Determinants of Internet Banking Adoption in Turkey[1]

Türkiye'de İnternet Bankacılığı Kullanımının Belirleyicileri

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Abstract: This study analyses individual-level determinants of internet banking adoption of customers in Turkey. Using a nationally representative household survey data, logistic regression models are estimated for quantification of the factors which influence consumer's decision of internet banking adoption. Empirical results indicate that females are less likely to use internet banking compared to males in Turkey. Education level, being employed, household income level, frequency, variety and skill levels of internet usage have significantly positive associations with likelihood of using internet banking services. Additionally, age demonstrates a non-linear association with the use of internet banking. Middle-aged Turkish citizens are more likely to employ internet banking tools compared to the young and the elderly. Hence, we conclude that the digital divide exists in the Turkish case and elimination of disparities in technology adoption has the potential to bring substantial benefits to the financial system in Turkey.

Keywords: Internet Banking, Gender, Logistic Regression Models, Turkey, Digital Divide
JEL Classification: G21, J10, C13, O31, 050

Öz: Bu çalışma, Türkiye'de müşterilerin internet bankacılığı kullanımının bireysel düzeydeki belirleyicilerini incelemektedir. Müşterinin internet bankacılığını kullanma kararını etkileyen faktörlerin ölçülmesi için ulusal temsil gücü yüksek bir hane halkı anketi verileri kullanılarak lojistik regresyon modelleri tahmin edilmektedir. Ampirik sonuçlar, Türkiye'de kadınların internet bankacılığı kullanma olasılığının erkeklere kıyasla daha az olduğunu göstermektedir. Eğitim düzeyi, çalışıyor olma, hanehalkı gelir düzeyi, internet kullanımının sıklığı, çeşitliliği ve beceri düzeyi, internet bankacılığı hizmetlerini kullanma olasılığı ile pozitif ilişkilidir. Ek olarak, yaş seviyesi internet bankacılığı kullanımıyla doğrusal olmayan bir ilişkiye sahiptir. Orta yaşlı Türk vatandaşlarının genç ve yaşlılara kıyasla internet bankacılığı araçlarını kullanma olasılıkları daha yüksektir. Dolayısıyla, dijital uçurumun Türkiye örneğinde var olduğu ve teknoloji kullanma konusundaki eşitsizliklerin giderilmesinin Türkiye'deki finansal sisteme önemli faydalar sağlama potansiyeline sahip olduğu sonucu ortaya çıkmaktadır.

Anahtar Kelimeler: İnternet Bankacılığı, Toplumsal Cinsiyet, Lojistik Regresyon Modelleri, Türkiye, Dijital Uçurum
JEL Sınıflandırması: G21, J10, C13, O31, 050

1. Introduction

The fast paced development of information and communication technologies (ICT) have transformed both business operations and customer experience in a wide array of sectors in recent years. One of the more heavily influenced industries has been the financial services sector. In this respect, since the second half of 1990s, internet banking has emerged as a useful financial service tool for both banks and their customers. Through the internet banking provision, banks can offer faster and improved services to reduce their operational costs (Xue et al., 2011). Customers can manage different financial activities such as transferring funds, paying bills, using financial investment and check services, and checking their account information (Tan and Teo, 2000).

Provision of online banking services by financial institutions and adoptions by customers have demonstrated a vast variation in different countries (Hanafizadeh et al., 2014; Shaikh and Karjaluoto, 2015). In Turkey, a developing country, banks competitively started to offer internet banking services in 1997 in a business environment where e-commerce use, financial sector deregulation, demand for alternative financial services, and computer literacy had been increasing (Celik, 2008). Introduction of internet banking services have implications on business performances and customer satisfaction. Researchers reveal that internet banking adoption is positively associated with deposit collection, lending and performance of banks whereas it may have negative impact on profits due to increasing competition and lowering interest rates in Turkey (Onay and Ozsoz, 2013). Currently, Turkish consumers are able to do almost all financial transactions through internet banking. Nonetheless, only 30% of the population actively used internet banking in Turkey during 2016 (TSI, 2016). The rate of Turkish customer participation in online banking is far below the European Union figures. Thus, understanding behaviour and characteristics of customers will be crucial for both agent of banking sector and governments to design policies for extending use of internet banking throughout Turkey as well as other developing countries. This study contributes to literature by providing an empirical analysis of customer characteristics for adopting internet banking by utilizing a nationally representative, large and recent data set from Turkey.

This paper examines determinants of internet banking adoption in Turkey by focusing on the digital gender gap. We employ Information and Communication Technology (ICT) Usage Survey of 2016, (conducted by the Turkish Statistical

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Institute (TSI)) to construct individual level data set of the study. The logistic regression models are used for estimation and quantification of the factors influencing internet banking use for full sample and sub-samples with respect to gender. We find that internet banking is less likely to be adopted by female consumers. Other significant determinants of internet banking adoption decision in Turkey are age, household income, internet use characteristics, employment status, and education level. Trust in internet enhances probability of internet banking adoption for only males. The paper proceeds as follows: section 2 presents background and research hypotheses, section 3 introduces data and methodology, section 4 discusses empirical results, and section 5 presents conclusion.

2. Related Literature and Research Hypotheses

In this section we discuss the related literature which analyses the predictors of internet banking adoption. There are studies that combine technology acceptance model (TAM), theory of planned behaviour (TPB), and unified theory of acceptance and use of technology (UTAUT) to examine factors influencing internet banking usage in different countries (Celik, 2008; Foon and Fah, 2011; Martins et al., 2014; Nasri and Charfeddine, 2012; Ozdemir and Trott, 2009; Ozdemir et al., 2008; Yuen et al., 2010).

Perceived usefulness, security, perceived ease of use, trust, and perceived risk are emphasized as critical consumer perception indicators influencing internet banking adoption behaviour. Nevertheless, there is not any consensus on the issue due to differences in empirical methods, samples of interest and methodology (Akinci et al., 2004; Celik, 2008; Foon and Fah, 2011; Gerrard and Cunningham, 2003; Zhao et al., 2010; Martins et al., 2014; Namahoot and Laohavichien, 2018; Nasri and Charfeddine, 2012; Onar et al., 2010; Ozdemir and Trott, 2009; Ozdemir et al., 2008; Polasik and Wisniewski, 2009; Sathye, 1999; Yadav et al., 2015; Yousafzai and Yani-de-Soriano, 2012; Yuen et al., 2010). Since ICT Usage Survey of Turkey has limited number of questions and does not cover information on consumer perceptions, this study focuses on sociodemographic characteristics and internet usage habits of Turkish individuals as predictors of internet banking use.

Gender is an essential demographic variable affecting customers' internet banking decision (Akinci et al., 2004; Polasik and Wisniewski, 2009; Riquelme and Rios, 2010; Yousafzai and Yani-de-Soriano; 2012). Yousafzai and Yani-de-Soriano (2012) argue that while male consumers pay more attention to usefulness of internet banking whereas female consumers care more about ease of use for internet banking. Riquelme and Rios (2010) observe that ease of use and social norms are more important for females compared to males, whereas relative advantage of service usefulness is more important for males. A common finding of the literature suggests that males show a higher tendency to adopt internet banking services. For instance, in a study of Turkish consumers, Akinci et al. (2004) report that majority of internet banking users is are males. Consistent with earlier findings, research hypothesis 1 of this paper is formulated as follows:

Hypothesis 1: Turkish females are less likely to use internet banking compared to Turkish males.

Age is analysed as a determinant of consumer's approach towards internet banking use. Polatoglu and Ekin (2001) argue that young customers are more likely to use internet banking, whereas Akinci et al. (2004) find that middle-aged people favour internet banking services more compared to other age groups. Furthermore, Yousafzai and Yani-de-Soriano (2012) indicate that there may be heterogeneity among different age groups in their perceptions for internet banking adoption. For instance, while perceived usefulness is a stronger factor for young customers, perceived ease of use may be more important for older customers. Older generations in Turkey has less engagement with technology compared to younger individuals.

The non-linear relationship between internet banking adoption and age is also examined by other studies. Camilleri and Grech (2017) find that while young and middle-aged customers dominantly use internet banking services the majority of old generation do not engage in using online financial services in Malta. The young users generally carry out simple tasks online such as procuring account statements or transferring funds. On the other hand, middle-aged customers prefer to use a wider variety of online banking services. Similarly, Matilla et al. (2003) and Abdinoor and Mbamba (2017) conclude that the majority of internet banking users are middle-aged in samples of Finnish and Tanzanian customers, respectively. Alwan and Al-Zubi (2016) argue that young and middle-aged people more likely adopt online banking services in Jordan. Therefore, this paper considers the possibility of a non-linear relationship between age and internet banking usage. The related research hypothesis is formulated as the following:

Hypothesis 2: There is a non-linear relationship between age and internet banking usage in Turkey.

A positive relationship between education and internet banking usage is reported by majority of the literature (Nasri and Charfeddine, 2012; Polasik and Wisniewski, 2009; Yadav et al., 2015). Educated individuals are more likely to be informed about online tools and tend to have higher skills of technology use. Hence, in line with earlier findings, the research hypothesis is given below:

Hypothesis 3: There is a positive correlation between education level and internet banking use in Turkey.

Considering the impacts of employment status and income on internet banking adoption, the literature proposes strong evidence that internet banking adopters are mainly employed and also earn higher incomes compared to non-

adopters (Polatoglu and Ekin, 2001; Ozdemir and Trott, 2009; Ozdemir et al., 2008; Patsiotis et al., 2012). Based on literature findings, hypotheses for associations of employment status and income on internet banking usage are formulated as follows:

Hypothesis 4: There is a positive relationship between being employed and internet banking use in Turkey.

Hypothesis 5: Household income displays a positive association with internet banking adoption among Turkish consumers.

Adoption of internet banking services usually requires certain levels of technology friendliness and internet knowledge. Thus, consumers who use internet more frequently and for a higher variety of tasks would be more likely to use internet banking services (Akinci et al., 2004; Boyacioglu et al., 2010; Celik, 2008; Foon and Fah, 2011; Gerrard and Cunningham, 2003; Martins et al., 2014; Mzoughi and M'Sallem, 2014; Polatoglu and Ekin, 2001; Onar et al., 2010; Ozdemir and Trott, 2009; Ozdemir et al., 2008; Patsiotis et al., 2012; Sathye, 1999; Sayar and Wolfe, 2007; Yadav et al., 2015; Yousafzai and Yani-de-Soriano, 2012). Moreover, there are studies which find that technology skills and trust in internet positively and significantly affect internet banking adoption decision of consumers (Akinci et al., 2004; Celik, 2008; Foon and Fah, 2011; Gerrard and Cunningham, 2003; Zhao et al., 2010; Martins et al., 2014; Namahoot and Laohavichien, 2018; Nasri and Charfeddine, 2012; Onar et al., 2010; Onay et al., 2008; Ozdemir and Trott, 2009; Ozdemir et al., 2008; Polasik and Wisniewski, 2009; Sathye, 1999; Sayar and Wolfe, 2007; Yadav et al., 2015; Yousafzai and Yani-de-Soriano, 2012; Yuen et al., 2010). The corresponding research hypotheses on internet usage habits and trust in internet are given below:

Hypothesis 6: Internet usage frequency is positively correlated with internet banking use in Turkey.

Hypothesis 7: There is a positive relationship between internet usage variety and internet banking adoption among Turkish consumers in Turkey.

Hypothesis 8: Internet usage skills are positively associated with internet banking use in Turkey.

Hypothesis 9: Trust in internet displays a positive relationship with internet banking adoption in Turkey.

In this respect, this study aims to complement the existing research by providing an analysis of Turkish consumers' adoption of internet banking. Hence, this paper would be a valuable addition to the literature by providing a thorough empirical analysis for determinants of internet banking usage in an emerging market economy.

3. Data and Methodology

The data set of this paper is obtained from Information and Communication Technology (ICT) Usage Survey of 2016, which is carried out by the Turkish Statistical Institute (TSI). In line with Eurostat's survey of ICT usage in households and by individuals, questionnaire includes information on access and use of ICTs and various online activities of households and individuals in Turkey. TSI provides access to micro level data set for researchers upon request by completion of application and approval process. TSI uses two-stage stratified clustered sampling methodology and systematic selection method to determine the sample of households. The sampling methodology uses NUTS-1 level of European Union classification for regional units. Thus, the sample of the survey is sufficiently representative for Turkey. Statistical unit is the household and data are collected by computer aided personal interviews. This study covers 14,236 adult internet users from 11,874 households in Turkey. However, due to missing observations, operating sample includes 13,508 individuals.

Use of internet banking tools is the dependent variable of this study. Internet banking use is constructed as a binary variable; where 1 represents use of internet banking by the individual and 0 indicates that individual does not utilize internet banking platforms. The corresponding survey question reads: "For which of the following activities did you use the Internet in the last 3 months for private purpose?" If the participant selects "Internet Banking" option, s/he is considered as a user of internet banking.
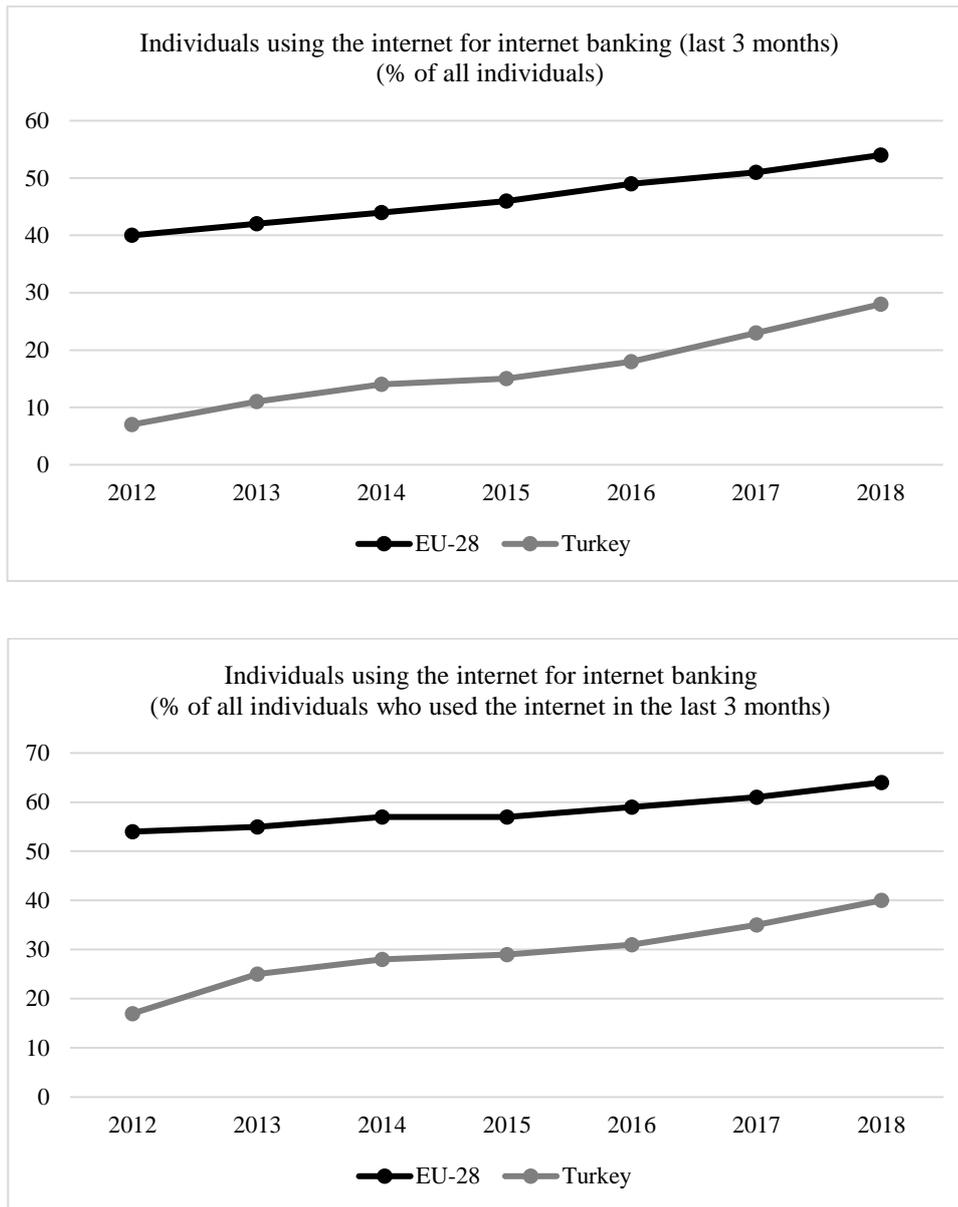
Figure 1. Internet Banking Use in Turkey and European Union
Source: Eurostat, 2019

Figure 1 exhibits trends of internet banking use in European Union (EU) countries and Turkey. Although adoption rates of internet banking by Turkish users have an increasing trend, they fall behind European rates. 40% of all individuals in Europe employed internet banking tools in 2012 whereas only 7% of Turkish citizens used online banking platforms during the same year. Moreover, internet banking usage rates in Europe and Turkey are 54% and 28% of all individuals in 2018, respectively. Similarly, only 40% of internet users employed online banking tools in Turkey whereas this rate for EU countries reads 64% for 2018. Overall, internet banking adoption rates of Turkish citizens are far strikingly lower than European figures.

Demographics, socioeconomic variables and internet use indicators are considered as independent variables. Gender is controlled by an indicator for females. Age, education level, employment status and household income level are included in empirical analysis. Variety and frequency of internet use, trust in internet and internet skills of individuals are measured by indicators obtained from survey questions. Internet usage frequency is measured from 1 (lowest frequency) to 3 (highest frequency) scale by the use of survey question: "What is the Internet usage frequency of internet users in last three months?" based on the following choices: 1- Less than once a week; 2-At least once week; 3-Almost every day. The "internet usage variety" is measured by consideration of many personal online activities of individuals such as using e-mails, video calls, social media, online banking and financial services, e-government services, reading online newspapers, listening music and watching television, videos online, playing online games, searching information for health and education issues, constructing personal websites. The survey includes a "Yes" or "No" question for 25 different categories of online activities. In order to quantify variety of internet usage, this study creates a binary measure for each

category with "Yes" =1 and "No" =0. Then, for each individual the internet usage variety is calculated as the average of 25 categories; which ranges from 0 (lowest variety) to 1 (highest variety). Three questions on participants' knowledge of internet security such as cookies, changing internet security settings and use of security software are used as proxy variables to construct an index for internet usage skills of individuals ranging from 0 to 3. Finally, information sharing behavior of Turkish participants are employed as a binary proxy variable for their trust in internet. Detailed description and summary statistics of all variables used in the analysis are summarized in the Appendix -Table A1 and Table A2. Table 1 reveals information on characteristics of internet banking users and non-users. 30.24% of the operating sample employs online banking platforms. Proportion of males is significantly higher among users of internet banking. Internet banking users are more likely to be older and higher educated. Non-users of internet banking are more likely to be unemployed and earn lower income. Adopters of internet banking display higher frequency, variety and skills of internet use and online trust.

Table 1. Frequency Distributions for Internet Banking Use

	Non-users of Internet Banking		Users of Internet Banking		z-value (*t-value*)
	N	% *(Mean)*	N	% *(Mean)*	
Total	9,423	69.76	4,085	30.24	-
Gender					
Female	4,867	51.65	1,290	31.58	21.51***
Male	4,556	48.35	2,795	68.42	-21.51***
Age	9,423	*34.12*	4,085	*35.33*	*-5.68***
Education Level					
No Diploma	206	2.19	4	0.10	9.00***
Primary School Degree	2,459	26.10	265	6.49	26.08***
Secondary School Degree	2,882	30.58	395	9.67	26.04***
High School Degree	2,588	27.46	1,235	30.23	-3.28***
Associate Degree	560	5.95	530	12.97	-13.75***
Bachelor's Degree	664	7.05	1,367	33.46	-39.44***
Master's Degree	56	0.59	238	5.83	-19.17***
PhD Degree	8	0.08	51	1.25	-9.50***
Employment Status					
Employed	4,045	42.93	3,211	78.60	-38.18***
Not employed	5,378	57.07	874	21.40	38.18***
Household Income (in TLs)	9,423	*2,490.12*	4,085	*4,109.17*	*-34.26***
Internet Usage Frequency					
Less than once a week	683	7.25	42	1.03	14.73***
At least once week	1,508	16.00	103	2.52	22.20***
Almost every day	7,232	76.75	3,940	96.45	-27.80***
Internet Usage Variety	9,423	*0.28*	4,085	*0.48*	*-69.96***
Internet Usage Skills	9,423	*0.35*	4,085	*0.98*	*-41.43***
Trust in Internet	9,423	*0.48*	4,085	*0.74*	*-29.05***

*Source: TSI (2016). Notes: *** p<0.01, ** p<0.05, * p<0.1. t-values and z-values are provided for mean comparison and proportion comparison tests of non-users vs. users, respectively.*

We consider the internet banking use as the dependent variable in regression estimations. It measures the consumer's participation in internet banking activities in the last three months. This indicator is composed as a binary variable where 1 indicates internet banking use and 0 indicates no internet banking use. Among the independent variables, demographic factors such as gender and age of participants are used. As for socioeconomic indicators, education level, employment status and household income are included in the estimations. Beside these demographic and socio-economic factors, estimated regression models control for frequency and variety of internet usage, internet skills, and trust in internet. Thus, we employ binary logistic regression models for empirical estimations. Binary logistic regression models assume that the dependent variable is dichotomous. Logistic regressions do not necessitate linear associations between dependent and independent variables. The error terms of logistic models are not necessarily normally distributed and they may display heteroscedasticity. Logistics regressions require large sample sizes and little multicollinearity among explanatory variables. The current study considers a large sample but multicollinearity among independent variables may be

considered as a limitation since the regression models include both age and its non-linear form. In order to account for heteroscedasticity issue, regression models are estimated with heteroscedasticity consistent standard errors.

4. Empirical Results

First, we estimate the model for the full sample and include gender as a control variable as described above. Then, the model is estimated for male sample and female sample separately to analyse potential gender differences in determinants of online banking adoption. Estimation results of binary logit models of internet banking use are given in Table 2. Wald test results indicate that all models are overall significant. Estimated with heteroscedasticity consistent standard errors, pseudo R^2 for full sample model of internet banking use in Turkey reads 39.2%.

Table 2. Logistic Regression Results for Internet Banking Use

	Full Sample		Females		Males	
	Coefficients	*Odds Ratio*	*Coefficients*	*Odds Ratio*	*Coefficients*	*Odds Ratio*
Female	-0.779***	0.459***	-	-	-	-
	(0.0589)	(0.0270)	-	-	-	-
Age	0.164***	1.178***	0.114***	1.121***	0.215***	1.240***
	(0.0136)	(0.0160)	(0.0244)	(0.0273)	(0.0177)	(0.0220)
Age^2	-0.00183***	0.998***	-0.00121***	0.999***	-0.00248***	0.998***
	(0.000180)	(0.000180)	(0.000337)	(0.000337)	(0.000232)	(0.000231)
Education Level	0.430***	1.537***	0.423***	1.526***	0.411***	1.508***
	(0.0214)	(0.0329)	(0.0342)	(0.0522)	(0.0268)	(0.0404)
Employed	0.945***	2.573***	1.214***	3.369***	0.630***	1.877***
	(0.0630)	(0.162)	(0.0886)	(0.298)	(0.0911)	(0.171)
Household Income	0.0788***	1.082***	0.0411***	1.042***	0.152***	1.164***
	(0.0149)	(0.0161)	(0.0133)	(0.0138)	(0.0196)	(0.0228)
Internet Usage Frequency	0.509***	1.663***	0.559***	1.750***	0.483***	1.621***
	(0.0762)	(0.127)	(0.153)	(0.268)	(0.0886)	(0.144)
Internet Usage Variety	6.322***	556.8***	6.967***	1,061***	5.885***	359.6***
	(0.210)	(116.8)	(0.359)	(380.7)	(0.258)	(92.79)
Internet Usage Skills	0.161***	1.175***	0.115**	1.122**	0.172***	1.188***
	(0.0301)	(0.0354)	(0.0513)	(0.0575)	(0.0374)	(0.0445)
Trust in Internet	0.242***	1.274***	0.151	1.163	0.289***	1.336***
	(0.0561)	(0.0715)	(0.0957)	(0.111)	(0.0691)	(0.0924)
Constant	-9.985***	0.000046***	-10.17***	0.000038***	-10.59***	0.000025***
	(0.323)	(0.000015)	(0.601)	(0.000023)	(0.399)	(0.00001)
Wald: χ^2	3,384.82***	-	1,403.76***	-	1,864.25***	-
Pseudo R^2	0.392	-	0.404	-	0.360	-
Observations	13,508	-	6,157	-	7,351	-

Source: TSI (2016). Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Empirical findings reveal that there are gender differences in adoption of internet banking in Turkey. Turkish females are 45.9% less likely to use internet banking compared to their male counterparts. These results are consistent with literature (Akinci et al., 2004; Polasik and Wisniewski, 2009; Riquelme and Rios, 2010; Yousafzai and Yani-de-Soriano, 2012) and support Hypothesis 1.

Estimation results suggest that coefficient of age is significantly positive whereas age-square has a significantly negative coefficient. Thus, age and internet banking adoption demonstrates a non-linear, inverse U-shaped, relationship. Middle-aged participants are more likely to employ online banking tools compared to the young and the elderly in Turkey. The non-linear relationship between age and online banking use is robustly present in both male and female samples. These findings are consistent with literature and support Hypothesis 2.

Results given by Table 2 imply that education level is positively correlated with use of internet banking platforms in Turkey. Obtaining a higher level of diploma is associated with 53.7% increase in probability of using internet banking in the full sample. This finding extends to both male and female sub-samples of the study. Similar to earlier findings, results of this study supports Hypothesis 3.

Employment and internet banking use are positively associated in Turkey. Empirical observations of this study, in column 1 of Table 2, implies that employed Turkish individuals are 2.5 times more likely to use online banking tools compared to individuals who are not employed in 2016. Relationship between employment and internet banking use is stronger in female sample. Employed females are 3.3 times more likely to use internet banking compare to females who are not employed. However, employed Turkish males are only 1.8 times more likely adopt online banking compared to other males. Similarly, household income level and internet banking use demonstrate positive correlations in all estimated

models. Higher household income levels are associated with higher probabilities of adopting online banking in Turkey. These findings are consistent with earlier literature and support Hypotheses 4 and 5.

The empirical analysis indicates that internet usage frequency is positively associated with internet banking adoption of Turkish individuals. More frequent users of internet are more likely to use online banking platforms in Turkey. Consistent with literature (Akinci et al., 2004; Boyacioglu et al., 2010; Celik, 2008; Foon and Fah, 2011; Gerrard and Cunningham, 2003; Martins et al., 2014; Mzoughi and M'Sallem, 2014; Polatoglu and Ekin, 2001; Onar et al., 2010; Ozdemir and Trott, 2009; Ozdemir et al., 2008; Patsiotis et al., 2012; Yadav et al., 2015; Yousafzai and Yani-de-Soriano, 2012; Yuen et al., 2010), this result supports Hypothesis 6. A higher level of internet use frequency enhances probability of internet banking use by 66.3% in full sample and 75% in female sample. Additionally, internet usage variety of individuals is directly correlated with use of online banking tools in Turkey. Individuals who utilize internet for more various purposes are more likely to employ internet banking technologies. This finding supports Hypothesis 7 and it is in line with earlier research. Associations of internet usage variety with adoption of online banking is stronger in female sample. Females with higher levels of internet use variety are thousand times more likely to use online banking services. Next, internet usage skills of Turkish individuals are positively related with online banking use. A higher level of internet skills is associated with 17.5% increase in likelihood of internet banking use for the full sample. Sub-sample estimations also report similar results for males and females. Supporting Hypothesis 8, these results confirm previous findings. Finally, trust in internet displays positive correlations with use of online banking tools in Turkey for the full sample. Individuals who trust in internet for sharing their private information are 27.4% more likely to utilize internet banking. This result supports Hypothesis 9 and confirms earlier literature findings. However, estimations for females indicate that adoption of internet banking is not associated with trust in internet. Unlike females, males who display higher levels of trust are more likely to adopt internet banking.

5. Conclusion

Gender gaps in technology uses are frequently documented by researchers. Although Turkish financial sector has been offering a wide range of online banking services, internet banking usage in Turkey has remained much lower than the European Union average in recent years. Furthermore, as of 2016, less than 32% of internet banking adopters are females in Turkey. This study investigates determinants of internet banking adoption at individual level in Turkey with a focus on gender differences. A nationally representative household survey data from ICT survey of Turkey and binary logistic regression models are used to carry out empirical analysis.

This study provides an insightful analysis of the digital divide in internet banking adoption in Turkey. Empirical results indicate that there exists a gender gap in adoption of online banking in Turkey. Turkish females are less likely to use online banking compared to Turkish males. Internet usage frequency, internet usage variety, internet usage skills, household income, being employed and education are positively associated with internet banking adoption in Turkey. These results are generally in line with related literature. Age level has a non-linear relationship with online banking use. There exists an inverse U-shaped relationship between internet banking usage and age. Middle-aged individuals are more likely to use online banking tools compared to the young and the elderly. All these determinants of online banking use are confirmed by full sample estimations as well as female and male samples of Turkey. However, trust in internet is not a predictor of online banking adoption for Turkish females. Turkish males' trust in internet positively correlates with internet banking use.

Results of this study have useful implications to policy makers and financial sector actors in the area of financial inclusion. While the internet based service tools have potential to generate mutual benefits for providers and users, online banking adoption displays significant gender gap in Turkey. Reduction of gender gap in use of internet banking tools would lead significant efficiency gains in financial sectors of Turkey as an emerging economy. Turkish financial service providers and practitioners should design and implement appropriate policies to attract more female customers to adopt internet banking. Researchers also argue that financial inclusion rises with age, since middle age people can have more knowledge about banking and financial services, until it reaches a certain "saturation" middle age, and declines in older ages (Abel et al., 2018; Akinci et al., 2004). In this respect, in Turkey policy makers and financial sector actors can cooperate to design strategies to increase adoption of internet banking services by females, the young and the elderly. This would improve performances of domestic banking and financial sector and lead to a higher degree of financial inclusion. In particular, Turkish banking system should employ a variety of strategies with respect to socio-demographic characteristics of the population, especially gender and age, to increase adoption rates of online banking. One-fit-all policies and applications should be avoided and policies targeting specific sub-samples of the population should be applied. Future research can focus on identifying reasons and mechanisms leading to gender gap in adoption of internet banking use, which would help with reducing the digital divide in use of online financial services.

REFERENCES

Abdinoor, A., and Mbamba, U. O. (2017). "Factors influencing consumers' adoption of mobile financial services in Tanzania", *Cogent Business & Management*, Vol. 4 No. 1, 1392273.

Abel, S., Mutandwa, L., and Le Roux, P. (2018). "A review of determinants of financial inclusion", *International Journal of Economics and Financial Issues*, Vol. 8 No. 3, 1-8.

Akinci, S., Aksoy, S. and Atilgan, E. (2004), "Adoption of internet banking among sophisticated consumer segments in an advanced developing country", *International Journal of Bank Marketing*, Vol. 22 No. 3, pp.212-232.

Alwan, H. A., & Al-Zubi, A. I. (2016). "Determinants of internet banking adoption among customers of commercial banks: an empirical study in the Jordanian banking sector", *International Journal of Business and Management*, Vol. 11 No 3, 95-104.

Boyacioglu, M.A., Hotamis, T.N. and Cetin, H. (2010), "An evaluation of Internet banking in Turkey", *Journal of Internet Banking and Commerce*, Vol. 15 No. 2, pp.1-32.

Camilleri, S. J., & Grech, G. (2017). "The relevance of age categories in explaining internet banking adoption rates and customers' attitudes towards the service", MPRA Paper No. 77745.

Celik, H. (2008), "What determines Turkish customers' acceptance of internet banking?", *International Journal of Bank Marketing*, Vol. 26 No. 5, pp.353-370.

Foon, Y. S. and Fah, B. C. Y. (2011), "Internet banking adoption in Kuala Lumpur: an application of UTAUT model", *International Journal of Business and Management*, Vol. 6 No. 4, pp.161-167.

Gerrard, P. and Cunningham, J. B. (2003), "The diffusion of internet banking among Singapore consumers", *International Journal of Bank Marketing,* Vol. 21 No. 1, pp.16-28.

Hanafizadeh, P., Keating, B. W. and Khedmatgozar, H. R. (2014), "A systematic review of Internet banking adoption", *Telematics and Informatics,* Vol. 31 No. 3, pp. 492-510.

Martins, C., Oliveira, T. and Popovič, A. (2014), "Understanding the Internet banking adoption: A unified theory of acceptance and use of technology and perceived risk application", *International Journal of Information Management,* No. 34 Vol. 1, pp. 1-13.

Matilla, M., Karjaluoto, H. and Pento, T. (2003) "Internet banking adoption among mature customers: early majority or laggards?", *Journal of Services Marketing,* Vol 17, No. 5, pp.514–528.

Mzoughi, N. and M'Sallem, W. (2013), "Predictors of internet banking adoption: Profiling Tunisian postponers, opponents and rejectors", *International Journal of Bank Marketing,* Vol. 31 No. 5, pp. 388-408.

Namahoot, K. S. and Laohavichien, T. (2018), "Assessing the intentions to use internet banking: The role of perceived risk and trust as mediating factors", *International Journal of Bank Marketing,* Vol. 36 No. 2, pp. 256-276.

Nasri, W. and Charfeddine, L. (2012), "Factors affecting the adoption of Internet banking in Tunisia: An integration theory of acceptance model and theory of planned behavior", *The Journal of High Technology Management Research,* Vol. 23 No. 1, pp. 1-14.

Onar, S. C., Aktas, E. and Topcu, Y. I. (2010), "A Multi-Criteria Evaluation of Factors Affecting Internet Banking in Turkey", in Ehrgott, M., Naujoks, B., Stewart, T., Wallenius, J. (Eds.) *Multiple Criteria Decision Making for Sustainable Energy and Transportation Systems,* Springer, Berlin, Heidelberg, pp. 235-246.

Onay, C., and Ozsoz, E. (2013). "The impact of internet-banking on brick and mortar branches: The case of Turkey", *Journal of Financial Services Research*, Vol. 44, No. 2, pp. 187-204.

Onay, C., Ozsoz, E. and Helvacıoğlu, A. D. (2008), The impact of internet-banking on bank profitability-The case of Turkey", in Oxford Business &Economics Conference Program, June 22-24.

Ozdemir, S. and Trott, P. (2009), "Exploring the adoption of a service innovation: A study of Internet banking adopters and non-adopters", *Journal of Financial Services Marketing*, Vol. 13 No. 4, pp. 284-299.

Ozdemir, S., Trott, P. and Hoecht, A. (2008), "Segmenting internet banking adopter and non-adopters in the Turkish retail banking sector", *International Journal of Bank Marketing,* Vol. 26 No. 4, pp. 212-236.

Patsiotis, A. G., Hughes, T. and Webber, D. J. (2012), "Adopters and non-adopters of internet banking: a segmentation study", *International Journal of Bank Marketing,* Vol. 30 No. 1, pp. 20-42.

Polasik, M. and Wisniewski, T. P. (2009), "Empirical analysis of internet banking adoption in Poland", *International Journal of Bank Marketing*, Vol. 27 No. 1, pp.32-52.

Polatoglu, V. N. and Ekin, S. (2001), "An empirical investigation of the Turkish consumers' acceptance of Internet banking services", *International Journal of Bank Marketing*, Vol. 19 No. 4, pp. 156-165.

Riquelme, H. E. and Rios, R. E. (2010), "The moderating effect of gender in the adoption of mobile banking", *International Journal of Bank Marketing,* Vol. 28 No. 5, pp. 328-341.

Sathye, M. (1999), "Adoption of Internet banking by Australian consumers: an empirical investigation", *International Journal of Bank Marketing,* Vol. 17 No. 7, pp. 324-334.

Sayar, C. and Wolfe, S. (2007), "Internet banking market performance: Turkey versus the UK", *International Journal of Bank Marketing,* Vol. 25 No. 3, pp. 122-141.

Shaikh, A. A. and Karjaluoto, H. (2015), "Mobile banking adoption: A literature review", *Telematics and Informatics,* Vol. 32 No. 1, pp. 129-142.

Statistical Office of the European Communities (EUROSTAT). (2019). Eurostat Information Society Indicators. Luxembourg: Eurostat. Retrieved (15.01.2019) from:

http://appsso.eurostat.ec.europa.eu/nui/submitViewTableAction.do

Tan, M. and Teo, T. S. (2000), "Factors influencing the adoption of Internet banking", *Journal of the AIS,* Vol. 1 No. 1, 5.

Turkish Statistical Institute (TSI). (2016). Information and Communication Technology (ICT) Usage Survey on Households and Individuals, 2016. http://www.tuik.gov.tr/MicroVeri/HBT_2016/english/index.html.

Xue, M., Hitt, L. M. and Chen, P. Y. (2011), "Determinants and outcomes of internet banking adoption", *Management Science,* Vol. 57, No. 2, pp. 291-307.

Yadav, R., Chauhan, V. and Pathak, G. S. (2015), "Intention to adopt internet banking in an emerging economy: a perspective of Indian youth", *International Journal of Bank Marketing,* Vol. 33 No. 4, pp. 530-544.

Yousafzai, S. and Yani-de-Soriano, M. (2012), "Understanding customer-specific factors underpinning internet banking adoption", *International Journal of Bank Marketing,* Vol. 30 No. 1, pp. 60-81.

Yuen, Y. Y., Yeow, P. H., Lim, N. and Saylani, N. (2010), "Internet banking adoption: Comparing developed and developing countries", *Journal of Computer Information Systems,* Vol. 51 No. 1, pp. 52-61.

Zhao, A. L., Koenig-Lewis, N., Hanmer-Lloyd, S. and Ward, P. (2010), "Adoption of internet banking services in China: is it all about trust?", *International Journal of Bank Marketing,* Vol. 28 No. 1, pp. 7-26.

APPENDIX

Table A1. Description of Variables

Variable	Description
Internet Banking Use	Measures the respondent's participation in internet banking activities in last three months. 1=Respondent used internet banking; 0=Respondent did not use internet banking.
Female	1=Female; 0=Male.
Age	Self-reported age of participants.
Education Level	Measures the level of latest diploma obtained by respondents. No Diploma=0; Primary School Degree=1; Secondary School Degree=2; High School Degree=3; Associate Degree=4; Bachelor's Degree=5; Master's Degree=6; PhD Degree=7
Employed	1=Employed, 0=Otherwise. Employed includes individuals who was working during the survey time.
Household Income	Measures self-reported monthly household income of participants in thousand Turkish Liras.
Internet Usage Frequency	Measures the respondent's frequency of internet use in last three months. 1= Less than once a week; 2=At least once week; 3=Almost every day.
Internet Usage Variety	Measures the respondent's variety of internet use in last three months. 25 categories of internet activity are asked in the survey. Respondents report whether they use the internet for each activity. For each internet activity, a binary indicator of individual's use ("Yes" =1 and "No" =0) is constructed. The internet usage variety is the average of the binary variables across 25 categories; which ranges from 0 (lowest variety) to 1 (highest variety). Internet banking activities are not included in this variable.
Internet Usage Skills	Measures the respondent's abilities for internet use. Survey includes three questions on participants' knowledge of internet security such as cookies, internet security settings and security software. Each question has a binary response and coded as Yes" =1 and "No" =0. Internet skill is the sum of three binary indicators; which ranges from 0 (lowest skill) to 3 (highest skill). This is used as a proxy for internet usage skills of the participant.
Trust in Internet	Measures the participant's information sharing behaviour over the Internet in last 12 months. 1=Participant shared personal information such as full name, date of birth and national identity number, etc. over the internet; 0=Participant did not share any personal information over the internet.

Source: TSI (2016).

Table A2. Descriptive Statistics

Variable	N	Mean	Standard Deviation	Min	Max
Internet Banking Use	13,508	0.302	0.459	0	1
Female	13,508	0.456	0.498	0	1
Age	13,508	34.488	12.32	16	74
Education Level	13,508	2.772	1.444	0	7
Employed	13,508	0.537	0.499	0	1
Household Income (in 1000 TLs)	13,508	2.979	2.629	0.001	70
Internet Use Frequency	13,508	2.773	0.532	1	3
Internet Use Variety	13,508	0.339	0.179	0	0.92
Internet Use Skills	13,508	0.538	0.869	0	3
Trust in Internet	13,508	0.557	0.497	0	1

Source: TSI (2016).