
				6.888	*16.79*	*7.499*
L.loansta				19.15***	23.03	22.43***
				2.621	*15.56*	*4.28*
L.nonperf				25.68***	77.48	24.07***
				7.745	*55.49*	*8.794*
L.roa				-32.71*		
				18.39		
L.marketshare				189.8***	300.1	226.7***
				42.74	*247.1*	*55.92*
L.listed				-0.861	-2.337	-0.472
				2.027	*2.606*	*2.354*
L.foreign				-2.069*	-3.675	-2.552**
				1.058	*4.103*	*1.249*
L.large				7.159***	-5.341	8.488***
				2.374	*5.605*	*3.274*
L.private				8.270***	2.619	10.35***
				2.069	*2.28*	*2.687*
L.logbranch				3.190**	8.293	3.820*
				1.49	*7.656*	*1.973*
L.intinc					-112.1	
					96.43	
L.nonintinc						0.658
						0.702
Observations	179	179	179	166	166	166
Number of bankno	14	14	14	14	14	14

Table 10.Logit Estimation

VARIABLES	mobile	mobile	mobile	mobile	mobile
depositta	12.85	16.69	5.987		
	10.64	*18.07*	*-9.367*		
loansta	16.20*	26.52	15.06*		
	8.421	*21.10*	*7.735*		
nonperf	28.74	71.88	46.75		
	78.64	*126.7*	*73.55*		
roa	-141.4*				
	79.06				
marketshare	71.41	180.8	66.40		
	76.40	*132.3*	*44.98*		
listed	1.256	-19.89	1.027		
	11.154	*8.692*	*3.864*		
foreign	1.630	-13.73	3.168		
	32.979	*36.781*	*8.426*		
large	19.48	17.56	17.10		
	07.32	*6.349*	*3.467*		
logbranch	38.32***	65.23*	33.64***		
	13.14	*36.60*	*11.10*		
internetdummy	15.95	8.695	13.50		
	39.143	*168.466*	*9.031*		
crisis	-4.826	-13.34	-8.069		
	79.043	*203.147*	*11.204*		
intinc		-130.0**			
		55.05			
nonintinc			3.042		
			2.538		
L.depositta				8.707	23.91
				9.662	*15.32*
L.loansta				20.61**	24.64**
				8.835	*10.24*
L.nonperfta				27.67	-5.645
				76.03	*105.2*
L.roa				-375.8**	
				160.0	
L.marketshare				214.3*	175.5
				120.5	*121.0*
L.listed				-15.16	-2.982
				10.985	*177.985*
L.foreign				5.171	-6.868
				15.119	*29.784*
L.large				27.08	19.66
				4.196	*5.855*
L.logbranch				35.61***	51.66**
				13.81	*23.40*
L.internetdummy				12.80	12.42
				10.504	*13.081*
L.crisis				1.767	1.225
L.nonintinc					3.097
					3.065
Observations	177	177	177	164	164
Number of bankno	13	13	13	13	13

CHAPTER 9

LIMITATIONS OF THE STUDY AND FURTHER RESEARCH DIRECTIONS

The chapter is divided in two sections. The first section highlights the limitations of this research. The second section discusses directions for further research.

9.1 Limitations of the study

The main limitation of the study comes from the sampling and the data collection issues discussed in chapter 5. While there were 33 active deposit banks in Turkey, the sample of the study composed of 14 deposits banks, for which detailed information regarding the adoption and services offered via mobile banking were collected. This meant 19 banks from the sample had to be excluded, for which detailed information about the adoption of mobile banking could not be retrieved from the websites or the financial reports of the banks. Nevertheless, the study was made with a homogenous and representative sample of the Turkish banking industry as the total assets of the sample banks represented 89% of the whole banking system. On the other hand the data period covered a 20 years including pre- and post-adoption periods. However, as mobile banking is a recent phenomenon the post-adoption period was shorter compared to pre-adoption period. As our main focus was the adoption drivers, the pre-adoption period was long enough to justify our findings.

9.2 Further research

This thesis addresses the question of why banks adopt mobile banking and discuss the financial motivations for banks to adopt a new technology. For this research we chose a developing country as our setup. However, as literature discusses there are

fundamental differences between developed and developing economies and the role of banks in their financial system development. Accordingly, further research in this field entails what happens after the adoption. Do banks really increase their profitability, market share via more customized offerings and decrease their credit risk via more efficient monitoring of their receivables? Furthermore are there motivational differences between banks that operate in developed economies vs developing economies in adopting new technologies? Does these technologies really increase the efficiency of the banks and serve the welfare of the nations? And finally what is the real impact of new technologies on access to financial services? These questions need international samples to represent the perspectives of both developed and developing economies.

CHAPTER 10

CONCLUSION

In this thesis, we examine the determinants of mobile banking adoption from the perspective of banks. This is the first researchthatinvestigatesmobile banking adoption drivers and we contribute to the literature in several ways. Studying a sample of 14 Turkish banks over a 20-year period, we show that banks adopt mobile banking mainly when their deposits and loans increase and when their profitability, particularly interest income, and market share decreases. Banks use mobile banking to access new/unbanked/underbanked customers as well as retaining existing ones and for effectively managing their assets and liabilities. Banks also rely on mobile banking to interact with their customers and to deliver tailored solutions to their financial needs in order to increase customer satisfaction and loyalty. Customer experience plays a mediating role on how customers evaluate product attributes and increases the value customers perceive from mobile (Sheng &Teo, 2012). Mobile banking adoption literature shows that customers value ubiquity, convenience, localisation andpersonalisation that comes with mobile and in our sample we see that banks who have taken the first-mover advantage by introducing mobile banking sooner have also protected their market leader position. Accordingly, our research also contributes to mobile banking adoption literature by showing that mobile banking isan integrated part of banks' business models. Furthermore, our findings contribute to ICT competition literature and financial inclusion literature by respectively showing that banks adopt mobile as interest income decreases due to higher competition induced by ICT and as their market share decreases (Claessens et al., 2002; Demirguc-Kunt&Klapper, 2012; Porteous, 2007). We also find that

branching intensity is a significant determinant of adoption decision. The higher the branching network, the more likely that the banks' will adopt mobile. While this indicates that mobile is complementary to branches, it could also be interpreted as bankswillingness toreduce operating costs. We also note significant differences between banks' decision to adopt mobile versus internet. While banks adopt internet banking when their financial situation is strong, we find that banks adopt mobile when their profitability is lower and when their non-performing loans are higher. Finally, by examining the impact of different bank characteristics on adoption decision, we contribute to the literature. We find that large, unlisted,private and local banks are more likely to adopt mobile banking.Technological advances and deregulation has increased competition and banks have responded by altering their production and distribution strategies towards generation of non-interest income by embracing new technologies such as ATMs, POS and internet banking (Al-Tarawneh, Khalaf, & Assaf, 2017; Bailey-Tapper, 2010; DeYoung & Rice, 2004).

In this thesis, we investigate the motivations of banks to adopt a new technology; mobile banking. We contribute by showing that banks use mobile banking complementary to branches and internet banking channel for actively managing their assets& liabilities, for protecting their market share and for increasing their profitability through better customer interaction mobile technologies enable from "anytime" and "anywhere". In this regard, our findings could be relevant and applicable to other contexts and industries that involve new technology adoption and guide them in building their mobile strategies.

REFERENCES

Aboelmaged, M. G., & Gebba, T. R. (2013). Mobile banking adoption: An examination of technology acceptance model and theory of planned behavior, *International Journal of Business Research and Development*, 2(1), 35-50.

Adizes, I. K. (2013). Change and its repercussions for the banking industry. *Journal of Central Banking Theory and Practice, 3*(1), 5-8.

Al-Qirim, N. (2007). The adoption and diffusion of e-commerce in developing countries: The case of an NGO in Jordan. *Information Technology for Development*, 13(2), 107-131.

Al-Tarawneh, A., Khalaf, B., & Assaf, G. A. (2017). Noninterest income and financial performance at Jordanian banks. *International Journal of Financial Research, 8*(1), 166.

Anckar, B., & D'Incau, D. (2002). Value-added services in mobile commerce: an analytical framework and empirical findings from a national consumer survey.Hawaii: International Conference on Systems Sciences.

Anderson, C. (2006). The long tail: Why the future of business is selling less of more. *Canadian Journal of Communication Corporation, 33*, 127-139.

Anderson, J. (2010). M-banking in developing markets: Competitive and regulatory implications. *Info, 12*(1), 18-25.

Ashley, P., Hinton, H., & Vandenwauver, M. (2001). Wired versus wireless security: The internet, WAP and iMode for E-commerce. (pp. 296- 306).IBM Software Group.

Aytar, O., Yeğen, İ., & Erdemir, N. K. (2012). Elektronik şube ve elektronik bankacılık hizmetleri. *Uşak UniversityAcademicInformation Conference*, (pp. 1-3).

Bailey-Tapper. (2010). Non-interest income, financial performance & the macroeconomy: Evidence on Jamaican panel data. *Financial Stability Department,* Bank of Jamaica.

Bansal, H. I. (2004). A three-component model of customer to service providers. *Journal of the Academy of Marketing Science, 32*(3), 234-250.

Barbosa, K. R., & Salazar, F. (2015). Assessing competition in the banking industry: A multi-product approach. *Journal of Banking & Finance,* 50(1), 340-362.

Barwise, P., & Strong , C. (2002). Permission-based mobile advertising. *Journal of Interactive Marketing,* 16(1), 14-24.

Bauer, H., Falk, T. &Hammerschmidt, M. (2005). Measuring the quality of e-banking portals. *International Journal of Bank Marketing*, 23(2), 153-175.

Belousova, V., & Chichkanov, N. (2015). *Mobile banking adoption in Russia: What incentives matter?Basic Research Program Working Papers Series: Science, Technology, Innovation Economy Wp Brp 48/STI/2015*, 1-25.

Bilgi Teknolojileri ve İletişim Kurumu. (2017). *Pazar verileri raporu.* İstanbul: Author.

Bose, S. B. (2016). Dynamics of firm-level financial inclusion:Empirical evidence from an emerging economy. *Journal of Banking and Finance Law and Practice,* 27(1), 47-68.

Brav, O. (2009). Access to capital, capital structure, and the funding of the firm. *Journal of Finance, 64*(1), 263-308.

Byers, R., & Lederer, P. (2001). Retail bank services strategy: A model of traditional, electronic, and mixed distribution choices. *Journal of Management Information Systems, 18*(2), 133-105.

Cadena, X., & Schoar, A. (2011). Remembering to pay? Reminders vs. financial incentives for loan payments.*Working Paper 17020*.

Casu, B., Ferrari, A., Girardone, C., & Wilson, J. O. (2016). Integration, productivity and technological spillovers: Evidence for eurozone banking industries. *European Journal of Operational Research,* 255(3), 971–983.

Chang-Soo, K., & Davidson, L. F. (2004). The effects of IT expenditures on banks' business performance: Using abalanced scorecard approach. *Managerial Finance,* 30(6), 28-45.

Cho, H., & Pucik, V. (2005). "Relationship between innovativeness, "quality, growth, profitability and market value. *Strategic Management Journal*, *26*(6), 555-575.

Ciciretti, R., Hasan, I., & Zazzara, C. (2009). Do internet activities add value? Evidencefrom the traditional banks. *Journal of Financial Services Research,* 35(1), 81-98.

Claessens , S., Dobos, G., Klingebiel, D., Laeven, L. (2013). The growing importance of networks in finance and its effects on competition. In Innovations in Financial and Economic Networks.(pp.109-134). The World Bank.

Claessens, S., Demirguc-Kunt, A., & Huizinga, H. (2001). How does foreign entry affect domestic banking markets? *Journal of Banking and Finance, 25*, 891-911.

Claessens, S., Glaessner, T., & Klingebiel, D. (2001). E-finance in emerging markets: Is leapfrogging possible? *Financial Markets, Institutions & Instruments*, 11(1), 1-125.

Claessens, S., Glaessner, T., & Klingebiel, D. (2002). Electronic finance: reshaping the financial landscape around the world. *Journal of Financial Services Research*, 22(1), 29-61.

Clarke, I. (2001). Emerging value propositions for m-commerce. *Journal of Business Strategies,* 18(2), 133-148.

Coelho, F., & Easingwood, C. (2003). Multiple channel structures in financial services: A framework. *Journal of Financial Services Marketing,* 8(1), 22-34.

Crabbe, M., Standing, C., Standing, S. & Karjaluoto, H. (2009). An adoption model for mobile banking in Ghana. *International Journal of Mobile Communications*, 7(5),515-543.

Cruz, P., Neto, L. B., Muñoz-Gallego, P., & Laukkanen, T. (2010). Mobile banking rollout in emerging markets, evidence from Brazil. *The International Journal of Bank Marketing,* 28(10), 342-371.

Daghfous, N., & Toufaily, E. (2007). The adoption of "E-banking" by Lebanese banks: Success and critical factors. *International Journal of E-Services and Mobile Applications,DOI: 10.4018/jesma.2009010105*

Dandapani, K. (2017). Electronic finance – recent developments. *Managerial Finance*, 43(5), 614-626.

Dandapani, K., Lawrence, E., & Rodriguez, J. (2016). Determinants of transactional internet banking. *Journal of Financial Services Research*, 1-25.

Dasgupta, S., Paul, R., & Fuloria, S. (2011). Factors affecting behavioral intentions towards mobile banking usage: Empirical evidence from India. *Romanian Journal of Marketing, 3*(1), 6-28.

Demirel, A. C. (2017). Dijital bankacılık ve Türkiye'deki mevcut durumunun analizi. *Master's thesis, Başkent Üniversitesi Sosyal Bilimler Enstitüsü*.

Demirguc-Kunt, A., & Klapper, L. (2012). Measuring financial inclusion. *Policy Research Working Paper, World Bank, 6025*, 1-58.

DeYoung, R. (2007). How the Internet affects output and performance at community banks. *J Bank Finance, 31*(4), 1033-1060.

DeYoung, R., & Rice, T. (2004). Noninterest income and financial performance at U.S. commercial banks. *Financial Review, 39*(1), 101–127.

Drake, L., & Hall, M. (2003). Efficiency in Japanese banking: An empirical analysis. *Journal of Banking and Finance,* 27(5), 891–917.

Faulkender, M., & Petersen, M. A. (2006). Does the source of capital affect capital structure? *Review of Financial Studies, 19*(1), 45-79.

Furst, K., Lang, W. W., & Nolle, D. E. (2002). Internet banking. *Journal of Financial Services,* 22(1), 95-117.

Giannetti, M. (2003). Do better institutions mitigate agency problems? Evidence from corporate finance choices. *Journal of Financial and Quantitative Analysis, 38*(1), 185-212.

Hakimi, A., Hamdi, H., & Djelassi, M. (2012). Modelling non-interest income at Tunisian banks. *Asian Economic and Financial Review*, 88-99.

Hanafizadeh, P. B. (2014). Mobile-banking adoption by Iranian bank clients. *Telematics and Informatics, 25*(2), 62-78.

Hannan, T., & McDowell, J. (1984). The determinants of technology adoption: The case of the banking firm. *RAND Journal of Economics,* 15(3), 328-335.

Hasan , I., & Marton, K. (2003). Development and efficiency of the banking sector in a transitional economy: Hungarian experience. *Journal of Banking & Finance, 27*(12), 2249-2271.

Hernández-Murillo, R. L. (2010). Strategic online banking adoption. *Journal of Banking and Finance*, 1650-1663.

Hernando, I., & Nieto, M. J. (2007). Is the Internet delivery channel changingbanks' performance? The case of Spanish banks. *Journal of Banking & Finance*, 31(4), 1083-1099.

Im, K. P. (2003). Testing for unit roots in heterogeneous panels. *Journal of Econometrics*, 115(1), 53-74.

Isik, I., & Hassan, M. (2002). Technical, scale and allocative efficiencies of Turkish banking industry. *Journal of Banking and Finance*, 26(4), 719-766.

James P. Dow, J. (2007). The adoption of web banking at credit unions. *The Quartly Review of Economics and Finance,* 47(3), 435-448.

Kerem, K. (2003). *Adoption of electronic banking: Underlying consumer behaviour and critical success factors: Case of Estonia.*Retrieved from www.ise.ac.uk: www.ise.ac.uk/../kerem.pdf.

Klein, M. M. (2011). Mobile banking and financial inclusion: The regulatory lessons. *Policy Research Working Paper, 5664*.

Koenig-Lewis, N., Hanmer-Lloyd, S. N., & Ward, P. (2010). Adoption of internet banking services in China: Is it all about trust? *International Journal of Bank Marketing*, 28(1), 7-26.

Kumar, A., & Gupta, H. (2009). branchless banking and financial inclusion. *Silicon India, 12*(8), 40-42.

Kumar, N., Mathur, A., & Lal, S. (2013). Banking 101: Mobile-izing financial inclusion in an emerging India. *Bell Labs Technical Journal, 17*(4), 37-42.

Kundu, S., & Datta, S. (2012). A comparative evaluation of customer perception and satisfaction of M-banking and I-banking. *Journal of Transnational Management, 17*(2), 118-136.

Kuo, Y.-F., & Chen, P.-C. (2006). Selection of mobile value-added services for system operators using fuzzy synthetic evaluation. *Expert Systems with Applications, 30*(4), 612-620.

Laukkanen, T. (2007). Internet vs mobile banking:Comparing customer value perceptions. *Business Process Management Journal, 13*(6), 788-797.

Laukkanen, T., & Lauronen, J. (2005). Consumer value creation in mobile banking services. *International Journal of Mobile Communications, 3*(4), 325-338.

Laukkanen, T., & Pasanen, M. (2008). Mobile banking innovators and early adopters: How they differ from other online users? *Journal of Financial Services Marketing,* 13(2), 86-94.

Lee, K., Lee, H., & Kim, S. (2007). Factors influencing the adoption behavior of mobile banking: A South Korean perspective. *Journal of Internet Banking and Commerce, 12*(2), 1-9.

Levin, A., Lin, C., & Chu, C. (2002). Unit root tests in panel data: Asymptotic and finite-sample properties. *Journal of Econometrics,* 108(1), 1-24.

Levine, R. (1996). *Foreign banks, financial development, and economic growth.* Washington, D.C: AEI Press.

Lewis, N., Palmer, A., & Moll, A. (2010). Predicting young consumers' take up of mobile banking services. *International Journal of Bank Marketing*, 28(5), 410-432.

Lin, H. (2010). An empirical investigation of mobile banking adoption: The effect of innovation attributes and knowledge-based trust. *International. Journal of Information Management*, 31(3), 252–260.

Luarn, P. a. (2005). Toward an understanding of the behavioral intention to use mobile banking. *Computers in Human Behaviour, 21*(6), 873-891.

Luo, D., Dong, Y., Armitage, S., & Hou, W. (2015). The impact of foreign bank penetration on the domestic banking sector: New evidence from China. *The European Journal of Finance*, 1-29.

Luo, X. L. (2010). Examining multi-dimensional trust and multifaceted risk in initial acceptance of emerging technologies: An empirical study of mobile banking services. *Decision Support Systems, 49*(2), 222-234.

Matos, J. C. (2010). Measuring the evolution of monetary and finance services in Portugal. *IFC Bulletin, 33*, 283-296.

Merwin, R. (2015). *Cracking the rural code.* Hindu Business Line. Retrieved from http://www.thehindubusinessline.com/ features/cracking-the-rural-code/article6757365.ece

Micco, A., Panizza, U., & Yan˜ez, M. (2007). Bank ownership and performance. Does politics matter? *Journal of Banking and Finance,* 31(1), 219-241.

Miller, S., & Noulas, A. (1996). The technical efficiency of large bank production. *Journal of Banking and Finance,* 20(3), 495-509.

Mittal, B., & Lassar, W. (1998). Why do customers switch? The dynamics of satisfaction versus loyalty. *Journal of Services Marketing, 12*(3), 177-194.

Ndung'u , N. (2011). Governor Central Bank of Kenya in his speech during the Launch of the Mobile Pay Tangaza E-Commerce and Money Transfer Service.Retrieved from //www.centralbank.go.ke/downloads/speeches/2011/Tanganza%20ECommerce%20Jan%2024.pdf

Oliveira P., V. H. (2011). Users as service innovators: The case of banking services. *Research Policy, 40*(6), 806-818.

Onay, C., & Ozsoz, E. (2012). The impact of internet-banking on brick and mortarbranches: The case of Turkey. *Journal of Financial Services Research*. 44(2), 187-204.

Onay, C., & Ozsoz, E. (2013). The impact of internet-banking on brick and mortarbranches: The case of Turkey. *The Journal of Financial Services Research*, 44(2), 187-204.

Pala, E., & Kartal, B. (2010). Banka müşterilerinin internet bankacılığı ile ilgili tutumlarına yönelik bir araştırma. *Yönetim ve Ekonomi*, 17(2), 43-61.

Peterson, B., Welch, L., & Liesch, W. (2002). The internet and foreign market expansion by firms. *Management International Review, 42*(2), 207-221.

Porteous, D. (2006). The enabling environment for mobile banking in Africa, londonRetrieved from http://www.bankablefrontier.com/assets/ee.mobil.banking.report.v3.1.pdf

Porteous, D. (2007). Just how transformational is Mbanking?Retrieved from http://www.microfinancegateway.org/sites/ default/files/mfg-en-paper-just-how-transformational-ism- banking-feb-2007

Puschel, J., Mazzon, J. A., & Hernandez, J. C. (2010). Mobile banking: Proposition of an integrated adoption intention framework. *International Journal of Bank Marketing,* 28(5), 389-409.

Rahmani, F. (2008). A Call for innovation. *IEEE Pervasive Computing.*

Ratten, V. (2011). Social cognitive theory in mobile banking innovations. *International Journal of E-Business Research,* 7(1), 39-51.

Riivari, J. (2005). Mobile banking: A powerful new marketing and CRM tool for financial services companies all over Europe. *Journal of Financial Services Marketing, 10*(1), 11–20 .

Riquelme, H. E., & Rios, R. E. (2010). The moderating effect of gender in the adoption of mobile banking. *The International Journal of Bank Marketing, 28*(5), 328-341.

Rogers, K., & Sinkey, J. (1999). An analysis of nontraditional activities at US commercial banks. *Review of Financial Economics,* 8(1), 25-29.

Saleem, Z., & Rashid, K. (2011). Relationship between customer satisfaction and mobile banking adoption in Pakistan. *International Journal of Trade, Economics and Finance,* 2(6), 539-540.

Sensarma, Rudra. (2006). Are foreign banks always the best? Comparison of state-owned, private and foreign banks in India. *Economic Modelling*, 23(4), 717-735.

Shaikh, A. A., & Karjaluoto, H. (2015). Mobile banking adoption: A literature review. *Telematics and Informatics*, 32(1), 129-142.

Shaikh, A. A., Karjaluoto, H., & Chinje, N. B. (2015). Consumers' perceptions of mobile banking continuous usage in Finland and South Africa. *International Journal of Electronic Finance,* 8(2), 1-20.

Sheng, M. L., & Teo, T. S. (2012). Product attributes and brand equity in the mobile domain: The mediating role of customer experience. *International Journal of Information Management , 32*(2), 139-146.

Shih, K.-H., & Lin, C.-Y. (2015). Is mobile banking a competitive weapon? . *International Journal of Electronic Finance,* 8(2), 1-20.

Simpson, J. (2002). The impact of the ınternet in banking: Observations and evidence from developed and emerging markets. *Telematics and Informatics, 19*(4), 315-330.

Simuchimba, K. (2012). Exploring information seeking behaviour of users of self service banking technologies in Zambia. *Master of Arts in Library and Information, The University of Zambia*, 12-13.

Singh, P. (2007). Determinants of internet banking adoption by banks in India. *Internet Research*, 17(3), 323-339.

Suoranta, M., & Mattila, M. (2004). Mobile banking and consumer behaviour: New insights into the diffusion pattern. *Journal of Financial Services Marketing, 8*(4), 354–366.

Tan, M., & Teo, T. S. (2000). Factors influencing the adoption of internet banking. *Journal of the Association for Information Systems*, 9(3), 4-5.

Thakur, R. (2014). What keeps mobile banking customers loyal? *International Journal of Bank Marketing,* 32(7), 628-646.

Tiwari, R., & Buse, S. (2007). The mobile commerce prospects: A strategic analysis of opportunities in the banking sector. *Hamburg University Press*.

Tiwari, R., Buse, S., & Herstatt, C. (2006). Customer on the move: Strategic implications of mobile banking for banks and financial enterprises. *Proceedings of the 8th IEEE International Conference on E-Commerce Technology and the 3rd IEEE International Conference on Enterprise Computing, E-Commerce, and E-Services (CEC/EEE'06)*.

Unite, A., & Sullivan, M. (2003). The effect of foreign entry and ownership structure on the Philippine domestic banking market. *Journal of Banking and Finance,* 27(12), 2323-2345.

Van der Boor, Oliveira, P. &Veloso, F.M. (2014). Users as innovators in developing countries: The global sources as innovation and diffusion in mobile banking services. *Research Policy*, *43*(9), 1594-1607.

Veronika, B., & Nikolay, C. (2015). Mobile banking adoption in Russia: What incentives matter? *Basıc Research Program Workıng Papers Series: Science, Technology, Innovation Economy Wp Brp 48/STI/2015*.

Vesala, J. (2000). Technological transformation and retail banking competition: Implications and measurement. *Bank of Finland Studies*.

Wambari, P. A. (2009). Mobile banking in developing countries. A case study on Kenya. *Unpublished Master's Thesis Vaasan Ammattikorkeakoulu*.

Wang, G., Nie, G., Zhang, P., & Shi, Y. (2009). Personal financial market segmentation based on clustering ensembles. *Proceedings of the WRI World Congress on Computer Science and Information Engineering*, 694-698.

Wonglimpiyarat, J. (2014). Competition and challenges of mobile banking: Asystematic review of major bank models in the Thai banking industry. *Journal of High Technology Management Research*, 25(2), 123-131.

Zhou, T., Lu, Y., & Wang., B. (2010). Integrating TTF and UTAUT to explain mobile banking user adoption. *Computers in Human Behavior, 26*(4), 760-767.