How Digital Banking Affects Greenhouse Gas Emissions in Turkey? An Empirical Investigation

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Abstract

This paper investigates the impact of digital banking on greenhouse gas emissions in a case of developing economy, Turkey. Digital banking means more technological innovations in banking transactions. If banking transactions can be made in digital rather than physical environments, environmental effects are expected. We assume the environmental effect is positive, so the examination of this relationship is quite important. Technological innovations mean an increase in cost of digital banking transactions in the short run but in the long run this cost-increased effect is expected to turn opposite by an increase of active users in digital banking. We analyse the long-run relationship for the period between 2011/1 and 2019/4 by employing the Autoregressive Distributed Lag (ARDL) model. The results show that the increase in digital banking transactions have a positive and statistically significant effect on greenhouse gas emissions in Turkey. The findings reveal the positive trend in increasing transactions in digital banking in Turkey.

Keywords	***DOI***	***JEL code***
Digital banking, greenhouse gas emissions, Turkey, environmental Kuznets curve	*https://doi.org/10.54694/stat.2022.37*	*G21, O16, Q01, Q55*

INTRODUCTION

Recently, one of the most effective growth engines in any economy has been financialization level. Financialization means a well-organized financial system in an economy. Financial systems are the centre of economic growth and development process. Insomuch that finance has started to be regarded the main building block both in developed and developing countries (Öztürk and Acaravcı, 2013).

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Financialization has developed and spread all over the world for about 30–40 years. Digitalization has become one of the most important factors within the process of evolution and dissemination of financial systems. The digitalization in finance, which is known as 'digital finance', means the digitalization of the entire financial industry. Zhong (2022) stated that the McKinsey Report introduces digital finance as financial services, which is delivered with mobile phones, the internet, or cards. The digital finance is also described in other ways. Ozili (2018) pointed out that digital finance could be used as a reliable digital system of payment by means of mobile phones, personal computers, the internet, etc. Furthermore, there is a report that introduces the digital finance as a mode in which digital technology is applied allowing payment, investment, and providing other financial services (Huang and Huang, 2018).

The development of financial system has increased the energy demand all around the world. Digitization of financial systems mean enormous energy consumption. Therefore, digitization has become an important mechanism, which may have a serious damaging effect on the environment all over the world. On the one hand, the development in the financial system may lead to adverse environmental consequences. On the other hand, an increase in population and its effect on the increase on energy demand may also remarkably damage environment. An increase of population is naturally followed by increase of production capacities of individual countries with an adequate increase of consumption. This circulation has led to the robust growth of fossil fuels consumption and thus to the recent acceleration of environmental degradation. As a result of the population increase, the use of financial transactions has increased, and financial institutions have taken advantage of the technological innovations to make financial transactions easier and more accessible. Thus, basically, population expansion and the continuous increase in energy demand has increased the environmental degradation (Zhao et al., 2021).

Turkey is a densely populated country among countries using new technologies in their financial systems. Following the 2000s, an amazing economic growth in Turkey has put pressure on ecosystem and Turkey has made efforts to decouple its growth from environmental issues (World Bank, 2022). According to this report, like for all countries, the financial sector's readiness to react to environmental factors is a core priority for Turkey. While environmentalists' efforts continue in socio-economic life, the goal of banks to provide faster, more standard, and better quality service to their customers has become more evident over time. For this reason, it has been observed that banks have brought digital service channels to the fore. Focusing on digitalization, besides increasing customer satisfaction, banks can increase their profitability by reducing unit service production cost. Thus, it appears that banks have increased their profitability rates by focusing on the use of technology in recent years (Özen and Vurur, 2021).

Increasing the scope and diversity of digital services by banks depends on new technological investments. The new investments bring new additional fixed costs for banks and raise energy consumption. These increases contribute constantly to environmental pollution. In this case, it is necessary to examine the effects of the new process in banks on carbon emissions in two dimensions. How the digital finance increases environmental pollution? (i) It should be emphasized that technological investments in the financial world will increase the energy use, as in other industries, and this will lead to an increase in carbon emissions. How the digital finance reduces environmental pollution? According to Zhao et al. (2021), there is an internal rationale for the offsetting effect of digital finance on carbon emissions. (ii) Digital finance supports the technological process. Thus, it promotes economic growth and reduces environmental pollution. When the technological development reaches a sufficient level, a good environment and economic growth re-emerge. Thanks to high technology, inefficient use of resources is reduced, and this reduces environmental pollution. (iii) Digital finance supports industrial restructuring. Funds provided by digital finance enhance the transformation of high energy-using industries into low-carbon and high-profit industries. (iv) Digital finance encourages consumers to participate in environmental behaviour in daily life.

It can be said that the two-way effect can be explained more appropriately by the Environmental Kuznets Curve (EKC) (Kuznets, 1955). This paper determined that there was an inverted-U-shaped relationship between these two variables. Then, Grossman and Krueger (1991) claimed that a similar relationship was valid between economic growth and environmental pollution. They found that as per capita income in a country increase, environmental pollution increases as well, but declines after a certain level of development. In parallel with the approaches of Kuznets (1955), and Grossman and Krueger (1991), it can be said that it is possible to examine the effects of changes in digital finance transactions on environmental pollution. Accordingly, although investments made for digital banking channels increase carbon emissions in the short term, while a reducing effect on carbon emissions should be expected in the long term. So, how digital banking affects the greenhouse gas emissions both in the short- and long-term in a developing country such as Turkey? Should banks continue to invest in technology? These questions are the main objectives of this paper. This paper seeks to provide empirical evidence about the digitalization effect of banks and greenhouse gas emissions in the case of Turkish economy during 2011/1 and 2019/4 by using Autoregressive Distributed Lag Model (ARDL) methodology. The data has not been calculated for after this period. The remainder of the paper is organized as follows: the next section discusses the related empirical literature. The second section introduces model, methodology and data. The third section shows the empirical results. Finally, the last section covers the findings of the estimated model.

1 LITERATURE SURVEY

This paper analysed the relationship between digital banking and environmental degradation by the lens of Environmental Kuznets Curve (EKC). The basic assumption in the analyse is that when technological innovation is included in the banking transactions, the cost of banking transactions rises to a certain level, in the long run this cost-increased effect will reverse with the high level of use of banking transactions. In the literature, many empirical studies have investigated the nexus of environmental degradation and some macroeconomic variables. Among them, most studies have examined the relationship between economic growth and carbon emissions in the context of EKC hypothesis. On the other hand, there are some studies which investigated the interaction between digitization in finance and carbon emissions. Thus, this section can be summarized mainly in two groups of empirical studies: a) which are interested in the EKC is valid or not; b) which are focused specifically on the nexus of digitalization in finance and environment degradation.

There are numerous studies that have been conducted for various countries about the EKC hypothesis during the last three decades. In the 1990s, all studies revealed some evidence of the validity of EKC hypothesis by employing per capita income and environmental degradation (Grossman and Krueger, 1991; Shafik and Bandyopadhyay, 1992). Recent studies have included in their analysis such as energy consumption, financial development, trade openness, etc. While some of them provide evidence that the EKC is valid (Say and Yücel, 2006; Zhang and Chen, 2009; Halıcıoğlu, 2009; Oztürk and Acaravci, 2013; Katircioglu, 2014; Albayrak and Gökçe, 2015), some studies do not confirm the EKC hypothesis (Öztürk and Acaravcı, 2010). On the other hand, some studies partially confirmed this hypothesis (Schröder and Storm, 2020). Schröder and Storm (2020) analysed the nexus of carbon emissions and some macroeconomics variables by using the data on OECD countries and found that the EKC hypothesis is valid for some countries albeit it is not validated for others.

There are relatively limited studies originating from developing countries. Jiang and Ma (2019) analysed the relationship between financial development and carbon emissions for 155 countries and showed that financial development increases carbon emissions in many countries. While the results of this analysis for developing countries were significant, the tests for developed countries were found to be insignificant. Çetin and Seyidova (2019) investigated the effects of growth in the Turkish banking sector on environmental pollution with the help of data such as loans extended, energy use per capita and GDP. This study concluded that GDP increases the production of carbon dioxide gas, and the banking sector loans/GDP ratio affects the energy consumption. De Haas and Popov (2020) determined that lower carbon emissions occur when companies provide their funds through stock issuance rather than borrowing from the credit market. This situation revealed that the form of financial development can also make a difference on environmental pollution. Koca and Sevinç (2022) examined the validity of EKC hypothesis for BRICS-T countries (Brazil, Russia, India, China, South Africa, and Turkey) and revealed that financial development influences reducing environmental pollution, openness of the economy, and exports and imports increasing environmental pollution. showed. In this case, it is seen in the study that the EKC is partially valid for the BRICS-T countries.

Recently, a few studies have focused the investigation of digitalization in finance and its potential effect on environmental degradation for some countries. Sun (2020) determined that the development in digital finance increased the total factor productivity in the coastal provinces of China between 2011 and 2018, increasing the marine ecological efficiency and reducing the environmental pollution. Zhao et al. (2021) examined the interaction between digital finance and carbon emissions at provincial level in China as an emerging market economy and concluded that there is a meaningful reducer effect of digital finance on carbon emissions in almost all cases. Zhong (2022) showed that digital finance is an effective way of promoting environmental sustainability by reducing environmental pollution and promoting social sustainability by mitigating income inequality. Accordingly, Zhong (2022) determined that EKC is validated by the progress in digital finance in his study using the digital finance index prepared by Peking University Institute of Digital Finance.

2 MODEL, METHODOLOGY AND DATA

2.1 Model

This study seeks the influence of digital banking indicators, in particular the total internet and mobile banking active customers number, on greenhouse gas emissions. Apart from the focus of the study, real income is also an important explanatory variable for the environmental degradation. Furthermore, this study endeavours the long-term relationship between digital banking and greenhouse gas emissions by the view of EKC hypothesis. Therefore, the use of real income in the analysis provides more comfortable results and gives more significant findings. The relationship between greenhouse gas emissions and independent variables can be exhibited as follow:

$$ghg = f(GDP, GDP,^2 bank, bank^2), \tag{1}$$

where:

ghg – greenhouse gas emissions,

GDP – Gross Domestic Product,

bank – digital banking (the sum of internet banking customers and digital banking customers).

Depending on the previous empirical literature on augmented EKC hypothesis, the long-term relationship between variables can be transformed into a linear logarithmic quadratic form:

$$lnghgt = \beta 0 + \beta_1 lngdp_t + \beta_2 lngdpt^2 + \beta_3 ln_t bank_t + \beta_4 lnbank_t^2 + \varepsilon_t , \tag{2}$$

where: β_0 represents the constant term and ε_t represents the error term, the β_1, β_2, β_3, β_4 indicate the elasticity parameters in the long-term. Here, the expected coefficients of GDP and gdp^2 give some information about the validity of EKC hypothesis but the expected coefficients of bank and $bank^2$ provide the novel explanation in relation to the effect of digitalization in banking sector on the environmental degradation. To promote an environmentally friendly understanding, several agreements, i.e. Green Deal, Paris Climate Agreement, has been carried out recently. Based upon this framework, the using type of banking operations becomes more important. Thus, despite the initial effect of digital banking, which is represented by β_3, is positive on greenhouse gas emissions, when the β_4 is negative, the greenhouse gas emissions decrease because of the increase in internet and mobile banking transactions (digital banking).

2.2 Methodology

This study employs the Auto-regressive Distributed Lag (ARDL) model to examine whether there is a long-term cointegration relationship between the greenhouse gas emissions, gross domestic product, and digital banking in Turkey. The ARDL model (Pesaran et al., 2001) runs better in the limited observations unlike conventional cointegration tests (Ibarra and Blecker, 2016). The sample size in the data of this study is only thirty-six, thus, we can use the ARDL bound test for the empirical analysis. The ARDL estimation method can only be used on the condition that the variables should be at I (1) or I (0), should not be at I (2) or more. The ARDL bound test method has an advantage due to the estimation of short- and long-term coefficients simultaneously (Haug, 2002). This study utilizes the ARDL approach to analysis the long-term relationship between variables via the following equation:

$$\Delta lnghg_t = \beta_0 + \Sigma_i = {}_1{}^p\beta_1\Delta lnghg_{t-i} + \Sigma_i = {}_1{}^p\beta_2\Delta lngdp_{t-i} + \Sigma_i = {}_1{}^p\beta_3\Delta ln(gdp)^2{}_{t-i} + \Sigma_i = {}_1{}^p\beta_4\Delta lnbank_{t-i} + \Sigma_i = {}_1{}^p\beta_5\Delta ln(bank)^2{}_{t-i} + \lambda_1 lnghg_{t-1} + \lambda_2 lngdp_{t-1} + \lambda_3 ln(gdp)^2{}_{t-1} + \lambda_4 lnbank_{t-1} + \lambda_5 ln(bank)^2{}_{t-1} + \varepsilon_t \,, \tag{3}$$

where: Δ represents the difference term, β_0 shows the constant term, and ε_t denotes the error term; also the β_1, β_2, β_3, β_4, and β_5 indicate the short-term coefficients while λ_1, λ_2, λ_3, λ_4, and λ_5 are the long-term coefficients in the estimated model; ^{p} shows the optimal lag length, which is determined in the model selection criteria by Akaike Information Criteria (AIC) or Schwarz Information Criteria (SIC) or Hannan-Quinn Information Criteria (HQ). The ARDL bounds test methodology is commonly conducted within two main steps. There is a hypothesis test to determination of any co-integration relationship between variables. So, the null and the alternative hypotheses to be tested by the F-test are as follows:

H_0: $\lambda_1 = \lambda_2 = \lambda_3 = \lambda_4 = \lambda_5 = 0$,
H_1: $\lambda_1 \neq \lambda_2 \neq \lambda_3 \neq \lambda_4 \neq \lambda_5 \neq 0$.

The null hypothesis shows that there is not any co-integration relationship between variables. When the null hypothesis is rejected, it means that there is a co-integration relationship between variables. For any co-integrating relationship, the unrestricted error correction model (UECM) (Pesaran and Shin, 1999) can be estimated as in the following equation:

$$\Delta lnghg_t = \beta_0 + \Sigma_i = {}_1{}^p\beta_1\Delta lnghg_{t-i} + \Sigma_i = {}_1{}^p\beta_2\Delta lngdp_{t-i} + \Sigma_i = {}_1{}^p\beta_3\Delta ln(gdp)^2{}_{t-i} + \Sigma_i = {}_1{}^p\beta_4\Delta lnbank_{t-i} + \Sigma_i = {}_1{}^p\beta_5\Delta ln(bank)^2{}_{t-i} + \Theta ECT_{t-1} + \varepsilon_t \,. \tag{4}$$

In Formula (4), Θ indicates the coefficient of the error correction term (ECT_{t-1}) and gives an information about the speed of adjustment showing the convergence capabilities of variables to the long-term equilibrium. The error correction model provides the distinguishing effects of short-term and long-term. Besides, the expectation of the coefficient of error correction term is negative and statistically significant value, i.e. between 0 and –1, to get a smooth correction to the long-term equilibrium.

2.3 Data

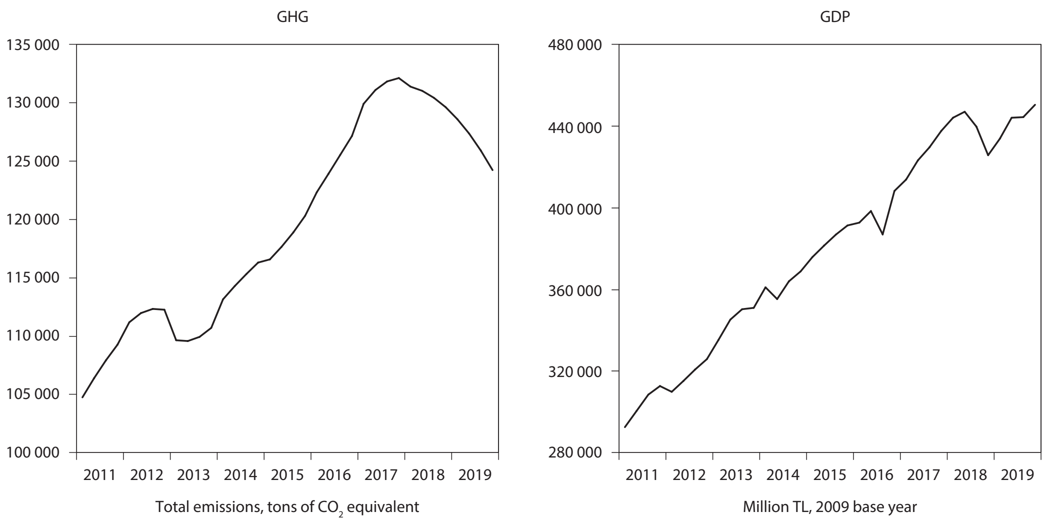
The analysis of the study uses quarterly data covering the period between 2011/1 and 2019/4. The data starts with the first quarter of 2011 because there is not any data for the mobile banking statistics before that period. The analysis focuses on the following variables on the Turkish economy for the long-term relationship between greenhouse gas emissions (*ghg*), gross domestic product (*gdp*) and digital banking (*bank*). The digital banking data represents the sum of internet banking customers and mobile banking customers in Turkey and was retrieved from the Banks Association of Türkiye databases, the data for gross domestic product was obtained from the Organisation for Economic Co-operation and Development (OECD) database,[3] the data for greenhouse gas emissions was also received from the OECD database. The quarterly data of greenhouse gas emissions is an interpolating version of annual data that have emerged by using E-views 12 package program. These data were calculated as a quadratic sum type. There are many studies in the literature that use this interpolation methodology to convert the data structure from low frequency to high frequency (McDermott and McMenamin, 2008; Shahbaz, Loganathan, Muzaffar, Ahmed, and Jabran, 2016). This study used the logarithmic values of the series. The logarithmic values are

Table 1 The summary statistics

Variables	Notation	Source	Obs.	Mean	Min.	Max.	St. dev.
Greenhouse gas emissions	ghg	OECD statistics	36	119 447.5	104 685.2	132 127.6	8 821.398
Digital banking	bank	the Bank Association of Turkey	36	28 287.97	7 457.815	61 694.66	17 742.13
Digital banking (squared)	bank2	the Bank Association of Turkey	36	1.11E+09	55 619 005	3.81E+09	1.15E+09
Gross domestic product	GDP	OECD statistics	36	379 633.7	292 146.7	450 440.2	49 738.18
Gross domestic product (squared)	GDP2	OECD statistics	36	1.47E+11	8.53E+10	2.03E+11	3.75E+10

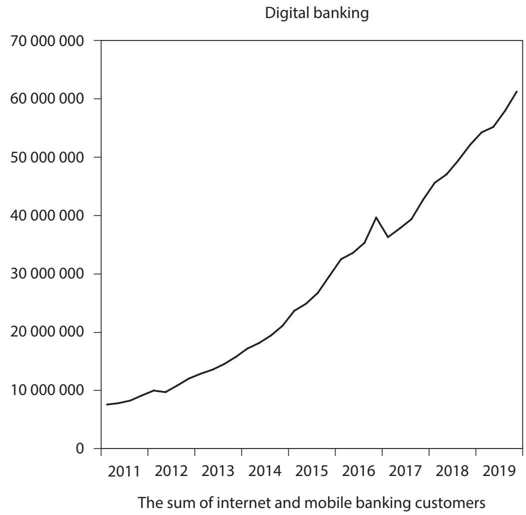
Source: Authors' calculations

Figure 1 The trends in greenhouse gas emissions, gross domestic product, and digital banking, 2011/1–2019/4 (quarterly)



[3] For OECD statistical databases: *<https://stats.oecd.org>*.

Figure 1 (continuation)



Source: OECD, the Bank Association of Turkey, authors' calculations

a percentage changes in the original values. Thus, the results become more interpretative and meaningful for such an analysis. Table 1 summaries the descriptive statistics of the variables.

Figure 1 pictures the greenhouse gas emissions, gross domestic product, and digital banking in Turkey during the period between 2011/1 and 2019/4. The use of digital banking tends to increase remarkably throughout the period. In particular, the increase in the use of mobile banking has significantly increased the number of active customers using digital banking, recently. There has also been a slight increase in greenhouse gas emissions until the first quarter of 2018. However, a considerable structural shift in the greenhouse gas emissions following the 2018/1 is clearly observable in the figure. As this structural shifting gives an important signal for the stability conditions of the variables, we prefer the unit root test with structural break to examine the stationary conditions of the variables. The conventional unit root tests assume that the effects of shocks are temporary and do not affect the series in the long run. Nelson and Plosser (1982) assert that the shocks on series have permanent effect and there exist a structural shift in the time series data. In such a case, breakpoint unit root test assesses the stationary level of the variables considering the structural break points. Also, the conventional unit root tests are unstable when there is a structural break in the time series (Sun, Zhang, and Xu, 2017).

3 EMPIRICAL RESULTS

Table 2 indicates the unit root test results. According to the results, the null hypothesis of unit root for all variables cannot be rejected in their level values albeit the null hypothesis can be rejected for all of them when the variables are transformed in their first difference. So, all the variables are in I (1) process and this result allows us to investigate the long-term cointegration relationship between the variables by using the Autoregressive Distributed Lag (ARDL) model estimation method.

The structural breaks in the time series spread over the whole period. Therefore, there is not necessary to add any dummy variables to control the structural break in the estimated model. Table 3 shows the bound test results. The calculated F-statistic value is above the upper value. Thus, there is a co-integration relationship between variables due to the null hypothesis is rejected. This result obtained reveals

Table 2 Breakpoint Unit Root test

Variables	At level		At 1st difference	
	TBs	T-statistics	TBs	T-statistics
lnghg	2018/3	−3.094 (5)	2017/3	−7.264*** (7)
lnGDP	2019/3	−3.776 (3)	2013/3	−6.297*** (0)
lnGDP^2	2016/4	−3.013 (9)	2013/3	−6.039*** (0)
lnbank	2014/2	−3.089 (0)	2016/2	−6.356*** (0)
lnbank^2	2013/4	−1.056 (0)	2014/1	−6.387*** (0)

Notes: *** represents significance at 1% level. The maximum lag length is selected at 9 and the breakpoint is based on Dickey-Fuller min-t method. The optimal lag lengths are in the bracket and are based on F-statistic selection.
Source: Authors' compilation

Table 3 Bound test results

Model	F-statistic	Critical values	
ghg = f(GDP, GDP^2, bank, bank^2)		I (0)	I (1)
Lag length structure (1, 2, 2, 4, 4)	12.96 ***	4.40	5.72

Notes: The critical values are from Kripfganz and Schneider (2020). *** means statistically significant at 1%.
Source: Authors' compilation

a long-term relationship between the dependent variable, the logarithm of greenhouse gas emissions, and independent variables, the logarithm of gross domestic product, the logarithm of gross domestic product squared, the logarithm of bank, and the logarithm of bank squared.

Table 4 presents the results of ARDL estimation in the long- and short-term. As expected, the bank and the bank squared affect greenhouse gas emissions positively and negatively, respectively. However, by contrast with the previous empirical literature on the validity of EKC hypothesis, the gross domestic product squared showed no significantly negative effect on the greenhouse gas emissions. The data used in the analysis is quarterly structure, therefore it differs from the existing literature. This situation can be shown as a reason for the results to differ from the existing literature. The table demonstrates that all explanatory variables have a significant effect on the greenhouse gas emissions in the long-term at 1 and 5 % level except for the gross domestic product squared, which is not statistically significant at 10 % level. We are basically concerned with the bank and the bank squared coefficients. So, the estimation results show that the coefficients of the digital banking variables are in parallel with our preliminary expectations.

The estimation of the Formula (1) indicates that the bank coefficient was estimated as 2.58. This result means that a one percent increase in digital banking tends to an increase in greenhouse gas emissions by 2.58%. Also, a one percent increase in the growth of digital banking reduces greenhouse gas emissions by approximately 1.74%. Accordingly, while the total number of internet banking and mobile banking active customers, which reflects the number of digital banking customers, initially increases greenhouse gas emissions, the increase in the number of digital banking customers has a reducing effect on greenhouse gas emissions. The results also show that a one percent increase in gross domestic product leads to an increase in greenhouse gas emissions by 0.41% while a one percent increase in the growth of gross domestic product causes a decreasing effect on greenhouse gas emissions by about 2.68%. However, as the negative effect of the increase in the gross domestic product growth was not statistically significant, the findings obtained in the study cannot prove the validity of the EKC hypothesis when quarterly data are used. Table 4 also indicates the short-term results. The short-term results seem that most of the coefficients are statistically significant at 1 and 5% levels.

Another estimation result presented in table 4 is the error correction mechanism. The error correction term is negative and statistically significant as expected. The ECT coefficient is about 0.77 in the model.

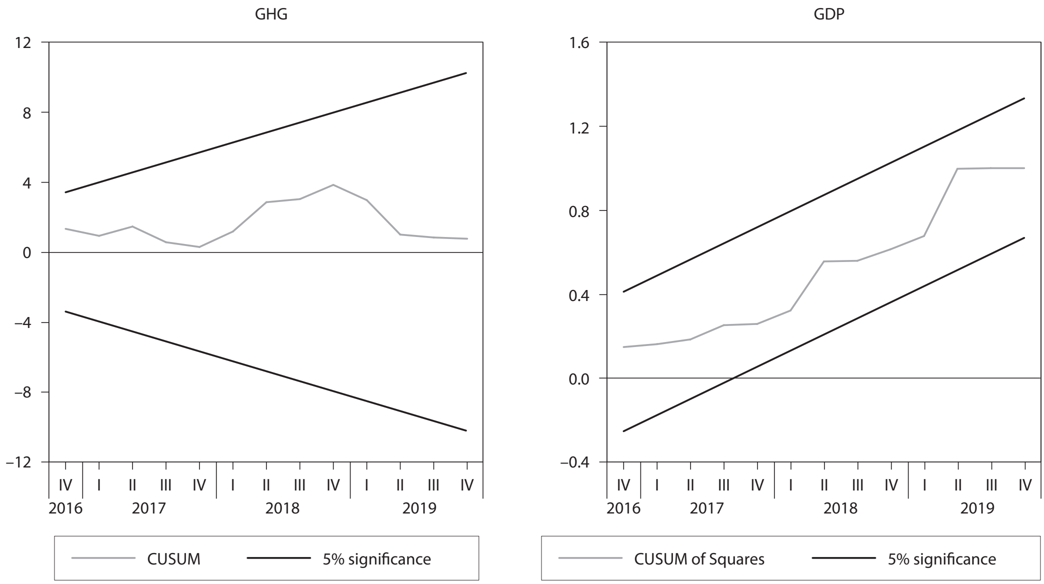
Table 4 The results of ARDL estimation

Variables	
	Long-run
GDP	0.412 (0.181) **
GDP^2	–2.680 (1.890)
bank	2.587 (0.086) ***
$bank^2$	–1.740 (2.520) ***
	Short-run
ghg (–1)	–0.770 (0.129) ***
ΔGDP	–0.084 (0.154)
GDP (–1)	–0.879 (0.136) ***
GDP (–2)	–0.786 (0.148) ***
GDP (–3)	–0.547 (0.149) ***
ΔGDP^2	1.301 (1.890)
GDP^2 (–1)	9.633 (1.701) ***
GDP^2 (–2)	8.303 (1.773) ***
GDP^2 (–3)	5.870 (1.790) ***
Δbank	1.275 (0.384) ***
bank (–1)	–1.088 (0.341) ***
$\Delta bank^2$	–9.583 (4.343) **
$bank^2$ (–1)	1.143 (3.920) **
trend	–2 345.385 (249.116) ***
error correction term (–1)	–0.770
constant	6 078.586 (833.271) ***
R-squared	0.954
N	36
	Diagnostic tests
serial LM	0.193 (0.016)
heteroscedasticity	0.969 (0.890)
J-B normality	2.983 (0.225)
Ramsey RESET	0.169 (0.690)
Durbin-Watson	2.61
Cusum	stable
CusumSQ	stable

Source: Authors' compilation

It means that most of the short-run deviation would clear out in the long-run in the model. Besides, some post-estimation diagnostic tests were performed to determine the validity of the estimated model and variables used in the ARDL methodology. According to these results, there is not any autocorrelation, heteroscedasticity, and normality problem. The Jarque-Bera test result also provides the normality condition. Finally, Figure 2 shows the Cusum test and the CusumSq test results. Accordingly, there is not any stability problem in the coefficients due to the test statistics in between the critical levels.

Figure 2 The Cusum and the Cusum Square test result



Source: Authors' compilation

CONCLUSION

This study is designed to determine the effects of the efforts of the Turkish banking sector on digitalization after 2010 on greenhouse gas emissions in the country. The impact of digitization on greenhouse gas emissions is investigated based on the Environmental Kuznets Curve (EKC) hypothesis. An increase in digital banking user numbers is increasing greenhouse gas emissions. However, an increase in the increasing trend in the number of digital banking users (the square of the number of digital transactions) contributes to the reduction of greenhouse gas emissions. Accordingly, while the number of active customers in internet banking and mobile banking initially increased the greenhouse gas emissions, the increase in the number of active customers because of the widespread use of digital banking transactions has an effect that reduces greenhouse gas emissions. In this case, the Kuznets curve for digital banking is confirmed.

In addition, in the study, it was concluded that an increase in GDP increases greenhouse gas emissions, while an increase in growth rate of GDP reduces greenhouse gas emissions. However, the negative effect of the increase in GDP growth rate was not found statistically significant. According to the findings of the study, it can be said that the environmental Kuznets curve cannot prove its validity when using quarterly data. The findings of the study are compatible with the studies of Çetin and Seyidova (2019), Koca and Sevinç (2022), Zhong (2022), and Sun (2020) in which financial development related data are used in the context of supporting the Kuznets curve. In this case, it can be argued that financial digitalization reduces environmental pollution. However, the type of financial data used in this study, unlike previous studies, focused on the use of digital banking. Because the widespread use of digital banking eliminates some costs such as transportation, printing and using physical documents, and this creates a reducing effect on greenhouse gas emissions. It seems that the study findings do not generally agree with the findings of Jiang and Ma (2019). However, Jiang and Ma's (2019) dataset is different from these study data.

Considering the positive impact of the prominence of digital service channels on bank profits (Özen and Vurur, 2021), it is an appropriate policy for banks to increase the use of digital channels in service marketing. However, it would be beneficial for users to come up with a product design that will enable financial transactions to be done easily and without errors. The findings of the study have various implications for banks as well as other policy makers, researchers, and citizens.

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