Income Diversification and Bank Performance: Evidence From Turkish Banking Sector

Ali Osman GÜRBÜZ[*]
Serhat YANIK[**]
Yusuf AYTÜRK[***]

Abstract

In this study, relationship between non-interest income generating activities (income diversification) and risk-adjusted bank performance is investigated by using yearly data of Turkish deposit banks for the period of 2005 – 2011. System Generalized Method of Moments (System-GMM) estimators are used in this study with an unbalanced panel dataset of 26 banks. Our empirical results indicate that income diversification increases risk-adjusted financial performance of Turkish deposit banks.

Keywords: Income diversification, Turkish banking sector, non-interest income, System-GMM

JEL Classification: G10, G21, G28.

Özet - Gelir Çeşitlendirmesi ve Banka Performansı: Türk Bankacılık Sektöründen Bulgular

Bu çalışmada, faiz dışı gelir yaratan faaliyetler (gelir çeşitlendirmesi) ve riske göre düzeltilmiş banka performansı arasındaki ilişki, Türk mevduat bankalarına ait 2005 – 2011 dönemi yıllık verileri kullanılarak incelenmektedir. Bu çalışmada, sistem genel momentler yöntemi (Sistem-GMM) tahmincileri, 26 bankanın yer aldığı dengesiz bir panel veri setiyle kullanılmaktadır. Ampirik sonuçlarımız, gelir çeşitlendirmesinin Türk mevduat bankalarının riske göre düzeltilmiş finansal performansını arttırdığını göstermektedir.

Anahtar Kelimeler: Gelir çeşitlendirmesi, Türk bankacılık sektörü, faiz dışı gelir, Sistem-GMM

JEL Sınıflandırması: G10, G21, G28.

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[*] Prof. Dr., İstanbul Ticaret Üniversitesi, Ticari Bilimler Fakültesi, Bankacılık ve Finans Bölümü.
[**] Doç. Dr., İstanbul Üniversitesi, Siyasal Bilgiler Fakültesi, İşletme Bölümü.
[***] Araş. Gör., İstanbul Üniversitesi, Siyasal Bilgiler Fakültesi, İşletme Bölümü.

1. Introduction

Financial liberalization process began in 1970s and today free market-based economies are well accepted almost all around the world. In the financial liberalization era, increasing role of both equity and bond markets leads banks to engage in different operations rather than only traditional lending activity. Examples of such operations are investment banking, trading, insurance and intermediation in financial markets. Although the traditional revenue source of banks is interest income, they have more intensively engaged in non-interest income generating activities especially in developed countries after the beginning of financial liberalization era. In this respect, share of non-interest income in net operating income has increased all around the world, especially in the last three decades.

According to the classification of Mercieca et al. (2007), diversification in banking sector has three dimensions: (a) financial products and services diversification, (b) geographic diversification, and (c) a combination of geographic and business line diversification (Mercieca et al., 2007, p.1977). Income diversification in banking sector refers to increasing share of fees, net trading profits and other non-interest income within net operating income of a bank. In finance theory, diversification of income sources in a bank should lead to a lower risk level and a higher risk-adjusted performance. Since service fees, net trading profits and other non-interest income are uncorrelated or imperfectly correlated with net interest income, diversification of income sources should make net operating income of a bank more stable. However, some studies examining the effects of income diversification on the risk-adjusted bank performance prove that diversification may increase the volatility of bank operating income. DeYoung and Roland (2001) emphasized three main reasons why non-interest income may increase the volatility of bank operating income: a) loan-based activities require higher switching costs as compared to fee-based activities, b) lending activities require lower operating leverage than fee-based activities, c) lending activities require lower financial leverage than fee-based activities (DeYoung and Roland, 2001, p.109). Although the related literature on income diversification is mixed, it is very significant to investigate the relationship between income diversification and risk-adjusted banking performance for bank managers, regulators and

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investors, because understanding whether income diversification can create value for banks or not is very crucial for the mentioned decision makers in banking sector.

This paper investigates the effects of income diversification on risk-adjusted performance of Turkish deposit banks by using individual bank data from 2005 to 2011. This study contributes to the literature by examining strictly regulated Turkish banking sector, a new dataset. This relationship has not been well examined for Turkish deposit banks. By looking at the link between income diversification and performance of Turkish deposit banks, this study aims to fill this gap in the literature.

In section 2, we introduce the Turkish banking sector and present recent developments in income diversification levels of Turkish deposit banks. In section 3, we briefly review the literature on the effects of income diversification in banking. In section 4, we introduce the variables, dataset and research methodology, which we used. In section 5, we report our empirical results and we conclude with section 6.

2. Turkish Banking Sector and Income Diversification

As of December 2012, there are 49 banks in Turkish banking sector, 32 of them being deposit, 13 development and investment and 4 of them participation banks. Turkish banking sector has experienced a dramatic change after 1999 and 2001 economic crises. In the late 1990s and the beginning of 2000s, several frauds were experienced in Turkish banking sector. After the financial corruption, Turkish banking system experienced a restructuring process. This process was first started with disinflation programme as of end of 1999 and followed by the extensive banking restructuring program in 2001. In this process, the financial problems of the banks which are under the control of Savings Deposit Insurance Fund (SDIF) were solved, state-owned banks were restructured, the capital of private banks were strengthened, the banking legislation became aligned with international regulations, best practices and European Union directives including Basel Capital Accord (Basel-II) (The Financial System and Banking Sector in Turkey Report, The Banks Association of Turkey, 2009, p.6). As a result of banking restructuring program, Turkish banking sector has become excessively regulated since 1999. Banking restructuring program was successful and this was one of the

most important factors improving the positive performance of Turkish banks during 2002 – 2008. Other factors contributing to the positive developments in Turkish banking system during 2002 – 2008 were favorable domestic macroeconomic developments (high GDP growth rates, low inflation and low interest rates), international economic situation (increasing international capital inflows) and the change in the risk management conception (The Financial System and Banking Sector in Turkey Report, The Banks Association of Turkey, 2009, p.5).

The current 2007 – 2008 economic crisis has negatively affected Turkish banking sector. However, negative effects were relatively limited compared to developed countries because of high capital adequacy ratio, high asset quality, low currency and liquidity risks, successful risk management, effective public supervision and the measures taken by the Central Bank and the Banking Regulations and Supervision Agency against global financial risks (The Financial System and Banking Sector in Turkey Report, The Banks Association of Turkey, 2009, p.4). As a result of the current 2007 – 2008 economic crisis, interest rates have been declining unprecedentedly in Turkey and all around the world. The rapidly falling interest rates positively affected the interest margin and Turkish banks have recognized extraordinary profits from such a declining process in interest rates.

Turkish banking sector has recently faced major changes due to recent merger and acquisitions and therefore competition has increased in the sector. Turkish banks have reacted to this new competitive environment by widening their operations beyond traditional lending activities so that an increasing share of non-interest income in operating profits was experienced. In Turkish banking sector, the share of non-interest income in total net operating income was about 35 percent in 2005. After a declining trend over 2007 – 2009 period, non-interest income was accounted for about 33 percent of net operating income in 2011. In last two years, 2010 and 2011, the share of non-interest income in total operating income has increased from 28 percent to 33 percent. Figure 1 indicates the trend of the non-interest income share in Turkish banking sector during the period of 2005 – 2011.

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Figure 1: Net Interest Income and Non-Interest Income as percentage of Net Operating Income in Turkish Banking Sector (2005 – 2011)
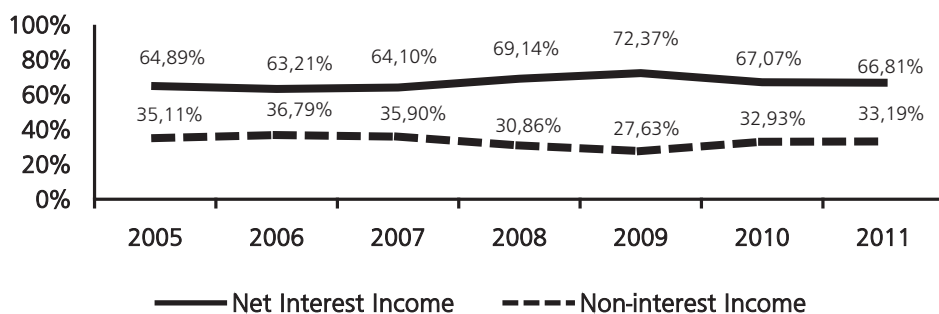

Table 1 also indicates the income components and profitability indicators of all Turkish deposit banks during the period of 2005 – 2011.

Table 1: Income Components and Profitability Indicators (2005 – 2011)

Year	Net Interest Income[*]	Non-Interest Income[*]	ROA[**]	ROE[**]
2006	4.18%	2.43%	2.18%	20.32%
2007	4.53%	2.54%	2.48%	20.87%
2008	4.30%	1.92%	1.74%	16.45%
2009	5.23%	2.00%	2.40%	19.70%
2010	4.02%	1.98%	2.20%	17.85%
2011	3.38%	1.68%	1.62%	14.78%

[*] As percentage of total assets calculated using aggregate values

[**] Return on assets (ROA) and return on equity (ROE) ratios calculated using aggregate values.

3. Literature Review

In theory, diversification among income sources in any bank is preferred, because service fees, net trading profits and other non-interest income are uncorrelated or imperfectly correlated with net interest income. As a result, income diversification should lead to more stable net operating income and superior risk-adjusted financial performance. However, empirical studies investigating the effects of income diversification in banking do not clearly support the theoretically expected benefits of diversification. The results of studies examining this relationship are mixed. While some studies prove that income diversification improves risk-adjusted performance and/or leads to risk reduction in banks, some other studies in the literature do not find any significant relationship or find the negative effects of income diversification on bank performance and/or risk. Although preliminary studies of income diversification in banking used the dataset of the United States and other developed countries (especially European Union countries), recently this relationship has also been examined by using the emerging countries' dataset. In this section, we reviewed the related literature with a special emphasis on recent developments.

DeYoung and Rice (2004) investigated the relationship between non-interest income and financial performance in the United States banking sector for the period of 1989 – 2001. They found a negative relationship between non-interest income and risk-adjusted financial performance of the U.S. banks. Stiroh (2004a) also looked at this relationship by using the U.S. banks data again from the 1970s to 2001. He found a positive relationship between non-interest income and bank insolvency risk indicating the fact that income diversification increases the insolvency risk of bank. Mercieca et al. (2007) examined the case of small European banks in terms of income diversification. They specifically investigated whether increased non-interest income activities could improve the performance of small European credit institutions or not by using 755 small banks dataset for the period of 1997 – 2003. They found an inverse relationship between non-interest income and risk-adjusted bank performance. Lepetit et al. (2008) looked at the same relationship for European banking industry from 1996 to 2002 and found a positive relationship between non-interest income and bank default risk.

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Baele et al. (2007) investigated whether income diversification could lead to a better performance/risk profile in European banks over the period of 1989 – 2004. They found a positive relationship between income diversification and the market's anticipation on future bank profits. They also stated that diversification could decrease total risk for most banks, but banks with higher non-interest income portions had more systematic risk. Chiorazzo et al. (2008) studied the link between income diversification and profitability of Italian banks by using annual individual bank data over the period of 1993 – 2003. They found that income diversification could increase risk-adjusted returns of Italian banks and this relationship was stronger at larger banks. Busch and Kick (2009) also analyzed the effects of fee-based income activities on risk-adjusted performance measures of German universal banks between 1995 and 2007. They empirically found that higher fee-based income could increase risk-adjusted returns of German universal banks. Elsas et al. (2010) investigated effects of income diversification on both bank performance and market value by using a panel data of nine countries over 1996 to 2008. They found that income diversification could improve bank profitability and market value. Recently, Sanya and Wolfe (2011) analyzed income diversification of banks in emerging countries. They found evidence that income diversification had a positive effect on risk-adjusted performance of emerging market banks. They also asserted that System GMM estimators, research methodology used in their study, is a better econometric model to overcome endogeneity problem in panel-data regression model estimations. As we reviewed the related literature on Turkish banks, to our knowledge, we can say that there is no study investigating the relationship between income diversification and financial performance of Turkish banks.

4. Variables, Dataset and Research Methodology

In this study, our empirical analysis is based on a set of variables that includes income diversification measures, measures of risk-adjusted returns and several control variables. We use a dataset obtained from individual financial statements of deposit banks in Turkey. There were 41 different deposit banks during our sample period of 2005 – 2011 and the range of deposit banks number changes from 31 to 34 during the period. In this period, merger and acquisition transactions took place in Turkish banking sector. With regard to merger and

acquisitions, we assumed that new banks, which are established as a result of merger and acquisition transactions, are continued structures of acquired banks and we merged data of these banks by accepting them as a single bank. We chose the year of 2005 as the starting point in our sample period. In Turkish banking sector, inflation accounting was used from 2001 to 2004 and to overcome data inconsistency problem, we began our dataset from 2005 and defined our sample period as 2005 – 2011 (7 years). Annual individual financial statements of deposit banks are provided in the web site of the Banks Association of Turkey (www.tbb.org.tr) and we used this database.

For the measurement of income diversification levels, firstly we assume that there are two main components of a bank's net operating income. These are net interest income *(NET)* and non-interest income *(NON)*. *NET* (net interest income) variable is calculated as total interest revenues minus total interest expenses, while *NON* (non-interest income) variable is calculated as the sum of net commission fees, net trading profit/loss and other non-interest income. The sum of the *NET* and *NON* variables is net operating income (net interest income plus non-interest income) of a bank. For income diversification, a bank must diversify its sources of net operating income among net interest income and non-interest income components. When the values of net interest income and non-interest income are equal to each other in a bank, this bank is accepted as fully diversified. In order to measure income diversification level of each bank, we calculate widely used Herfindahl Hirschman Index *(HHI)* for all banks. Considering the shares of net interest income and non-interest income in total net operating income, *HHI* measure is calculated as follows:

$$HHI = \left(\frac{NET}{NOI} \right)^2 + \left(\frac{NON}{NOI} \right)^2 \tag{1}$$

Net operating income *(NOI)* captures the total value of *NET* and *NON*. *HHI* varies between 0.50 and 1.00. *HHI* value of 0.50 indicates complete diversification in a bank, while *HHI* value of 1.00 represents the lowest level of income diversification.

Our risk-adjusted performance measures are based on accounting profit ratios. These ratios are return on equity *(ROE)* and return on assets *(ROA)* defined as annual net income divided by equity and total assets respectively. For calculating risk-adjusted performance measures, firstly we calculate total volatility of each profit ratio for each bank as standard deviations of *ROA* and *ROE* for the sample period. Then we divide each observation by its total volatility as stated below

$$RAROE_{i,t} = ROE_{i,t} / \sigma ROE_i \qquad (2)$$

$$RAROA_{i,t} = ROA_{i,t} / \sigma ROA_i \qquad (3)$$

where $RAROE_{i,t}$ and $RAROA_{i,t}$ indicate risk-adjusted performance measures in terms of *ROE* and *ROA* respectively, for the bank *i* in the year *t*. σROA_i and σROE_i indicate standard deviations of *ROA* and *ROE* for the bank *i*.

There were 41 different deposit banks in our sample period 2005 – 2011 and several merger and acquisition transactions took place in Turkish banking sector in this period. We assumed that new banks, established as a result of merger and acquisition transactions, are continued structures of acquired banks and we merged data of these banks accepting them as a single bank. In forming our dataset we also eliminated banks where *HHI* value is over 1.00 for any year as a result of negative net interest income *(NET)* or non-interest income *(NON)*. We also excluded banks having lower than 3 years period data. Lastly, large positive and negative *RAROA* and *RAROE* outliers were excluded which constrains our sample between the 1st and 99th percentile. This applied to total 8 banks in our sample. In this study, we have an unbalanced panel data consisting of 26 deposit banks. We provide a complete list of these banks in the appendix.

Depending on the previous studies in the literature, we added some control variables in our models. By including control variables in the models, we tried to ensure that there is no excluded independent variable, which could affect the relationship between income diversification and risk-adjusted bank performance. All the variables in the models can be defined as follow:

ASSETS variable is the natural logarithm of total bank assets. This control variable represents the effects of bank size in our models. *ASSETS* variable is used

in most of the recent studies in the literature. Larger banks may have better risk management and diversification opportunities, on the other hand, small banks are more flexible in their operations (Sanya and Wolfe 2011; Chiorazzo et al. 2008; DeYoung and Rice 2004).

EQUITY variable is the ratio of equity to total assets. This variable indicates the financial leverage degree of a bank. A higher ratio of equity/total assets refers to risk aversion and protection to bank default risk. This variable is also used in most of the recent studies in income diversification literature (Sanya and Wolfe 2011; Chiorazzo et al. 2008; Stiroh, 2004b).

GROWTH variable is the annual growth rate of total assets. This variable represents the bank managers' risk taking behaviors. A high growth rate refers to a high risk-taking attitude (Busch and Kick 2009; Chiorazzo et al. 2008; Stiroh, 2004b).

LOAN variable is the ratio of total loans to total assets. This variable is a proxy for the effects of lending strategy on risk-adjusted bank performance (Sanya and Wolfe 2011; Chiorazzo et al. 2008; Stiroh 2004b).

INTEREST variable is overnight (O/N) interest rate of Central Bank of the Republic of Turkey (CBRT) observed at the end of each year during the sample period of 2005 – 2011. This variable captures the effect of central bank interest rate policy on banks. We used overnight interest rate rather than the policy rate (one-week repo rate), because CBRT started to use one-week repo rate as policy rate in 2010.

CRISIS variable is a dummy variable for global financial crisis period. It is equal 1 during 2008 – 2009 and 0 otherwise.

PUBLIC variable is a dummy variable for the public (state-owned) banks. It is equal 1 for the state-owned banks and 0 for the private banks.

FOREIGN variable is a dummy variable for foreign banks. It is equal 1 for foreign banks and 0 for national banks.

In this study, following Sanya and Wolfe (2011) we used System Generalized Method of Moments (System-GMM) estimators. In recent studies on the effects of income diversification in banking (Acharya et al., 2006; Baele et al., 2007; Sanya

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and Wolf, 2011; Strioh and Rumble, 2006), endogeneity problem has been emphasized. One omitted variable (e.g. management skill or location of the bank) can affect both income diversification level and bank's performance. Moreover, the decision to diversify can be affected by past and current performance and vice versa. Endogeneity problem can cause biased estimations in the analysis. In order to overcome a possible endogeneity problem, we used Arellano and Bover (1995) and Blundell and Bond (1998) System Generalized Method of Moments (System-GMM) estimators. System-GMM combines two set of equations as shown in equations 4 and 5 below. The first equation is expressed in differences where lags of dependent and independent variables are used as instruments and in the second equation both dependent and independent variables expressed in levels.

$$\Delta y_{i,t} = \alpha \Delta y_{i,t-1} + \beta \Delta x_{i,t} + \Delta v_{i,t} \qquad (4)$$

$$y_{i,t} = \alpha_0 y_{i,t-1} + \alpha_1 x_{i,t} + \delta_i + v_{i,t}$$

$$(5)$$

where $(y_{i,t})$ is a measure of risk-adjusted returns, risk-adjusted return on equity *(RAROE)* or risk-adjusted return on assets *(RAROA)* for each bank *i* in period *t*. ($y_{i,t-1}$) are lagged observations of risk-adjusted bank performance measures in the previous period. (δ_i) is the unobserved bank specific effect. $(v_{i,t})$ is the error term which is independent across banks. $(x_{i,t})$ is a vector of explanatory and additional control variables *(RAROA$_{t-1}$, RAROE$_{t-1}$, HHI, ASSETS, EQUITY, GROWTH, LOAN, INTEREST, CRISIS, PUBLIC, FOREIGN)*. As strongly advised by Roodman (2006), we also added time dummies in our models but they were not reported in the tables.

There may be three important econometric problems with our models. As stated in the previous paragraph, the decision to diversify can be affected by past and current performance and vice versa. In other words, causality can be in two ways and diversification and performance variables can be correlated with the error terms. Time-invariant bank specific characteristics (fixed effects) can be also correlated with the error terms. The existence of lagged dependent variable in the model (autoregressive characteristic) can also cause autocorrelation. Moreover, our dataset consists of short time period (7 years) and relatively longer bank units

(26 banks). To deal with these econometric problems we used System Generalized Method of Moments (System-GMM) estimation, an efficient research methodology in the literature. System-GMM includes a system of two equations (in our models, equation 4 and 5). The first one is differenced and the other one is in level. Thus the variables in equation 5 are instrumented with their own differences in System-GMM and this methodology increases the efficiency of estimation.

5. Empirical Results

Table 2 indicates the summary statistics and definitions of all variables used in this study. Mean value of *HHI* variable in our sample *(0.5985)* indicates that Turkish deposit banks are more concentrated on the interest income generating activities over the sample period. However, the share of non-interest income generating activities in Turkish deposit banks cannot be underestimated since the maximum value of *HHI* variable is 0.9824. The mean value of *EQUITY* variable (equity/total assets) is relatively high *(0.2054)* during the sample period as a result of strictly regulated environment of Turkish banking sector. *LOAN* variable has the mean of lower than 50 percent *(0.4439)* which may indicate conservative risk attitude of Turkish deposit bank managers as whole and again an indicator of strict regulatory rules in Turkish banking sector. The mean value of asset growth rate *(GROWTH)* in Turkish deposit banks over the period 2005 – 2011 is relatively high *(15.06%)* despite the 2007 – 2008 economic crisis. This high asset growth rate in banking sector is a result of high growth in Turkish economy. Overnight (O/N) interest rate of Central Bank of the Republic of Turkey (CBRT) observed during the sample period 2005 – 2011 ranges from 9% to 22.50% with mean of 15.42%.

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Table 2: Summary Statistics and Definitions of Variables (2005 – 2011)

Variable	Definition	Mean	Std.	Max	Min
HHI	The sum of the squares of the share of net interest income and the share of non-interest income over net operating income	0.5985	0.0995	0.9824	0.5000
RAROA	Ratio of ROA to standard deviation of ROA over the sample period	2.9669	2.1048	8.4987	-0.8093
RAROE	Ratio of ROE to standard deviation of ROE over the sample period	3.1164	2.2090	8.0477	-1.1079
ASSETS	Natural logarithm of bank total assets	22.1571	2.2020	25.3284	17.0567
EQUITY	Equity divided by bank total assets	0.2054	0.2042	0.8575	0.444
GROWTH	Annual growth rate of a bank's total assets	0.1603	0.3926	3.2781	-0.4298
LOAN	The ratio of total loans to total assets	0.4439	0.2181	0.7621	0.0000
INTEREST	Overnight (O/N) interest rate of Central Bank of the Republic of Turkey (CBRT) observed at the end of each year	0.1542	0.0498	0.2250	0.0900
CRISIS	Dummy variable for global financial crisis period 2008-2009	0.2905	0.4553	0.0000	1.0000
FOREIGN	Dummy variable for foreign banks	0.4190	0.4948	0.0000	1.0000
PUBLIC	Dummy variable for the public (state-owned) banks	0.1173	0.3227	0.0000	1.0000

All variables are calculated based on real values deflated by annual consumer price inflation index.

We estimated two different models, one for risk-adjusted return on assets *(RAROA)* and the other one for risk-adjusted return on equity *(RAROE)* to investigate the effects of income diversification on risk-adjusted bank performance by following two-step System-GMM with robust standard errors procedures. Our empirical results are reported in table 3.

Coefficients of *HHI* variable in both of the models are negative and statistically significant at 5% level. We can imply that there is a positive relationship between income diversification and risk-adjusted return on assets and risk-adjusted return on equity. In terms of economic significance, one standard deviation decrease in *HHI* variable (a higher diversification level) increases risk-adjusted return on assets *(RAROA)* and risk-adjusted return on equity *(RAROE)* by 10.56% and 11.30% respectively. We found a relatively strong and significant relationship between the degree of income diversification and risk-adjusted financial performance and our finding is consistent with the current studies on income diversification in banking (Baele et al., 2007; Chiorazzo et al., 2008; Elsas et al. 2010; Sanya and Wolfe, 2011).

Our results also prove that Turkish deposit banks benefit from diversifying their activities beyond the traditional lending activities. In other words, higher reliance on non-interest income generating activities is associated with a better risk/return level during our sample period. As pointed out by Baele et al. (2007) this may be a result of increased income of the bank or reduced operating costs of the bank from diversifying operations. Moreover, our finding indicates that the degree of income diversification in Turkish deposit banks may not have reached its peak. On average, the share of non-interest income in net operating income was about 33 percent during the sample period. Since the share of non-interest income is not high enough, small changes in the share of non-interest income may have still affected the risk-adjusted returns in Turkish deposit banks.

Our empirical results also proved the autoregressive nature of our empirical models. This autoregressive nature is implied from the $RAROA_{t-1}$ and $RAROE_{t-1}$ variables, which have statistically significant coefficients as we expected. Besides the lagged variable, other control variable, *ASSETS*, has also statistically significant positive coefficients for *RAROA* and *RAROE* models. *ASSESTS* variable is a proxy for size of the Turkish deposit banks. Positive coefficients of *ASSETS* variable in the

models imply that as the size of a bank increases, the risk-adjusted performance does so. Our finding on the positive relationship between banks size and risk-adjusted performance is well proved in the literature (Demsetz and Strahan, 1997; DeYoung and Rice, 2004; Sanya and Wolfe, 2011). The reason for our finding on size may be the fact that larger banks generally have better risk management, information technology, human capital and geographical diversification and lower cost of capital. *GROWTH* variable has a statistically significant positive coefficient for *RAROE* model. Our empirical results for *RAROE* model illustrate that asset growth rate can improve risk-adjusted return on equity in a bank, which is consistent with the study of DeYoung and Rice (2004). Asset growth rate is a proxy for risk taking attitudes of bank managers. Dummy control variable of *CRISIS* is also statistically significant and positive in our models. This variable aims to capture the effects of global financial crisis period (2008 – 2009) on risk-adjusted bank performance. Positive signs of *CRISIS* variable in the models indicate that during global financial crisis Turkish deposit banks did perform better than the other years in terms of risk-adjusted accounting performance measures of ROA and ROE. Lastly, *PUBLIC* dummy variable used as a proxy for state-owned deposit banks has a positive and significant coefficient in *ROE* model. This relatively weak positive relationship indicates that state-owned Turkish deposit banks perform better than private banks in terms of risk-adjusted return on equity measure.

Table 3: Empirical Results

This table reports two step System-GMM dynamic panel-data estimation results with robust standard errors. In panel A, *t-statistics* are reported in parenthesis. In panel B, *probability values* are reported in parenthesis. Our dependent variables are risk-adjusted return on assets *(RAROA)* and risk-adjusted return on equity *(RAROE)* respectively. $RAROA_{t-1}$ is first lag of *RAROA* and it is used as regressor in *RAROA* regression. $RAROE_{t-1}$ is first lag of *RAROE* variable and it is used as regressor in *RAROE* regression. *HHI* measures income diversification in Turkish deposit banks. *ASSETS* is the natural logarithm of total assets. *EQUITY* is the ratio of equity to total assets. *GROWTH* is the annual growth rate of total assets. *LOAN* is the ratio of loans to total assets. *INTEREST* is overnight (O/N) interest rate of Central Bank of the Republic of Turkey (CBRT) observed at the end of each year. *CRISIS* is a dummy variable for global financial crisis period 2008-2009. *PUBLIC* is a dummy variable for state-owned banks. *FOREIGN* is a dummy variable for foreign banks. Year dummies are also added in the models. All variables are calculated based on real values deflated by annual consumer price inflation index. In *panel A,* we report the regression analysis results and in *panel B* diagnostic test results are reported.

Panel A: System-GMM dynamic regression results

	RAROA	RAROE
$RAROA_{t-1}$	0.2494*	
	(1.78)	
$RAROE_{t-1}$		0.1999*
		(1.70)
HHI	3.1487**	-3.5386**
	(-2.64)	(-2.19)
ASSETS	0.3682*	0.3971*
	(1.73)	(1.98)
EQUITY	0.9062	0.4563
	(0.46)	(0.21)
GROWTH	-0.0914	0.6074*
	(-0.32)	(1.92)
LOAN	0.5873	-0.2802
	(0.39)	(-0.15)
INTEREST	-8.3345	-3.9008
	(-1.57)	(-0.97)
CRISIS	.1064***	0.7641**
	(4.25)	(2.57)
PUBLIC	1.0285	1.9131*
	(0.79)	(1.79)
FOREIGN	-0.3338	-0.5347
	(-1.15)	(-0.91)

Panel B: Diagnostic Test Results

Number of Groups	26	26
Number of Instruments	25	25
Hansen test of overidentifying restrictions	12.39	14.92
	(0.335)	(0.186)
Arellano-Bond test for AR(1)	-2.44**	-2.54**
	(0.015)	(0.011)
Arellano-Bond test for AR(2)	-0.07	0.23
	(0.943)	(0.817)
F-test for joint significance of instruments	34.40***	18.02***
	(0.00)	(0.00)

Constant and year dummies are not reported.

***,**,* refers to 1%, 5% and 10% statistical significance level respectively.

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We reported the results of several diagnostic tests for an efficient estimation in System-GMM methodology in panel B in table 3. All the results are satisfactory for the models. In the dynamic panel data models, first order autocorrelation (AR(1)) should be significant and second order (AR(2)) should be insignificant. In our models, while first order autocorrelations in the residuals are significant at 5%, second order autocorrelations are statistically insignificant. The coefficient of the Hansen test for over identifying restrictions is statistically insignificant and indicates that there is no over-identification problem in our models. As a rule of thumb, we also compared number of groups and number of instruments in our models. The number of groups is higher than the number of instruments in our dynamic models and this comparison also supports the Hansen test for over-identification. Lastly, the F-test for joint significance of regressors indicates that regressors are jointly significant in our models at 1% level.

6. Conclusion

Over the last two decades, commercial banks have diversified their operations all around the world including Turkey. The income generating activities of a deposit bank can be grouped into two basic categories. The first one is lending and earning interest income. The second category is other financial services, which generate fees, trading income and other non-interest income. Should banks enlarge their operations towards non-interest income generating activities or only focus on traditional lending activities? This controversial question has attracted attention since 1990s both in literature and practice. Finance theory points out that income diversification should increase risk-adjusted bank performance. In Turkey, the role of non-interest income in a strictly regulated banking sector has also been a debatable topic during the financial liberalization process. Lack of a detailed study investigating the effects of income diversification on risk-adjusted performance in Turkish banking sector motivated us to conduct a study on this popular issue.

In this paper, we examined the effects of income diversification on risk-adjusted bank performance in Turkish banking sector by using System-GMM estimators. We also checked the effects of several control variables (size, assets growth, equity/total assets, loan/total assets, interest rate, global financial crisis, bank

ownership structure). We found that income diversification strongly increases the risk-adjusted financial performance of the Turkish deposit banks over the period of 2005 – 2011, that is, increase in non-interest income leads to an increase in risk-adjusted profit on assets *(RAROA)* and equity *(RAROE)*. Depending on the results of our *RAROA* and *RAROE* models, we can imply that Turkish deposit banks benefit from diversifying their activities beyond the traditional lending activities. We also found positive relationships between control variables (size, assets growth, crisis dummy variable, public ownership dummy variable) and risk-adjusted bank performance.

Our findings have one main implication for bank managers, regulators and investors that income diversification in Turkish banks can create value for stakeholders. The positive effect of income diversification on banking financial performance may be a result of increased income of the bank or reduced operating costs of the bank from diversifying operations. Since net trading income, fee income and other non-interest income generally are not perfectly correlated with net interest income, an increase in income diversification lowers the variations in operating income.

Our findings also indicate that the degree of income diversification in Turkish deposit banks may not have reached its peak. On average, the share of non-interest income in net operating income was about 33 percent during the sample period of 2005 – 2011. Since the share of non-interest income in net operating income is not high enough, small increases in the share of non-interest income may have still affected the risk-adjusted returns in Turkish deposit banks. This finding stands in contrast to the previous findings in the literature on developed countries that deposit banks do not benefit from income diversification anymore because of the over-diversification.

Lastly, we have a relatively limited sample period and consider all sub-categories of non-interest income generating activities as a whole. In the future studies on the effects of income diversification, a longer sample period can be used and the effects of sub-categories of non-interest income generating activities can also be investigated.

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Appendix

Table 4: List of Banks in Our Sample

	Bank
1	Adabank A.Ş.
2	Akbank T.A.Ş.
3	Alternatif Bank A.Ş.
4	Anadolubank A.Ş.
5	Bank Mellat
6	Birleşik Fon Bankası A.Ş.
7	Citibank A.Ş.
8	Denizbank A.Ş.
9	Eurobank Tekfen A.Ş.
10	Finans Bank A.Ş.
11	Fortis Bank A.Ş.
12	Habib Bank Limited
13	HSBC Bank A.Ş.
14	JPMorgan Chase Bank N.A.
15	Şekerbank T.A.Ş.
16	Tekstil Bankası A.Ş.
17	The Royal Bank of Scotland N.V.
18	Turkish Bank A.Ş.
19	Turkland Bank A.Ş.
20	Türk Ekonomi Bankası A.Ş.
21	Türkiye Cumhuriyeti Ziraat Bankası A.Ş.
22	Türkiye Garanti Bankası A.Ş.
23	Türkiye Halk Bankası A.Ş.
24	Türkiye İş Bankası A.Ş.
25	Türkiye Vakıflar Bankası T.A.O.
26	Yapı ve Kredi Bankası A.Ş.

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