



RESEARCH ARTICLE

The Effect of Bank Employees with a Postgraduate Education Level on Credit Risk and Financial Performance

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Abstract

The aim of this study is to examine the effect of the educational qualifications of bank personnel on Turkish banks. Within the scope of the study, based on the annual data of 21 banks operating in Turkey during the 2004-2019 period. The factors affecting the non-performing loans of banks have been examined with static panel data analysis methods over five different models. A random effects method was used in the analysis. The results show that Non-Performing Loans and Loan Loss Provisions, which are the credit risk indicators of the bank, decreased with the increase in the ratio of personnel with postgraduate education, which is used as a human capital indicator for banks. It reveals that investment in postgraduate personnel reduces the credit risk of banks by less than 1% and at a level of 5% significance. These results were also corroborated by a sensitivity analysis. However, it has been determined that the level of postgraduate education, which is used as a human capital indicator of banks, does not have a significant relationship with the Z-Score, which is an indicator of bankruptcy risk, and Asset on Equity and Return on Equity, which is an indicator of profitability.

Keywords

Non-Performing Loans, Financial Performance, Human Capital, Credit Risk

Introduction

Intellectual capital (IC), which is considered among intangible assets, has begun to replace physical capital in terms of providing important production factors and sustainable business activity in knowledge and knowledge-based economies in the globalized world (Drucker, 1993; Clarke & Gholamshahi, 2018). All three dimensions of intellectual capital (human capital, structural capital, and customer capital) are important to a business. Human capital, which is among these three dimensions, is considered a very important factor for service businesses because it not only affects the quality of short-term services, but also affects various long-term business outputs (Aryee et al., 2016; Seleim & Bontis, 2013; Diebolt, & Hippe, 2019).

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To cite this article: Pilatin, A. (2023). The effect of bank employees with a postgraduate education level on credit risk and financial performance. *Istanbul Business Research*, 52(2), 407-436. <http://doi.org/10.26650/ibr.2023.52.1109060>



Some researchers who want to develop intellectual capital components think that human capital is the most important component of intellectual capital (Wang & Chang, 2005; Gitaiga, 2020). It is stated that one of the most important factors contributing to the economic growth of a nation is human capital (Yarovaya, Mirza, Abaidi & Hasnaoui, 2021). Sveiby (1997) states that human capital can be defined as “the capacity to act in a wide variety of situations to generate both tangible and intangible assets”. Qualification of a business’s human resources makes a significant positive contribution to the business and its employees. It positively affects the development of employees and makes the business more efficient and sustainable (Awan & Sarfraz, 2013). In recent years, human capital is an important factor that every business pays attention to and provides a competitive advantage to businesses (Neves & Proença, 2021; Gupta and Raman, 2021). Therefore, banks with more qualified human capital show a more efficient, less risky and more profitable performance (Adesina, 2021).

Human capital has become very important in today’s world, especially for service structures based on information and technology. For this reason, human capital is at the center of successful companies due to its direct and indirect impact on firm performance (Gitaiga, 2020). This situation is also valid for banks that operate largely based on human capital, which are among the most important building blocks of the economy and the main funders of economic activities (Rahman & Akhter, 2021). This is because banks need less physical capital due to their intensive use of technology and service structures, while they continue their activities using more human capital.

The performance differences between different businesses in the same sector, between sectors and between banks can be explained by the differences in human capital such as recruitment, the education level of the personnel hired and training. The resource-based view (RBV) that provides superior performance and a competitive advantage to a firm’s valuable, rare, inimitable and non-substitutable private capital stock supports this explanation (Barney, 1991; Prahalad & Hamel, 1990). Education, is the most important component of human capital. The level of education is considered one of the most effective factors in increasing the economic potential of people, firms and nations. Supporting this view, it shows why human capital allocates huge resources to education services for the socio-economic development of countries at the point of achieving national goals and the wealth of nations (Stewart, 1997; Acemoğlu, & Robinson, 2012).

The most important group of people in companies is the board of directors. The importance of the boards of directors in terms of directing businesses and making strategic decisions is undeniable.. However, it is the personnel who will implement the decisions of the board of directors and who will ensure the achievement of the target by working and performing in line with the strategies and targets determined by the companies, especially in banks. It should not be forgotten that these are middle and lower level employees who are outside the boards

of directors of enterprises and banks and constitute the majority of the employees. For this reason, in this study, the effect of the education level of bank employees on credit risk and bank performance is discussed.

If the principal and interest payments of the loans are 90 days or more late, such loans are considered non-performing loans (uncollectible receivables) for banks (IMF, 2006). The 90-day period for the uncollectible parts of the loans extended by the banking system in the world has been determined as the delay period (Klein, 2013: 8). The generally accepted period in Turkey is 90 days as in the world (Ayaydın, Pilatin & Barut, 2021). A well-functioning banking system is very important in terms of ensuring the sustainability of banks, which are the main fund providers of the country's economy. Profitability may not be sufficient for a well-functioning banking system. Banks should keep their credit risks at a certain level or below a certain level. When banks fail to balance risk correctly, they start lending to riskier customers, which increases banks' non-performing loan rates. Increasing the non-performing loan rates of banks creates an important risk factor by negatively affecting the bank, then the sector and the economy (Turner, 2010: 44; Çelik, & Tekşen, 2021). In addition, increasing non-performing loans disrupt the financial functioning of banks, causing a decrease in their profitability. Banks with a decreasing profitability may resort to increasing the loan interest rates and commission fees they apply to customers in order to reach their targeted profitability. This situation reflects negatively on both banks, consumers and the general course of the economy. If non-performing loans cannot be prevented, bank profitability may also tend to decrease. On the other hand, investment costs increase due to rising interest rates. This may turn into a cause that triggers inflation in the long run.

The ability of loan allocation personnel to perform an accurate creditworthiness and risk analysis is increasing in parallel with their educational status. At this point, the lending attitudes of the loan allocation personnel of banks are very important.

Studies in the literature have generally focused on whether there is a relationship between the educational level of the board members of banks and bank performance (Deca, Sanchez, & Ferrero, 2015; King, Srivastav & Williams, 2016; Pereira & Filipe, 2018). The importance of the boards of directors, which are the most important boards of companies in terms of directing banks and making strategic decisions, is undeniable in terms of directing the business (D'Amato and Gallo, 2019). However, it is known that the personnel who will work in accordance with the strategy, goals and credit policies determined by the banks and ensure that the bank achieves these goals are the personnel working at the middle and lower levels. For this reason, the effect of postgraduate education, which is one of the most important determinants of human capital, on the credit risk and profitability of banks has been discussed in the study. The main motivation source of the study is that there is no study in the literature focusing on the postgraduate education level of bank personnel.

A total of 21 banks, 3 of which are public-owned, 8 private-capital deposit banks, and 10 foreign-owned deposit banks established in Turkey, were included in the study. The study is based on the annual data of 21 banks for the period 2004–2019. There are 34 deposit banks in Turkey, but 3 of them were excluded from the study because the number of branches in Turkey is less than 4. The remaining 10 were not included in the study due to the inability to provide data for each year in 2004–2019.

After the introductory part of the study, the related literature and hypothesis development are mentioned in the second part. In the third part, the data set and the methodology are explained. In the fourth chapter, the application and findings are mentioned. In the fifth and last part of the study, the results and suggestions are given by giving the research findings.

Related Literature and Hypothesis Development

Human capital theory states that the knowledge and skill acquired by individuals are likely to result in higher earnings in the labor market (Becker, 1964). In addition to the increase in the financial performance of enterprises with high human capital, innovative initiatives that will contribute to their competitiveness also increase (Pala & Pilatin, 2019). Education levels and work experience are the two most important types of human capital that individuals can earn throughout their careers (Myers, Griffith, Daugherty, & Lusch, 2004; Singer & Bruhns, 1991). Both of these two variables are used as an indicator of human capital. For some, work experience generally decreases as the level of education increases. This is because those who spend more years getting more and better education have less time to gain work experience.

When the studies in the literature are examined, it is seen that there is a relationship between the education level of the board members and the bank's performance (Meca, Sánchez, & Ferrero, 2015; King, Srivastav & Williams, 2016; Pereira & Filipe, 2018). The importance of the board of directors, which is one of the most important boards of companies, in terms of guiding banks and making strategic decisions is undeniable (D'Amato & Gallo, 2019). However, the personnel who work in line with the strategies and targets set by the companies and especially the banks and ensure the achievement of these targets are the middle and lower level personnel.

In a small number of studies in Turkey, bank's boards of directors have also been discussed (Yılmaz, 2017; Yağlık & Şimşek, 2017; Yağlık, 2019). There are also studies dealing with the effect of intellectual capital capacity on financial performance in the Turkish banking system (Kahya, İmamoğlu & Durmaz 2015). These studies were generally carried out with the VAIC method produced by Pulic (1998) (Arslan & Kızıl 2019; Ozkan, Cakan, & Kayacan, 2017). However, the VAIC method has been criticized on some points. Topaloğlu & Bayrakdaroğlu (2012) examined the effects of the intellectual capital levels of bank employees on the bank

through a survey. However, risk and profitability were not addressed in this study. When the literature is examined, there is no study that deals with the effect of postgraduate education level on the risk and performance of banks in the Turkish banking sector. This situation constitutes the main motivation for this comprehensive study.

Businesses want to hire personnel who have the potential to provide them with a competitive advantage. It is also essential to increase organizational benefits, invest in an effective system, recruit and retain the right staff, and develop high-quality human resources for firms (Rahman & Akhter 2021). Having a sufficient level of education of the personnel of an enterprise contributes to greater productivity and efficiency of the personnel (Adesina, 2019; Andersen, 2021). Banks are institutions in the service sector where human capital is very important. More trained personnel are expected to result in a lower credit risk and higher profitability later on because it is thought that decreasing non-performing loans will enable the bank to reach a higher financial performance. No study has been found on the effect of education level, which is considered as one of the most important indicators of human capital, on credit risk in banks. However, in a related study (D'Amato and Gallo, 2019), it is stated that the education level of the members of the board of directors of banks mediates the relationship between the risk-taking of cooperative banks. For this reason, in this study, the effect of education level on the credit risk and financial performance of banks is examined rather than experience, which is one of the human capital indicators. In addition, no study has been found in the literature that deals with the banking sector, where the postgraduate education level is taken as an indicator of human capital. This reason is one of the important motivation sources of the study. The aim of this study is to reveal the effect of education levels of bank employees at different levels on credit risk and financial performance. For this, five different hypotheses have been developed by making use of the studies in the literature and considering the gap in the literature.

Based on this, the following hypothesis was developed:

H₁: Postgraduate education(PEDU) is negatively correlated with banks' non-performing loan rates (NPL).

H₂: Postgraduate education(PEDU) is negatively related to banks' Loan loss provisions (LLP).

As the Z-Score increases, the bankruptcy and bankruptcy risk of banks decreases. For this reason, the relationship between human capital and Z-Score is expected to be positive (Chiaromonte, Groci &Poli, 2015).

Based on this, the following hypothesis was developed.

H₃: Postgraduate education(PEDU) is positively associated with banks' bankruptcy risk (Z-Score).

The relationship between human capital and financial performance has been extensively studied over time; however, the available literature shows mixed findings. Studies in the literature have found different relationships between human capital and business performance (Andersén, 2021; Schultz, 1993; Jamal & Saif, 2011; Nguyen, 2020; Rahman, & Akhter, 2021; Köse & Tanç, 2018). Some studies indicate that there is no relationship (Razafindrambinina and Anggreni, 2017; Calabro et. al. 2021; Nyberg et. al. 2014; Soewarno & Tjahjadi, 2020).

While some studies say that there is a positive or negative direct link (Firer & Williams, 2003; Chowdhury et al., 2019), some say that there is an indirect causality (Bontis et al., 2000; Wang & Chang, 2005). Urquhart, & Zhang, (2021), in their study, based on a sample of CEOs in publicly traded FTSE 350 firms, investigated the relationship between CEO training and firm performance, providing evidence that firms with CEOs with PhDs outperform others. Adesina (2021) analyzed data from 400 commercial banks operating in 34 African countries. Here, despite calculating the human capital variable over VAIC-based wages, it shows that higher human capital is positively related to bank performance. In the USA, which is a developed country, Meles et al. (2016) states that HC has a positive effect on bank performance. Similar results are found in the studies of Topaloğlu & Bayrakdaroğlu (2012) and Yılmaz and Aybars (2021) on the Turkish banking sector. In the study conducted by Vo and Tran (2021) in Vietnam, the findings show that intellectual capital contributes to bank performance in a significant and positive way.

Based on this, the following hypotheses were developed:

H₄: Postgraduate education (PEDU) is positively related to the return on assets (ROA) of banks.

H₅: Postgraduate education (PEDU) is positively related to the return on equity (ROE) of banks.

Data And Methodology

In this study, a data set consisting of time series and cross section data was used. Multiple models were created with this data set. With these models, it is aimed to reveal the effect of human capital on a banks' credit risk, bankruptcy risk and profitability. In the methodology part of the study; The purpose and scope of the study, the variables used, research models, hypotheses and research methods are mentioned. In the last part of the section, the tests used in the model selection in the study are given.

Data

In the study, a data set of 21 banks operating in Turkey with 3 public capital, 8 private capital and 10 commercial banks with foreign capital located in Turkey was used. The study was based on the annual data of banks for the period 2004–2019. Although there are a total of

34 deposit banks in Turkey, 3 of them have less than 4 branches in Turkey, and the remaining 9 banks were excluded from the study due to a lack of data for the years 2004–2019. However, as of the end of 2019, the total assets of the banks included in this data set correspond to 94% of the total assets of the banking sector. In terms of the number of employees, this rate is around 98%.

A large sample of banks covering the period 2004-2019 was used to test the hypotheses of the research. More specifically; The data used in the calculation of the postgraduate education levels of banks, dependent and independent variables in terms of credit risk, bankruptcy risk and profitability were taken from the database of the Banks Association of Turkey (BAT) and the Banking Regulation and Supervision Agency (BRSA), which includes the balance sheet information of banks.

Variables

The aim of this study is to reveal the human capital levels of banks, which are among the important actors of the financial sector, and the effect of human capital levels on NPL, LLP, which is a credit risk indicator, Z-SCOR, which is an indicator of bankruptcy risk, and profitability ratios such as ROA and ROE. For this purpose, the factors affecting the non-performing loans of banks were analyzed by a panel data analysis method by using the data of the 2004-2019 period of 21 banks operating in Turkey. The variables used in the research are shown in Table 1.

In the study, 4 dependent variables, 2 independent variables, 7 bank-specific variables, Macroeconomic and Financial variables and dummy variables were used. These variables are shown in Table 1.

As in similar studies, the level of postgraduate education is taken as a proxy for the human capital variable (Karadağ, 2016; Rahman & Akhter, 2021; Urquhart & Zhang, 2021). This variable was obtained as the ratio of those with a postgraduate degree working in a bank to the total number of employees. NPL, which is taken as a dependent variable as a credit risk indicator of banks and is used in many similar studies (Foss et al. 2010, Reinhart & Rogoff, 2011; Jin et. al. 2019; Pilatin & Ayaydın; 2022), is the variable that shows the NPL ratio of banks.

LLP, which is taken as the credit risk indicator of banks as the dependent variable and used in many similar studies (Foss et al. 2010, Reinhart & Rogoff, 2011; Jin et. al. 2019; Pilatin & Ayaydın; 2022), is the other variable LLP, which shows banks' loan loss provision ratios.

The Z-score (Boyd & Graham, 1986; Beck & Laeven, 2006; Laeven & Levine, 2006; Chiamonte, Croci & Poli; 2015), is calculated as;

$$Z - SCORE = \frac{ROA + ETA}{\sigma ROA}$$

Table 1
Variables Used in The Study

	Variables	Code	Definition	Reference
Dependent Variables	Non Performing Loans	NPL	Non Performing Loans / Total Loans	<i>Foss vd. (2010), Reinhart & Rogoff (2011), Pilatin & Ayaydin (2022)</i>
	Loan Loss Provisions	QUALTY	Loan loss provisions / Total Loans	<i>Keeton (1999), Sharma & Gounder (2015), Jin et. al. (2019), Pilatin & Ayaydin (2022)</i>
	L.Z-Skor	Z-SKOR	Natural Logorhythm of (ROA+ETA)/Standard deviation of ROA	<i>Liu et. al. (2013), Baselga-Pascual et al., (2015), Chiaramonte, Groci & Poli, (2015)</i>
	Return of Asset	ROA	Net Profit / Total Asset	<i>Messai & Jouini (2013), Nikolaidou and Vogiazas (2014), Ayaydin, et. al. (2021)</i>
	Return on Equity	ROE	Net Profit / Equity	<i>Sharma & Gounder (2015), Podpiera & Weil, (2008), Abid et. al. (2014), Louzis et al., (2012), Ayaydin, et. al. (2021)</i>
Independent Variables	Postgraduate Education	PEDU	Number of Postgraduate Employees/Total Employees	<i>Urquhar & Zhang (2022), Rahman & Akhter, (2021)</i>
	Specialization in Lending	SPECIALIZ	Total Loans / Total Asset	<i>Klein (2013), Espinoza & Prasad (2010), Louzis vd. (2012)</i>
	Capitalization	CAP	Equity / Total Asset	<i>Klein (2013), Louzis et. al. (2012), Macit (2012), Makri et. al. (2014).</i>
Bank-Specific Variables	Diversification	DIVERSITY	Non-Interest Income / Total Income	<i>Fukuyama & Matousek, (2011), Ozili, 2017</i>
	Effective	EFFECTIVE	Non-Interest Expenses/ Total Assets	<i>Espinoza and Prasad (2010), Louzis et al. (2012)</i>
	Efficient	EFFICIENT	Total Loans / Total Deposit	<i>Dimitrios vd. (2016)</i>
	Market Share	MSHARE	The ratio of the bank's assets to the sector's total assets	<i>Etmiko, (2018), Rehman, Aslam, & Iqbal, (2022)</i>
	Interest Rate	RATE	Interest Rate	<i>Beck et al. (2015), Berge & Boye (2007)</i>
	Exchange Rate	EXCHANGE	Annual Average Exchange Rate (\$)	<i>Bunda & Desquilbet, (2008)</i>
Macroeconomic and Financial Variables	Economic Growth	GDPG	GDP growth rate	<i>Rinaldi & Sanchis (2006), Ghosh, (2015), Louzis et al., (2012), Espinoza & Prasad, (2010)</i>
	Unemployment	UNEMP	Annual Unemployment Rate	<i>Messai & Jouini (2013), Rinaldi & Sanchis (2006).</i>
	Inflation Rate	INFL	Annual Inflation Rate	<i>Bunda, & Desquilbet (2008), Messai & Jouini (2013)</i>
Dummy	Public Bank	PUBLIC	Gets 1 if it's a public bank, 0 if it's a private bank	<i>Ghosh (2015), Messai & Jouini (2013)</i>

ROA represents the bank's return on average assets, while the ETA shows the ratio of the bank's equity to its total assets. σ ROA represents the standard deviation of the bank's average return on assets. A three-year time frame (previous year, current year, and following year) is used to calculate the volatility of the bank's return on assets (σ ROA) (Chiamonte et al, 2015). A higher Z-score indicates a lower risk of bankruptcy, as well as a stronger bank structure. Therefore, a negative relationship is expected between the dependent variable, the Z-score, and the independent variable, postgraduate education. Since the Z-score is highly volatile, the natural logarithm of the Z-score was taken (Laeven & Levine, 2009; Liu, Molyneux, & Wilson, 2013).

Return on assets (ROA) and return on equity (ROE), which represent dependent variables, are used as financial performance indicators. A higher return on bank assets (ROA) indicates that banks are well-utilized and are able to generate sufficient profits. If this ratio is low, it means that banks cannot use their assets efficiently. In this study, bank performance was measured by return on assets (ROA), as used in previous studies (Messai & Jouini, 2013; Nikolaidou & Vogiazas, 2014; Ayaydin, et al., 2021). Likewise, a higher return on bank equity (ROE) indicates that banks' equity is used well and sufficient profits are made. In this study, bank performance was also measured by return on equity (ROE), as used in previous studies (Podpiera & Weil, 2008; Abid et. al., 2014; Sharma & Gounder, 2015; Louzis et al., 2012; Ayaydin, vd., 2021).

In addition, some control variables used in the literature were also used in the study to increase the accuracy of the model. These include bank-specific variables such as SPECIALIZ, CAP, DIVERS, EFFECTIVE, EFFICIENT and MSHARE, as well as macroeconomic and financial variables such as IRATE, EXCHANGE, GDPG, UNEMP and INFL. In addition, a dummy variable was added to the model to see if the results changed if the banks were state banks.

Methodology

In panel data studies, it is necessary to examine whether there is autocorrelation, varying variance and correlation between units for the classical, fixed and random effects model. In the case of one or more of the aforementioned situations, the problem of biased estimation of the model results may arise. For this reason, it is necessary to statistically test whether these assumptions exist before proceeding to the model estimates created in the research (Ün, 2018: 75).

Before model estimation, it is important to check whether the panel consists of a micro panel or a macro panel because different panels require different econometric methods. For micro panels the asymptotics should be for large N and constant T. Asymptotics for macro panels can be for large N and large T. It is important to pay attention to the issues that may

arise in time series such as unit root, structural break and cointegration in macro panels and which concern the stationarity of the variables. In micro panels, on the other hand, since the time dimension is shorter ($N > T$), there is no need to deal with stationarity (Baltagi, 2013: 1).

In panel data analysis, it is generally encountered that the number of horizontal cross-sectional units is higher than the number of periods. In general, the panel data model;

$$Y_{it} = \alpha + \sum_{k=1}^q \beta_k X_{kit} + u_{it} \quad i = 1, 2, 3, \dots, N; \quad t = 1, 2, 3, \dots, T; \quad k = 1, 2, 3, \dots, q \quad (1)$$

It can be written in the form.

Where Y is the dependent variable, X_k is the independent variables, α is the constant parameter, β_k is the slope parameters, and u_{it} is the error term. i refers to the horizontal cross-sectional units (such as individual, company, city, country), and the t refers to the time (such as day, month, year). It is assumed that the mean of the error term u_{it} is zero and has a constant variance. In this model, the constant and slope parameters are valued according to both units and time (Tatoğlu, 2013: 4). According to the above panel data model, it is predicted that all independent variables affect all horizontal cross-sectional units to the same degree. Otherwise, the equation expressed is insufficient. An important issue that arises at this point is how to define (β_1). The starting point can be kept constant for all units, or different starting points can be allowed for different units. In this case, two methods appear - fixed and random-effect models. The fixed-effect model predicts that the starting point will take a constant value for all horizontal cross-sectional units. The fixed effect model is expressed with the help of the following equation (Kaya & Yılmaz, 2006: 69).

$$Y_{it} = \beta_{1i} + \beta_{2i} X_{2it} + \beta_{3i} X_{3it} + u_{it}, \quad \beta_{1j} \neq \beta_{1i} \quad (2)$$

The random effects model defines the starting point as a random variable. Accordingly, the starting points consist of the sum of the constant value and the zero-mean random variable. The random effects model is expressed by the equation model defined below (3). The parameter estimate is calculated in such a way that the Pooled Least Squares estimator is in the following formula. The Pooled Least Squares Method makes estimates under the assumptions that the constant and slope parameters are constant in cases where unit or time effects do not exist (Tatoğlu, 2013: 40).

$$Y_{it} = \beta_{1i} + \beta_{2i} X_{2it} + \beta_{3i} X_{3it} + u_{it}, \quad \beta_{1j} \neq \beta_{1i} + \mu_i \quad (3)$$

If the error term has unit or time effects, the error term in the pooled least squares method is, that is, the combined error. Here: unit effects show the time effect. If the error term is heteroscedastic (Changing Variance), effective estimators cannot be obtained. In this case, a method such as using resistant standard errors or making estimates using the generalized least squares (GEKK) method should be chosen (Tatoğlu, 2013: 42).

$$\beta_1 = [\sum_{i=1}^N \sum_{t=1}^N X'_{it} X_{it}]^{-1} \cdot [\sum_{i=1}^N \sum_{t=1}^N X'_{it} X_{it}] \tag{4}$$

Pooled ordinary least squares method (POLS); it can take the entire observation into a pool. If the binary composition of horizontal-sectional data with time series is neglected in POLS, a large educational performance function can be estimated. When a pooled model is established, it assumes that the function coefficients showing the effect of training on performance remain constant over time and cross-section (Gujarati, 2016: 407). The In-Group Estimation Method is used in the analysis of the fixed-effect panel data model. Which of the “fixed-effect” and “random-effect” models will be valid in panel data forecasts is determined by the “Hausa test” (Greene, 1993: 458-462). Accordingly, some tests were carried out on the micro panel (N>T), which was created from the data of 21 banks operating in Turkey in the 16-year period including the years 2004-2019. The tests are different according to the fixed and random effects models. According to the Hausman test, this study is more suitable for the random effects method. In this study, in order to determine whether there is a heteroscedasticity problem for each model in the random effects model, the Modified Wald Test; Bhargava, Franzini and Narendranathan’s Durbin-Watson and Baltagi-Wu local best invariant test (1982) was applied to determine whether there was an autocorrelation problem. The Pesaran (2004) test was used to determine whether there is a correlation between units (horizontal section dependency) in the models.

As a result of the tests, it was determined that there was no heteroscedasticity, autocorrelation and correlation between units in the models (See Table 4). For this reason, Generalized Least Squares Estimator is used in model estimation.

The hypotheses created to reveal the effect of banks’ postgraduate education level on credit risk and profitability are as follows.

Model 1

$$NPL_{i,t} = \beta_{0i} + \beta_1 PEDU_{i,t} + \beta_2 MSHARE_{i,t} + \beta_3 SPECIALIZ_{i,t} + \beta_4 CAP_{i,t} + \beta_5 EFFTECTIVE_{i,t} + \beta_6 DIVERSITY_{i,t} + \beta_7 EFFICIENT_{i,t} + \beta_8 RATE_{i,t} + \beta_9 EXHANGE_{i,t} + \beta_{10} GDPG_{i,t} + \beta_{11} UNEMP_{i,t} + \beta_{12} INFL_{i,t} + \beta_{13} STATE_i + \mu_i + \lambda + u_{i,t}$$

Model 2

$$LLP_{i,t} = \beta_{0i} + \beta_1 PEDU_{i,t} + \beta_2 MSHARE_{i,t} + \beta_3 SPECIALIZ_{i,t} + \beta_4 CAP_{i,t} + \beta_5 EFFTECTIVE_{i,t} + \beta_6 DIVERSITY_{i,t} + \beta_7 EFFICIENT_{i,t} + \beta_8 RATE_{i,t} + \beta_9 EXHANGE_{i,t} + \beta_{10} GDPG_{i,t} + \beta_{11} UNEMP_{i,t} + \beta_{12} INFL_{i,t} + \beta_{13} STATE_i + \mu_i + \lambda + u_{i,t}$$

Model 3

$$Z-SKOR_{i,t} = \beta_{0i} + \beta_1 PEDU_{i,t} + \beta_2 MSHARE_{i,t} + \beta_3 SPECIALIZ_{i,t} + \beta_4 CAP_{i,t} + \beta_5 EFFTECTIVE_{i,t} + \beta_6 DIVERSITY_{i,t} + \beta_7 EFFICIENT_{i,t} + \beta_8 RATE_{i,t} + \beta_9 EXHANGE_{i,t}$$

$$\beta_{10}GDPG_{i,t} + \beta_{11}UNEMP_{i,t} + \beta_{12}INFL_{i,t} + \beta_{13}STATE_i + \mu_i + \lambda + u_{i,t}$$

Model 4

$$ROA_{i,t} = \beta_{0i} + \beta_1 PEDU_{i,t} + \beta_2 MSHARE_{i,t} + \beta_3 SPECIALIZ_{i,t} + \beta_4 CAP_{i,t} + \beta_5 EFFECTIVE_{i,t} + \beta_6 DIVERSITY_{i,t} + \beta_7 EFFICIENT_{i,t} + \beta_8 RATE_{i,t} + \beta_9 EXCHANGE_{i,t} + \beta_{10}GDPG_{i,t} + \beta_{11}UNEMP_{i,t} + \beta_{12}INFL_{i,t} + \beta_{13}STATE_i + \mu_i + \lambda + u_{i,t}$$

Model 5

$$ROE_{i,t} = \beta_{0i} + \beta_1 PEDU_{i,t} + \beta_2 MSHARE_{i,t} + \beta_3 SPECIALIZ_{i,t} + \beta_4 CAP_{i,t} + \beta_5 EFFECTIVE_{i,t} + \beta_6 DIVERSITY_{i,t} + \beta_7 EFFICIENT_{i,t} + \beta_8 RATE_{i,t} + \beta_9 EXCHANGE_{i,t} + \beta_{10}GDPG_{i,t} + \beta_{11}UNEMP_{i,t} + \beta_{12}INFL_{i,t} + \beta_{13}STATE_i + \mu_i + \lambda + u_{i,t}$$

Analysis and Findings

Descriptive Statistics

Table 2 shows the explanatory statistics of the dependent variables for the 2004-2019 period. NPL, LLP, Z-SKOR, ROA and ROE independent variables; PEDU represents the main independent variable. In addition to these, bank-specific variables, control variables, and a dummy variable coded as 1 if the banks are public banks were also used.

According to the table, the average of the banking sector is NPL 6,422%. LLP is 1.076%, L.Z-SCORE 3.921%, ROA 4.643, ROE 18.624 and PEDU 6.422.

Table 2
Descriptive Statistics for Variables

Dependent variables	N	Mean (%)	Std. Deviation	Min.	Max.
NPL	336	6.422	3.007	0.009	28.094
LLP	336	1.076	0.737	0.065	6.618
L.Z-SKOR	336	3.921	0.843	.0724	7.286
ROA	336	4.643	1.652	-12.554	6.462
ROE	336	18.624	17.582	-178.636	39.885
Independent variables					
PEDU	336	6.422	3.371	1.160	21.010
Bank-Specific Variables					
SPECIALIZ	336	4.567	5.355	.042	20.487
CAP	336	57.785	13.486	9.985	83.842
DIVERSITY	336	14.348	7.458	-16.854	35.874
EFFECTIVE	336	3.254	1.486	1.427	14.145
EFFICIENT	336	93.745	26.658	16.877	226.874
MSHARE	336	4.564	5.125	0.037	20.458
Control Variables					
RATE	336	14.219	5.505	7.937	26.750
EXCHANGE	336	2.235	1.329	1.287	5.721

Dependent variables	N	Mean (%)	Std. Deviation	Min.	Max.
INFL	336	9.468	3.241	6.160	20.150
UNEMP	336	10.392	1.450	8.432	14
GDPG	336	5.349	3.854	-4.654	11.025
DUMMY	336	.143	0.350	0	1

Table 2 shows the descriptive statistics for the variables used in the regressions. The entire sample body includes 336 observations from 2004 to 2019. The data were obtained from the Data System of the Banks Association of Turkey (<https://verisistemi.tbb.org.tr/>) and the Banking Regulation and Supervision Agency (<https://www.bddk.org.tr/>). Variables are explained in Table 1.

Table 3 shows the correlations of the variables. Accordingly, the NPL variable, LLP, CAP, EFFECTIVE and DIVERS variables are in positive and have a significant correlation. The LLP variable also has a significant correlation with the same variables, similar to the NPL. The ZSKOR dependent variable, MSHARE, CAP variables have positive and negative and significant correlations with the EFFECTIVE variable. The ROA dependent variable was positively and significantly correlated with the ROE, MSHARE, CAP and DUMMY variables and are EFFECTIVE negatively. Finally, the ROE dependent variable is in positive and has a significant correlation with the MSHARE, CAP and DUMMY variables and is EFFECTIVE.

Appropriate Model Selection

With the conclusion that there is a unit effect according to the F-Test for the models, it is necessary to determine whether the unit effect is constant or random in order to determine the correct model. In this context, the Hausman (1978) Test was applied to both models.

The Hausman (1978) Test is used to decide which is the optimal model when choosing between the fixed and random effects model. The main hypothesis of the test in question is “There is no correlation between explanatory variables and unit (time) effect.” while the alternative hypothesis is established as “Explanatory variables and unit (time) effect are correlated”. If the H_0 cannot be rejected, it is concluded that the difference between the parameter estimators of the fixed-effects model and the random-effects model will be very small, and both estimators are consistent, but the random-effects estimator is more efficient. If the H_0 is rejected, it is concluded that the difference between the parameter estimators will be large and the random effects estimator is inconsistent with the fixed effects estimator (Tatoğlu, 2018: 187).

Table 3
Correlation Matrix

	NPL	LLP	Z-SKOR	ROA	ROE	PEDU	MSHR.	SPEC.	CAP	EFFT.	DIVER.	EFFC.	DUMMY
NPL	1.000												
LLP	0.510***	1.000											
Z-SKOR	-0.182	-0.298**	1.000										
ROA	-0.119*	-0.342**	0.158	1.000									
ROE	-0.151*	-0.209*	0.136	0.943**	1.000								
PEDU	-0.124***	-0.096*	-0.164	-0.216	-0.198	1.0000							
MSHARE	-0.100**	-0.096*	0.132*	0.295*	0.266*	-0.340*	1.000						
SPECIA-LIZ	-0.259*	0.088	0.072	0.009	0.093	0.096*	0.056	1.000					
CAP	0.066*	-0.025*	0.281**	0.219*	0.102*	0.043	-0.123	-0.205	1.000				
EFFEC-TIVE	0.226*	0.423*	-0.176*	-0.322*	-0.374*	0.001	-0.431*	-0.141	0.368*	1.000			
DIVER-SITY	0.137*	0.262*	-0.003	0.157	0.084	-0.282*	0.117	-0.186	0.259	0.376*	1.000		
EFFICI-ENT	-0.281*	0.031	-0.078	-0.075	-0.028	0.059	-0.151	0.832*	-0.253	-0.225	-0.183	1.000	
DUMMY	0.068	-0.151	-0.051	0.168*	0.204*	-0.096	0.501***	-0.163	-0.246*	-0.356*	-0.135	-0.227	1.000

Note: ***, **, * indicate that the variables are significant at 1%, 5% and 10% significance level, respectively.

Table 4
Model Selection and Summary of Model Test Specifications

	F Test		Hausman Test		Selected Model	Specification Tests		
	Coefficient	P	Coefficient	P		Autocorrelation Test	Peseran CD	Variable Variance Test
<i>Model 1</i>	5.35	0.000*	18.71	0.4758	Durbin-Watson Baltagi-Wu LBI	0.685 1.081	0.285 Prob:0.9604	48.26 Prob:0.000
<i>Model 2</i>	9.52	0.000*	17.93	0.5854	Durbin-Watson Baltagi-Wu LBI	0.894 1.247	0.284 Prob:0.8674	24.56 Prob:0.000
<i>Model 3</i>	448.57	0.000*	24.78	0.5274	Durbin-Watson Baltagi-Wu LBI	0.745 1.145	0.296 Prob:0.3894	.263 Prob:0.000
<i>Model 4</i>	17.43	0.000*	17.93	0.5791	Durbin-Watson Baltagi-Wu LBI	0.862 1.263	0.289 Prob:0.3138	440.51 Prob:0.000
<i>Model 5</i>	10.20	0.024*	3.65	0.9978	Durbin-Watson Baltagi-Wu LBI	0.916 1.442	0.284 Prob:0.7237	211.93 Prob:0.000

Note: * denotes critical value at alpha=0.05 level.

When the Hausman (1978) Test results stated in Table 4 are examined; in the NPL, LLP, Z-SKOR, ROA and ROE models, it was seen that the H_0 hypothesis could not be rejected at the 5% significance level (Prob> 0.010), and there was no correlation between the unit effect and the explanatory variables. In the light of these results, it was understood that there was no correlation between the unit effect and the explanatory variables in all five models, and the one-way unit random effects model was more consistent for the research model.

When Table 4 is examined, the Modified Wald Test performed for each model in the random effects model shows that there is no heteroscedasticity problem in the models. According to Bhargava, Franzini, and Narendranathan’s Durbin-Watson and Baltagi-Wu local best invariant test (1982), there is no autocorrelation problem in the models. According to the Pesaran (2004) test, which was conducted to determine whether there is a correlation between units (horizontal section dependency) in the models, it was determined that there was no correlation between units in the models. For this reason, the Generalized Least Squares Estimator was used to estimate the models.

Results

After it has been determined that the random effects model will be applied, the necessary assumptions must be provided in order to use the Generalized Least Squares (GLS) estimator,

which is the random effects estimator. If the assumptions cannot be met, then resistant estimators will be used. These assumptions are that there is constant variance between error terms (no changing variance problem), no correlation between units (horizontal section dependence) and no correlation (autocorrelation) between error terms. Generalized Least Squares Estimator was used because the necessary assumptions were met in the models.

Model 1 results; consistent with H1, it reveals that human capital is negatively and significantly correlated with banks' non-performing loans. As the level of postgraduate education, which is used as a human capital indicator of banks, increases, the non-performing loans of banks decrease strongly ($B1 < 0$). A one-unit increase in human capital causes a decrease of -0.382 (z value = -5.89) in non-performing loans. This shows that banks with high human capital follow a more selective and cautious lending policy when extending loans than banks with low human capital.

According to Model 1, the share of banks in the sector (MSHARE), lending specialization (SPECIALIZ), deposit to loan ratio (EFFICIENT), market interest rates (RATE) and gross national product growth (GROWTH) negatively and significantly affect non-performing loans. There is an inverse relationship between the variables in question and the problem loans of banks Decisively. As these variables increase, the problem loans of banks decrease. As the size of the banks in the sector increases, their competitive capacity also increases. This result can be interpreted as a banks' ability to provide loans to their lower-risk loan customers in the market. Similar results were obtained in similar studies (Ayaydin et. al., 2021).

The lending specialization (SPECIALIZ) variable was found to be negative and statistically significant in models 1 and 2. As conventional banks specialize in lending in Turkey, it means that they can better identify and follow up risky customers and loans that cause NPLs to increase. Although there are similar results in the literature (Kosmidou et. al., 2007; Ayaydin et. al., 2021), the opposite results were obtained in some studies (Festic, 2011, Messai and Jouini, 2013, Ozili, 2019). The negative effect of the SPECIALIZ variable on non-performing loans can be explained by reasons specific to Turkey.

Accordingly, as the rate of channeling the total assets of banks to loans increases in Turkey over the years, the non-performing loan ratios increase less compared to this increase, that is, they tend to decrease. It can be said that the structural arrangements and changes made after the 2001 crisis were effective in the emergence of this situation. In addition, the fact that the Total Credit/Total Assets (SPECIALIZ) ratio, which was 45% in the first 3 years of the research, has approached 70% in the last three years, can be interpreted as confirming this situation. The low rate of this ratio brings with it results such as high storage costs and lower profitability (Staikouras et. al. 2008).

GDP growth is expected to affect loan demand and returns (Boadi & Osarfo, 2019). As seen in Models 1 and 2 in this study, increasing GDP growth significantly reduces the credit

risk of banks. At this point, it can be seen as a remarkable result that the increase in market interest rates reduces the non-performing loans of banks. While supporting the same results in Model 2, the results in Models 4 and 5 also confirm that the profitability of banks increases with interest rates. The increase in interest rates in Turkey affects banks positively both in terms of risk and profitability.

On the other hand, operating efficiency (EFFECTIVE), inflation (INFL) and unemployment (UNEMP) are positively and significantly related to non-performing loans. As these variables increase, the non-performing loans of banks also increase. In addition, it has been determined that there is a positive relationship between non-performing loans and public banks (DUMMY). From this, it is understood that public banks have higher non-performing loans compared to private banks. No statistically significant relationship was found between the equity ratio (CAP), income diversification (DIVERSITY) and exchange rate (EXCHANGE) variables and non-performing loans.

Although Staikouras and Wood (2003) stated that inflation may have a direct and indirect effect on the performance of banks, in this study, it was determined that the inflation rate was statistically positive and significant only with non-performing loans.

Tablo 5
GLS Model Results

Independent Variables	Dependent Variables				
	Model 1 NPL	Model 2 LLP	Model 3 Z-SKOR	Model 4 ROA	Model 5 ROE
<i>PEDU</i>	-0.382*** [-5.89]	-0.077*** [-5.21]	-0.026 [-1.58]	0.019 [0.64]	0.231 [0.63]
<i>MSHARE</i>	-0.172*** [-3.18]	-0.001 [-0.04]	0.008 [-0.43]	-0.005 [-0.12]	-0.175 [-0.53]
<i>SPECIALIZ</i>	-0.078*** [-3.95]	-0.024* [-0.46]	0.001 [1.04]	0.013 [1.64]	0.073 [0.46]
<i>CAPITAL</i>	0.007 [0.13]	-0.034*** [-2.81]	0.151*** [7.08]	0.238*** [9.27]	2.271*** [7.05]
<i>EFFECTIVE</i>	0.518*** [3.93]	0.326*** [11.38]	-0.299*** [-5.85]	-0.906*** [-15.61]	-10.015*** [-13.76]
<i>DIVERSITY</i>	-0.011 [-0.50]	0.007 [1.52]	0.001 [0.03]	0.059*** [6.20]	0.629*** [5.85]
<i>EFFICIENT</i>	-0.018* [-1.90]	-0.002 [-0.91]	0.001** [2.35]	0.005 [1.11]	0.078 [1.20]
<i>INFL</i>	0.088* [1.70]	0.009 [0.63]	0.004 [0.17]	0.003 [0.12]	0.306 [0.94]
<i>RATE</i>	0.233*** [-6.41]	-0.042*** [-5.40]	-0.005 [-0.37]	0.097*** [6.42]	0.965*** [4.51]
<i>GROWTH</i>	-0.069* [-1.66]	0.063*** [-7.07]	-0.009 [-0.54]	-0.005 [-0.31]	-0.124 [-0.57]
<i>UNEMP</i>	0.300*** [2.01]	0.034 [-1.09]	-0.029 [-0.50]	0.108* [1.79]	0.956 [1.21]

Independent Variables	Dependent Variables				
	Model 1 NPL	Model 2 LLP	Model 3 Z-SKOR	Model 4 ROA	Model 5 ROE
<i>EXCHANGE</i>	0.272 [1.17]	0.143*** [2.88]	-0.145 [-1.25]	0.404*** [-4.27]	-4.994*** [-4.04]
<i>DUMMY</i>	1.553* [1.94]	0.042 [0.19]	0.206 [0.29]	0.184 [0.22]	4.047 [0.68]
<i>- Cons</i>	10.612*** [4.97]	1.957*** [4.25]	3.073*** [3.67]	-2.289** [-2.55]	-18.744* [-1.64]
Random Effect	Yes	Yes	Yes	Yes	Yes
R ²	0.54	0.64	0.61	0.57	0.53
# of observations	336	336	336	336	336
Wald chi2	252.26	846.33	441.10	389.12	274.75
Prob. > chi2	0.000***	0.000***	0.000***	0.000***	0.000***
theta	0.5878	0.5936	0.7651	0.7493	0.6448

Note: ***, ** and * denote the significance level of 0.01, 0.05 and 0.10, respectively. The values in [] brackets indicate the z value.

Although there is evidence that growth affects loan demand (Goddard, Molyneux & Wilson, 2004) and profitability (Işık, Noyan, et al., 2017), there is no evidence that it increases profitability in Turkey according to Models 3 and 4. These results are consistent with the study results of Samırkaş, Evcı & Ergün (2014).

The Model 2 results, consistent with H₂, reveal that human capital is negatively and significantly correlated with a banks' loan loss provisions. As the postgraduate education level of the personnel in the banks increases, the loan loss provisions of the banks decrease strongly ($\beta_1 < 0$).

A one-unit increase in postgraduate education causes a decrease in the loan loss allowance of -0.077 (z value= -5.21). In general, the results in Model 2 support the results in Model 1. This situation can be interpreted as banks with high postgraduate education having to allocate less provision for loan losses as a result of following a more selective and cautious lending policy than banks with low postgraduate education during the loan allocation process.

According to Model 2, banks' lending specialization (SPECIALIZ), equity ratio (CAP), market interest rates (RATE) and gross national product growth (GROWTH) are negatively and significantly related to the bank's loan loss provisions. While these variables increase, the bank's loan loss provisions decrease. The results show that postgraduate education is positively and significantly associated with banks' operating efficiency (EFFECTIVE) and exchange rate (EXCHANGE). As the operational efficiency and exchange rate of banks increase, the provision for loan losses also increases.

According to the Model 3 results, there is no significant relationship between the postgraduate education ratio and the Z-Score ratios of banks. The fact that the capital ratios of the banks in Turkey are strong and therefore the Z-SCORE ratios are higher than the re-

commended ratio of 1.8 (Li et al., 2017; Aksoy and Donduran, 2020), where the risk of bankruptcy may arise, may have rendered the relationship meaningless. While there was a positive and significant relationship between CAP, EFFECTIVE and EFFICIENT variables and Z-SCORE, no relationship was found between other variables.

According to the Model 4 and 5 results; Although postgraduate education positively affects ROA and ROE, which are important profitability indicators of banks, this relationship between them is not significant. It was determined that there is a positive and significant relationship between CAP, DIVERSITY, and RATE. While banks' equity ratios, income diversification and interest rates increase, ROA and ROE increase significantly. It was determined that there is a negative and significant relationship between EXCHANGE and EFFECTIVE. While the exchange rate and non-interest expenses of banks increase, their profitability decreases significantly. It can be said that these results are due to the high foreign currency usage rates of banks in Turkey and their foreign currency short positions. The high non-interest expenses indicate that the operational efficiency of the banks is low and as a result, it may have a reducing effect on profitability.

Tablo 6
Hypothesis Results

Hypothesis	Acceptance / Reject
H1. Human capital (PEDU) is negatively correlated with banks' non-performing loan rates (NPL).	Accepted
H2. Human capital (PEDU) is negatively correlated with banks' loan loss provisions (LLP).	Accepted
H3. Human capital (PEDU) is positively related to the bankruptcy risk of banks (Z-SCORE).	Rejected
H4. Human capital (PEDU) is positively correlated with banks' return on assets (ROA).	Rejected
H5. Human capital (PEDU) is positively correlated with banks' return on equity (ROE).	Rejected

A summary of all hypotheses is given in Table 6. Accordingly, it was related to a negative and significant relationship between human applied and non-performing loans (NPL) and loan expenditures (LLP). As with any relationship between the risk (Z-SCORE) of other banks, return on assets ratio (ROA) and equity ratio (ROE).

Sensitivity Tests

In this study, the validity of the research hypotheses was tested on the variables of credit risk, bankruptcy risk and profitability. While the credit risk variable was tested with NPL and LLP, the bankruptcy risk was tested with the Z-Score. Profitability is tested with both ROA and ROE. It is aimed to ensure the acceptability of the results by testing profitability and credit risk with two variables. In addition, bans with an asset size of 9% and above of the sector and those with less than 9% were divided into two and retested.

As in the studies of Kim and Lu (2011), Hasan et al. (2017), and Pilatin & Ayaydın (2019) the results from the basic model reduce any potential concern that human capital is affected

by endogeneity due to variables that are related to but neglected. As an alternative method, susceptibility testing was also performed.

Seven banks with an asset size of 9% and above and 14 banks with an asset size of less than 9% of the banks were analyzed again separately on the same models. The results in Table 7 show the test results.

Table 7

Effect of Postgraduate Education Level on Credit Risk and Financial Performance (Asset size of 9% or more in the sector)

Independent Variables	Dependent Variables				
	Model 1 NPL	Model 2 LLP	Model 3 Z-SKOR	Model 4 ROA	Model 5 ROE
<i>PEDU</i>	-0.364** [-2.08]	-0.045** [-1.32]	-0.032 [-0.63]	-0.018 [-0.44]	-0.018 [-0.44]
<i>MSHARE</i>	-0.661*** [-6.76]	0.015 [0.10]	0.034 [1.21]	0.003 [0.15]	-0.003 [-0.01]
<i>SPECIALIZ</i>	-0.363*** [-4.32]	-0.019 [-1.54]	0.002 [0.09]	0.057*** [2.83]	0.657*** [2.64]
Independent Variables	Dependent Variables				
	Model 1 NPL	Model 2 LLP	Model 3 Z-SKOR	Model 4 ROA	Model 5 ROE
<i>CAPITAL</i>	-0.053 [-0.42]	0.067*** [3.47]	0.095** [2.54]	0.005 [0.18]	-1.144*** [-3.02]
<i>EFFECTIVE</i>	0.203 [0.92]	0.505*** [15.08]	-0.428*** [-6.57]	-1.250*** [-23.45]	-16.872*** [-25.76]
<i>DIVERSITY</i>	0.049 [0.71]	0.030*** [2.88]	0.002 [0.08]	0.040** [2.40]	0.517** [2.48]
<i>EFFICIENT</i>	0.114*** [2.65]	0.009 [1.36]	0.007 [0.54]	-0.028*** [-2.78]	-0.306** [-2.40]
<i>INFL</i>	-0.055 [-0.44]	0.204 [1.09]	-0.027 [-0.74]	-0.006 [-0.21]	-0.342 [-0.93]
<i>RATE</i>	-0.011* [-0.23]	-0.026** [-2.24]	0.001 [-0.03]	0.085*** [4.59]	1.338*** [5.90]
<i>GROWTH</i>	0.026 [1.62]	-0.045*** [-3.70]	0.023 [0.98]	-0.003 [-0.15]	0.025 [0.11]
<i>UNEMP</i>	0.338 [1.22]	0.001 [0.02]	-0.014 [-0.17]	0.160** [2.39]	2.146 *** [2.61]
<i>EXCHANGE</i>	0.241 [1.62]	0.881 [1.13]	-0.043 [-0.31]	-0.430*** [-3.75]	-4.835*** [-3.43]
<i>DUMMY</i>	2.027** [2.28]	0.526*** [3.91]	0.112 [0.43]	-0.671 [0.22]	-8.082*** [-3.07]
<i>_Cons</i>	10.576*** [3.48]	-1.214* [1.66]	3.252** [2.29]	1.989* [1.71]	28.098** [1.96]
Random Effect	Yes	Yes	Yes	Yes	Yes
R ²	0.52	0.74	0.48	0.56	0.84
# of observations	112	112	112	112	112
Wald chi2	130.83	335.95	113.45	349.87	748.23
Prob. > chi2	0.000***	0.000***	0.000***	0.000***	0.000***
theta	.5358	.5942	.6687	.7493	.6448

Note: ***, ** and * denote the significance level of 0.01, 0.05 and 0.10, respectively. The values in [] brackets indicate the z value.

Banks with an asset size of 9% or more were analyzed separately. The results reveal that human capital is negatively and significantly correlated with banks' non-performing loans, supporting the baseline model results. As the level of postgraduate education, which is used as a human capital indicator of banks, increases, non-performing loans of banks decrease ($\beta_1 < 0$). A one-unit increase in human capital causes a decrease of -0.364 (z value= -2.08) in non-performing loans.

To support the main model, as the level of postgraduate education, which is used as a human capital indicator of banks, increases, the provision for credit losses of banks also decreases ($\beta_1 < 0$). A one-unit increase in human capital causes a decrease of -0.045 (z value= -1.08) in loan loss reserves. According to the results of Models 3 and 5, there is no relationship between the dependent variables of Z-SCORE, ROA and ROE and the dependent variable of human capital, respectively.

The data of 14 banks with an asset size of less than 9% of the banks were analyzed again and again using the same models. Table 7 shows the test results.

Table 8
Effect of Postgraduate Education Level on Credit Risk and Financial Performance (Asset size of less than 9% in the sector)

Independent Variables	Dependent Variables				
	Model 1 NPL	Model 2 LLP	Model 3 Z-SKOR	Model 4 ROA	Model 5 ROE
<i>PEDU</i>	-0.368*** [-5.55]	-0.077** [-4.34]	-0.254 [-0.63]	0.016 [0.43]	-0.087 [-0.20]
<i>MSHARE</i>	-0.201 [-0.90]	-0.039 [-0.60]	0.081 [0.88]	0.184 [1.20]	-2.632* [-1.65]
<i>SPECIALIZ</i>	-0.046*** [-2.68]	-0.000 [-0.01]	-0.001 [-0.11]	0.008 [0.92]	-0.011 [-0.10]
<i>CAPITAL</i>	-0.129** [-2.26]	0.047*** [-3.07]	0.156** [5.39]	0.287*** [9.23]	2.567*** [6.86]
<i>EFFECTIVE</i>	0.880*** [5.67]	0.282*** [6.88]	-0.266*** [-3.38]	-0.795*** [-9.50]	-6.673*** [6.61]
<i>DIVERSITY</i>	0.001 [0.07]	0.009* [1.81]	0.001 [0.01]	0.048*** [4.45]	0.434*** [3.24]
<i>EFFICIENT</i>	-0.020** [-2.33]	0.002 [-0.84]	0.009** [-2.00]	0.008* [1.71]	0.104* [1.82]
<i>INFL</i>	0.240*** [3.42]	0.015 [0.84]	0.014 [0.37]	-0.021 [-0.58]	0.208 [0.46]
<i>RATE</i>	-0.369*** [-10.15]	-0.047*** [-4.94]	-0.005 [-0.29]	0.106*** [5.53]	0.804*** [3.42]
<i>GROWTH</i>	-0.151*** [-3.58]	-0.081*** [-7.35]	-0.023 [-1.02]	0.010 [0.46]	0.015 [0.06]
<i>UNEMP</i>	0.320** [2.10]	-0.046 [-1.14]	-0.043 [-0.54]	0.057** [0.57]	0.246 [-0.25]

Independent Variables	Vari-	Dependent Variables				
		Model 1 NPL	Model 2 LLP	Model 3 Z-SKOR	Model 4 ROA	Model 5 ROE
<i>EXCHANGE</i>		-0.012 [-0.05]	0.119* [1.87]	-0.167 [-1.32]	-0.235* [-1.82]	-2.63* [-1.68]
<i>DUMMY</i>		-	-	-	-	-
_cons		10.576*** [4.90]	2.42*** [4.25]	3.001*** [2.74]	-3.009** [-2.55]	-19.878 [-1.42]
Random Effect		Yes	Yes	Yes	Yes	Yes
R ²		0.46	0.44	0.43	0.46	0.42
# of observations		224	224	224	224	224
Wald chi2		176.45	147.29	106.47	170.80	107.54
Prob. > chi2		0.000***	0.000***	0.000***	0.000***	0.000***
theta		.5917	.6661	.4384	.7564	.6572

Note: ***, ** and * denote the significance level of 0.01, 0.05 and 0.10, respectively. The values in [] brackets indicate the z value. All of them are private banks.

According to the results, banks with an asset size of less than 9% were again analyzed separately. The results reveal that human capital is negatively and significantly correlated with banks' non-performing loans, supporting the baseline model results. As the level of postgraduate education, which is used as a human capital indicator of banks, increases, non-performing loans of banks decrease ($\beta_1 < 0$). A one-unit increase in human capital causes a decrease of -0.368 (z value= -5.55) in non-performing loans.

To support the main model, as the level of postgraduate education, which is used as a human capital indicator of banks, increases, the provision for credit losses of banks also decreases ($\beta_1 < 0$). A one-unit increase in human capital causes a decrease of -0.077 (z value= -4.34) in loan loss reserves. According to the results of Models 3 and 5, there is no relationship between the dependent variables of Z-SCORE, ROA and ROE and the dependent variable of human capital, respectively.

Conclusion

Human resources departments of businesses exist to recruit the most educated, qualified and competent personnel. That's what banks' human resources departments are for. Perhaps the best are hired for superior education and competence. While some of the characteristics of the personnel are observable (educational background, competence and experience), some of them are unobservable (leadership and entrepreneurial skills) (Bhagat et al., 2010). Unobservable features are difficult to identify and measure. However, observable features are easy to identify and measure and are very important for business. Education level is important because it is both observable and the most important and most used surrogate of human capital (Hambrick & Mason, 1984; Barro & Lee, 2010; Ellul & Yerramilli, 2013). In this study, the level of postgraduate education was used as an indicator of human capital for banks.

Human capital is at the center of successful companies because of its direct and indirect impact on business performance. This view is supported by the resource-based view (RBV), which provides superior performance and competitive advantage to an enterprise's capacity for valuable, rare, inimitable, and non-substitutable products and services (Barney, 1991; Prahalad & Hamel, 1990). Different empirical studies have been conducted on different sectors regarding human capital. While studies on human capital show that human capital contributes to a higher financial performance (King et. al. 2016; Adesina, 2021), there are also studies reporting that it does not (Razafindrambinina & Anggreni, 2017; Soewarno & Tjahjadi, 2020).

In general, human capital in the banking sector is more important than in production enterprises. This is because as the level of education and knowledge of human capital increases, its competence also increases. There are studies on the effect of the education level of board members on financial performance and bank risk level in banks (García-Meca et. al. 2015; King et. al. 2016; Pereira & Filipe, 2018; Yılmaz & Aybars, 2021). The main implementers of the bank's policies and objectives are the personnel working at different levels and constituting the majority of the employees. However, no study has been found on the effect of education levels on the bank's credit risk and financial performance. This gap in the literature constitutes the main motivation for the study.

Banks, which are very important for economies, ensure the functioning of the financial system by bringing together those who supply funds and those who demand funds in the system. In order for investment, commercial and financial activities to continue and develop in the economic structure, market actors must be able to meet the needs from financial markets. The most important function of banks is the lending function. The banking system works well to the extent that banks fulfill their lending function.. While performing the lending function, banks pay attention to the fact that the customer consists of the customers who will provide the bank with the highest return and the lowest risk. They also try to give loans to areas that will make the highest contribution to the economy. At this point, the human capital of banks gains importance because more educated bank personnel are expected to be more skilled at benchmarking customers, predicting risks and managing future cash flows. Therefore, since a bank with more educated personnel will have a lower NPL ratio, it is expected to have a lower credit risk and a more efficient and profitable performance.

The main purpose of this study is to determine whether there is any relationship between postgraduate education and banks' credit risk, bankruptcy risk and profitability in Turkey, a developing country. In the study, analyses were carried out by taking the data of all state-owned, private-capital and foreign-owned conventional banks in Turkey during the 16-year period covering the 2004–2019 period. Although the number of conventional banks in Turkey is 34, these banks were not included in the research because the number of branches of 3 banks in Turkey is less than 4. The remaining 10 banks were excluded from the scope of the study as they did not provide sufficient data for the years 2004–2009 and did not maintain widespread

banking activities throughout Turkey. The sample used in the study covers 94% of the asset size of the Turkish banking system and 98% of the number of employees.

In the study, non-performing loans (NPL), loan loss provisions (LLP), bankruptcy risk (Z-Score), return on assets (ROA) and return on equity (ROE) were used as dependent variables. The postgraduate education variable was used as the independent variable. According to the empirical results, results supporting H1 were found between postgraduate education and non-performing loans. Accordingly, postgraduate education is significantly and negatively correlated with non-performing loans (NPL) of banks. As the postgraduate education level of banks rises, the tendency of non-performing loans decreases. Results supporting H₂ were found between postgraduate education and provisions for loan losses (LLP). Accordingly, postgraduate education is significantly and negatively correlated with LLP. As the postgraduate education level of banks increases, the LLP tendency decreases. These results show that as the level of postgraduate education of bank personnel increases, the probability of conversion of loans to non-performing loans decreases accordingly. This shows that bank personnel with higher education levels follow a more conservative and prudent strategy in lending.

According to the results of the study, no results supporting H₃ were found between postgraduate education and Z-SCORE. The results do not support H₄ and H₅, which indicate that high postgraduate education has a positive effect on ROA and ROE, which are bank profitability indicators. No significant relationship was found between postgraduate education and ROA and ROE.. These results support the studies of Awan & Sarfraz (2013), Calabro et. al. (2021), Nyberg (2014) and Rahman & Akhter (2021).

According to the sensitivity analysis, it has been confirmed that there is a negative and significant relationship between the postgraduate education level of banks with an asset size of 9% and above and NPL and LLP. It has been confirmed that there is a negative and significant relationship between the postgraduate education level of banks with an asset size below 9% and the credit quality indicators NPL and LLP. Thus, it has been revealed that there is a negative and significant relationship between banks' postgraduate education level and credit risk in terms of size. These results support both the theory on which the research is based and the H₁ and H₂. As seen in Models 1 and 2 in the study, increasing GDP growth significantly reduces the credit risk of banks. Interestingly, the increase in market interest rates in Turkey significantly reduces the non-performing loans of banks, while significantly increasing bank profitability in all models. It can be seen as a remarkable result of this study. While supporting the same results in Model 2, the results in Models 4 and 5 also confirm that the profitability of banks increases with interest rates. The increase in interest rates in Turkey affects banks positively both in terms of risk and profitability.

According to all these results, as the level of postgraduate education, which is a human capital indicator of banks, increases, non-performing loans (NPL) and loan loss provisions

(LLP), which are indicators of credit risk, decrease. On the other hand, it has been understood that there is no relationship between the Z-SCORE, which is an indicator of bankruptcy risk of banks, and ROA and ROE, which are profitability indicators. These findings support studies conducted in developing countries (Absar et. al 2012; Garcia, 2005; Rahman & Akhter, 2021). There are different results in the study conducted in the developed country sample (Nguyen et. al. 2015). The fact that the level of postgraduate education is not associated with profitability may be due to the fact that there are too many variables affecting profitability. The results do not support the studies of Topaloğlu & Bayrakdaroğlu (2012) and Yılmaz & Aybars (2021). Because in banks where the level of postgraduate education is high, staff may tend to behave more cautiously and conservatively. This situation can be interpreted as causing the personnel to use less credit and decrease the profitability together with the credit risk. In addition, as the level of postgraduate education increases, the tendency of loan allocation personnel to give loans with high risk and return decreases. This conservative loan allocation policy may prevent banks from increasing their profitability after a certain period of time. Non-performing loans, which gained importance all over the world after the 2008 global financial crisis, can be used as an early warning system to predict a possible financial crisis. Considering this, in order to prevent this, the necessity for banks to be more selective in extending loans comes to the fore. In order to achieve this, as the results of this study show; banks are required to employ staff with a higher level of postgraduate education.

The findings of this study provide important information for policy makers, regulatory and supervisory institutions and organizations, research commissions, bank managers and researchers. Bank managers may set criteria for employing personnel with a certain level of postgraduate education in the bank policy. Policy makers, regulatory and supervisory institutions can apply policies that encourage banks to employ employees with a certain level of postgraduate education who are experts in their fields.

The effects of the Covid-19 pandemic, which adversely affected the global economy, on the national economies, financial system and banking system have not been fully revealed. In this period, low-interest loans, bailout packages and incentives were given in order to reduce the negative effects on the economies and to revive the economic activity. These developments led to rapid growth of loans and deterioration in loan quality, especially in developing countries. This may trigger new and devastating financial crises for the banking sector (Pilatin & Ayaydin, 2022). At this point, banks' postgraduate education levels can be used as a supportive mechanism to reduce these risks or to enable them to emerge in a more controlled manner. In future studies, studies can be conducted on the effect of the education level of bank employees on the credit risk and profitability of banks during the Covid-19 period. The research can be further developed by using different variables in the future study.

Peer-review: Externally peer-reviewed.

Conflict of Interest: The author has no conflict of interest to declare.

Grant Support: The author declared that this study has received no financial support.

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