THE EFFECT OF INTANGIBLE FIXED ASSETS ON FIRM VALUE FINANCIAL POLICY AND FINANCIAL PERFORMANCE: A STUDY ON FIRMS LISTED IN BIST TECHNOLOGY INDEX

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ABSTRACT

This study investigates the effects of Intangible Fixed Assets (IFA) on firm value (FIRVE), financial policy (FINPO), and financial performance (FINPER) for 12 firms consistently listed in the BIST Technology Index from 2006 to 2023. The data obtained within this context were evaluated employing the panel data analysis method. In the research study, the Market Value/Book Value (MV/BV) ratio representing FIRVE, the Total Debt/Total Equity (TD/TE) ratio representing FINPO, and the Return on Assets (ROA) ratio representing FINPER were used as dependent variables. IFA were designated as the independent variable, while Firm Size (FS) and Net Sales (NS) served as control variables. The findings indicated that IFA positively and significantly affected FIRVE, but they had significant negative impacts FINPO and FINPER. It was determined that firm size negatively affects firm value, yet shows a positive and significant relationship with both FINPO and FINPER. On the other hand, net sales positively influence FIRVE and FINPER, but negatively affect FINPO. These results highlight the varying influence of IFA and firm-specific factors on key financial metrics.

Keywords: *Intangible Fixed Assets, Firm Value, Financial Policy, Financial Performance, Panel Data Analysis.*

JEL Codes: *G32, M41, C23.*

1. INTRODUCTION

According to Turkish Accounting Standards (TAS) Article 38 about IFA Standard, intangible fixed assets (IFA) are defined as "non-monetary assets that do not have a physical substance but are identifiable and capable of providing future economic benefits for the business." IFA generally include patents, trade secrets, R&D expenditures, trademarks, copyrights, intellectual property rights, employee satisfaction and loyalty, products designs, and organizational and managerial capabilities.

Nolan (2011) classified IFA into three categories: (a) economic competencies (firm-specific human capital, organizational capital, marketing and advertising elements, networks, etc.); (b) innovative property (designs, brand value, R&D, copyrights, and trademarks, etc.); (c) computerized

information (databases, software, etc.). Five key characteristics define IFA. First, these assets do not directly generate value; yet, they contribute to the production of value-creating services by combining with other goods and services. Second, their consumption is non-rivalrous; that is, they can be consumed by multiple users simultaneously and, thanks to these characteristics, they can be scaled at low marginal cost. Third, since they are challenging for competitors or business partners to fully imitate and understand, they can be considerably appropriable by firms. Fourth, most intangible assets are generally not tradable and therefore their market price cannot be determined. Finally, due to their unique nature, these assets are difficult for external parties to understand and replicate, which makes them strategic for the firm (Buckley et al., 2022).

Every business must analyze its own asset structure to ensure an optimal balance between tangible and intangible assets (Herciu and Ogrean, 2008). While historically the foundation of firms' profitability, success, and value was constituted by tangible assets (TA) such as infrastructure, land, and equipment in the contemporary world economy, intangible assets (IA)—through the development of human capital and knowledge management—assets account for approximately 80% of a company's value (Nuryaman 2015; Vodák 2011). The Current economy is fundamentally motivated by the management and development of IA, a key factor in a firm's competitive strength and a fundamental stimulus of development (Córcoles 2010; Zambon et al. 2020). IFA are the driving force behind a fundamental transformation in the economic value creation process, as today's economies are shifting away from a traditional physical asset-based structure and evolving into one increasingly built on IA (Lev, 2018). Research shows that IFA are prevalent in the business world and affect almost all elements of a firm, encompassing product development to human capital, personnel activities such as law, finance, and accounting to operational activities; for instance, marketing, research and development, and general management (Qureshi and Siddiqui, 2020).

Considering the importance of IFA investments in the asset structure of companies, it was assessed that these investments could have an influence on the value, FINPOs, and financial performance of firms, which created the driving force for this research. The aim of the present research study is to establish the influence of IFA on company value, FINPO, and FINPER for 12 firms having been continuously listed on the BIST Technology Index from 2006 to 2023. The data attained from the EquityRT database were studied employing methods of panel data analysis. Previous studies on this topic were conducted by Qureshi and Siddiqui (2020) and Longa and Sitorus (2024). There is no research examining the impact of IFA, as part of the asset structure of technology companies specifically on FIRVE, financial policies, and financial performance. This study addresses a significant gap in the literature as it is the first research to investigate the comprehensive influences of IFA on FIRVE, FINPO, and financial performance specifically for technology firms in Turkey. Unlike existing studies, which generally focus on only one or two of these factors, this research provides a unique contribution by presenting a comprehensive model that simultaneously analyzes three key financial dynamics. The

contribution of the current study to the literature is further strengthened by selecting the BIST Technology Index, which has a high concentration of IFA in its asset structure, as a sample over a broad time span from 2006 to 2023.

Such sectoral focus enables the relationships under investigation to be delineated more clearly. In this context, empirical evidence for the Turkish context is presented through the careful application of the analysis method of panel data to this unique framework and sample. The reason for completing the research in 2023 is that the data for 2024 for the companies examined has not yet been disclosed on the Public Disclosure Platform (PDP).

2. LITERATURE REVIEW

IFA are assets that lack a physical structure, according to the definition provided by the American Financial Accounting Standards Board. Furthermore, intellectual capital may be specified as the sum of information and technology-related elements generated by three main components of an organization (structural capital, human capital, and customer capital), which can offer a competitive advantage to the organization in its corporate form and offer greater value (Gamayuni, 2015). IFA have become a key motive of transformation in today's economic value generating mechanisms. This is because modern economies are increasingly moving away from traditional asset-based structures and evolving into a model built mainly on intangible assets. This transition has fundamentally changed the nature of economic activities and value production mechanisms. The effects of IFA on FIRVE, FINPO, and financial performance have become an important area of study in recent academic research. In the following phases of the current study, the abbreviations IFA, FIRVE, FINPO, and FINPER will be used for intangible fixed assets, firm value, financial policy, and financial performance, respectively. The findings of research studies, which have been carried out in this field so far, are stated as follows:

In the study they conducted, Garanina and Pavlova (2011) investigated the influence of IFA on company value through five different sectors of firms operating in Russia and the UK from 2001 to 2006. The outcomes of the study demonstrated that IFA have a substantial influence on the companies' firm values in manufacturing field; however, this influence is not clear in other sectors.

In their research, Li and Wang (2014) carried out an investigation scrutinizing the affiliation between IFA and FINPER in technology firms enumerated on the Hong Kong Stock Exchange from 2008 to 2012. The analyses showed that IFA – such as sales training and, R&D contributions - had a positive influence on FINPER. However, it was found that employee benefit expenses did not significantly contribute to FINPER.

In the research study, Gamayuni (2015) scrutinized the influence of IFA, FINPO, and FINPER on FIRVE in an empirical investigation carried out on firms enumerated on the Indonesian stock exchange (IDX). Findings based on a process analysis covering the period 2007-2009 revealed that IFA,

FINPO, and FINPER have a significant effect on FIRVE. Nevertheless, IFA possessed no statistically substantial influence on FINPO, while it was determined that it had a positive and substantial influence on FINPER (ROA) and FIRVE.

In a research study they conducted, Fındık and Ocak (2016) searched the influence of IFA on FINPER in firms enumerated on BIST National All-Index from 2005 to 2013. The outcomes of the research demonstrated that as the share of IFA in the companies' total assets increased, FINPER rose as well.

Zhang (2017) scrutinized the association between IFA and FINPER in 17 publicly trading telecommunications firms in China between 2014 and 2016 in one of his studies. The research study established that IFA had a positive and substantial influence on FINPER.

Bhatia and Aggarwal (2018) searched the influence of financial contributions of IFA on FINPER (ROA, ROE, and Tobin's Q) for 346 firms functioning in India from 2001 to 2012 in their study. The research investigation revealed that IFA had a substantial and positive influence on all three dependent variables.

Tahat et al. (2018) carried out a research to establish the inclination of the influence of goodwill and R&D expenditures on the present and future FINPER of 150 non-financial enterprises in the UK from 1995 until 2015. The scientific investigation revealed that goodwill had a positive influence on firms' present and future FINPER, whereas R&D expenditures only influenced the future FINPER of companies.

Ferdaous and Rahman (2019) intended to establish the level of influence of IFA expenditures on FINPER and market-based performance for 66 firms, which function in manufacturing sector, in Bangladesh from the date 2007 till 2017. The scientific investigation established that IFA expenditures had a substantial positive influence on FINPER, while having a substantial adverse influence on market-based performance.

The research study carried out by De Moura et al. (2020) aimed to experimentally analyze the influence of IFA on FINPER and MV in 122 firms listed on public markets outside the financial sector functioning on the Brazilian Stock Exchange (B3) in Latin America. The scientific investigation established that IFA displayed a positive and statistically substantial affiliation with FINPER and MV.

Mohammed and Al Ani (2020) studied the influence of IFA, FINPER, and FINPO on FIRVE for Omani industry companies enumerated on the Muscat Securities Market from 2010 to 2014. In line with the investigation outcomes, IFA, FINPO, and FINPER were determined to have a substantial influence on FIRVE.

Qureshi and Siddiqui (2020) carried out an investigation to find whether IFA had an influence on FINPO, FINPER, and FIRVE for 80 firms of 14 diverse countries functioning in the global technology

sector with high MV in their countries from 2015 until 2018. This research investigation is the first scientific paper to search the influence of IFA on FINPER, FINPO, and FIRVE in the sector of technology by means of an international comparative analysis. The investigation established that IFA had a substantial negative influence on return on invested capital, ROE, ROA, debt/equity ratio, asset turnover, price/sales, and market value/book value. Conversely, it had a insignificant positive influence on profitability and price/earnings and a substantial positive influence on dividend policy.

Mohanlingam et al. (2021) analyzed the influence of IFA on FINPER and FINPO in 33 technology companies enumerated on the Thai Stock Exchange from the date of 2015 to 2019 in their study. The outcomes of the investigation demonstrated that IFA had a substantial and positive affiliation not only with FINPER but also with FINPO.

In a research carried out by Bagna et al. (2024), the influence of IFA on FINPER was scrutinized in companies traded on the stock exchanges of 29 countries of Europe from 2002 till 2020, leaving out the banking, finance, asset management, and insurance sectors. In the abovementioned study including a total of 3,016 firms, it was established that the intensive use of IFA substantially raised FINPER at a statistically meaningful level.

In his research study, Koç (2024) went through the influence of IFA on FINPO in 57 firms in the BIST Manufacturing Sector from 2018 till 2022 employing panel data analysis. As stated in the results achieved in the research, IFA was found to have a positive effect on FINPO.

In the study they conducted, Longa and Sitorus (2024) reviewed the influence of IFA on FINPER, FINPO, and FIRVE for 45 LQ firms enumerated on IDX of Indonesia from the date of 2018 to 2022. The investigation revealed that IFA had a positive influence on FINPER, FINPO, and FIRVE.

3. METHOD

3.1. The Purpose, Scope, and Significance of the Research

The objective of this research study is to establish the direction and strength of the impact of IFA on FIRVE, FINPO, and financial performance for 12 firms, which have been constantly listed on the BIST Technology Index for 18 years, from 2006 to 2023. The companies included in the analysis are given in Table 1.

Table 1. List of Companies Included in the Study

RANK	CODE	COMPANY NAME
1	ALCTL	ALCATEL LUCENT TELETAŞ TELECOMMUNICATIONS INC.
2	ARENA	ARENA COMPUTER INDUSTRY AND TRADE INC.
3	ASELS	ASELSAN ELECTRONICS INDUSTRY AND TRADE INC.
4	DGATE	DATAGATE COMPUTER HARDWARE TRADING INC.

5	ESCOM	ESCORT TECHNOLOGY INVESTMENTS INC.
6	INDES	INDEX COMPUTER SYSTEMS ENGINEERING INDUSTRY AND TRADE INC.
7	INGRM	INGRAM MICRO COMPUTER SYSTEMS INC.
8	KAREL	KAREL ELECTRONICS INDUSTRY AND TRADE INC.
9	LINK	LINK COMPUTER SYSTEMS SOFTWARE AND HARDWARE INDUSTRY AND TRADE INC.
10	LOGO	LOGO SOFTWARE INDUSTRY AND TRADE INC.
11	NETAS	NETAŞ TELECOMMUNICATIONS INC.
12	PKART	PLASTİKKART SMART CARD COMMUNICATION SYSTEMS INDUSTRY AND TRADE INC.

The reason for the preference of the technology sector is that, compared to other sectors, IA (patents, brands, software, etc.) are found at a higher rate, the influence of these assets on firm performance is more pronounced, and the relationship between the variables examined in this study can be observed more clearly.

No comprehensive study has been found in Turkey that simultaneously examines the effects of IFA on FIRVE, FINPO, and FINPER in technology companies. Available investigations have generally concentrated on one or at most two of these factors. In this context, the research is the first research to analyze the comprehensive influences of technology companies' IFA on these three factors.

3.2. Research Limitations

The study is limited to companies that were continuously listed on the BIST Technology Index between 2006 and 2023 and for which the necessary data were available. The reason for limiting the scope to 2023 is that the companies' data for 2024 had not yet been disclosed during the analysis period.

3.3. Research Methodology and Data Set

The data utilized in analyses were attained from the Public Disclosure Platform (PDP) and the EquityRT database. In the study, the panel regression analysis method was preferred to examine the influence of IFA.

In the study, IFA variable was treated as a predictor variable. The firm's size and sales were used as control variables. FIRVE, FINPO, and FINPER were determined as the dependent variables of the study. In determining the variables in the research study, variables commonly used in the literature were preferred. Data about the dependent and independent variables employed in this investigation study, along with the methods for calculating these variables, are demonstrated in Table 2.

Table 2. Variables and Calculation Methods

DEPENDENT VARIABLES	CALCULATION METHOD	SYMBOL	SOURCE
Company Value		FIRVE	
Price-to-Book Ratio	Market Value/Book Value	MV/BV	(Ertuğrul, 2020); (Qureshi ve Siddiqui, 2020)
Financial Policy		FINPO	
Debt/Equity Ratio	Total Debt/Total Equity	FINPO	(Gamayuni, 2015); (Gitman ve Zutter, 2015); (Mohammed ve Al Ani, 2020); (Qureshi ve Siddiqui, 2020); (Mohanlingam et al., 2021); (Koç, 2024); (Longa ve Sitorus, 2024); (Olin ve Purwaningrum, 2024)
Financial Performance		FINPER	
Asset Profitability Ratio	Net Profit / Total Assets	ROA	(Gamayuni, 2015);(Fındık and Ocak, 2016); (Qureshi and Siddiqui, 2020); (Mohanlingam et al., 2021); (Achmad and Rahmawati, 2024); (Longa ve Sitorus, 2024)
INDEPENDENT VARIABLES			
Intangible Fixed Assets	Intangible Fixed Assets (LOG)	IFA	(Fındık and Ocak, 2016); (Kaygusuz, 2017); (Taysı, 2019); (Qureshi and Siddiqui, 2020); (Koç, 2024); (Longa and Sitorus, 2024)
CONTROL VARIABLES			
Company Size	Total Assets (LOG)	FS	(Mohanlingam et al., 2021), (Olin and Purwaningrum, 2024), (Longa ve Sitorus, 2024)
Gross Sales	(Product Returns + Damaged or Missing Goods + Discounts) (*% CHANGE*)	NS	(Mohanlingam et al., 2021)

3.4. Research Hypotheses and Models

In this study, the following hypotheses will be tested to determine the influence of IFA on FIRVE, FINPO, and FINPER:

H1: There is a relationship between IFA and FIRVE.

H2: There is a relationship between FS and FIRVE.

H3: There is a relationship between NS and FIRVE.

H4: There is a relationship between IFA and FINPO.

H5: There is a relationship between FS and FINPO.

H6: There is a relationship between NS and FINPO.

H7: There is a relationship between IFA and FINPER.

H8: There is a relationship between FS and FINPER.

H9: There is a relationship between NS and FINPER.

Model 1- MV/BV

$$MV/BV_{it} = \alpha_{0it} + \beta_{1it}IFA_{it} + \beta_{2it}FS_{it} + \beta_{3it}NS_{it} + \varepsilon_{it}$$

(1)

Model 2- FINPO

$$FINPO_{it} = \alpha_{0it} + \beta_{1it}IFA_{it} + \beta_{2it}FS_{it} + \beta_{3it}NS_{it} + \varepsilon_{it} \qquad (2)$$

Model 3 - ROA

$$ROA_{it} = \alpha_{0it} + \beta_{1it}IFA_{it} + \beta_{2it}FS_{it} + \beta_{3it}NS_{it} + \varepsilon_{it} \qquad (3)$$

4. FINDINGS

The descriptive statistics for the variables employed in the study are demonstrated in Table 3, before proceeding to the research findings.

Table 3. Descriptive Statistics for the Variables

Variables	Min.	Max.	Mean	Std. Dev.	Skew.	Kurtosis	Jarque-Bera	Prob.
MV/BV	0,264	203,280	3,166	13,926	13,865	199,272	353626,1	0,000
FINPO	0,015	235,257	3,404	17,403	11,892	152,137	205270,2	0,000
ROA	-23,856	133,439	6,227	14,025	4,670	38,771	12301,92	0,000
IFA	0,000	10,217	6,340	1559	-0,402	4,348	22,20193	0,000
FS	6,788	11,310	8,559	0,.844	0,382	3,106	5,358	0,068
NS	5,280	10,866	8,527	1,040	-0,594	3,359	13,897	0,000

In line with the data presented in Table 3, the mean value of MV/BV variable, 3.166, indicates that investors appraise the market values of firms approximately 3.2 times higher than their book values. The average value of the FINPO variable, 3.404, indicates that companies have 3.404 TL of debt for every 1 TL of equity. The average value of the ROA variable, 6.227, indicates that companies' investments in their assets yield a moderate return. The average value of the IFA variable is 6.340, which represents the logarithmic magnitude of the intangible fixed assets held by the firms. The average value of the FS variable, 8,559, indicates that companies have a significant total asset size. The average value of the NS variable, 8,557, indicates that companies are achieving increasing NS revenue. The standard deviation values of the variables are low, indicating that there is no significant fluctuation in the variables over the years.

The IFA and NS variables, which have negative skewness values, are skewed to the left, while the other variables, which have positive skewness values, are skewed to the right. Since the kurtosis values of all variables are positive, they show a sharp distribution. When the Jarque-Bera statistics and

probability values are evaluated together, it is determined that the variables have high statistical values and probability levels below 0.05. Therefore, it is concluded that not all variables exhibit a normal distribution.

After conducting descriptive statistical analyses on the variables, Spearman's correlation and Variance Inflation Factor (VIF) tests were employed to examine the presence of multicollinearity (MC) among the explanatory variables giving non-normal distribution of the data series. The threshold values established for the Spearman correlation test are (p> 0,90) and (p< -0.90), while the cutoff value defined for the VIF test is 4 in this study. Different studies may adopt varying critical values for these tests. If the correlation coefficients surpass the critical threshold in these test outcomes, it suggests the presence of a multicollinearity (MC) issue among the variables (Yerdelen Tatoğlu, 2020). Furthermore, the issue of endogeneity will be investigated to evaluate the association between the models' error terms and the independent variables. The critical limits for detecting endogeneity are set at (+0.90) and (-0.90) (Tabachnick and Fidell, 2001). The error terms 1, 2, and 3 in Table 4 represent the independent variables of Model 1, Model 2, and Model 3, respectively. Spearman and internal consistency test results are depicted in Table 4, and VIF test outcomes are demonstrated in Table 5.

Table 4. Spearman and Internal Consistency Test Results

	Error-term	Error-term	Error-term	IFA	BUY	NETS
Error-term1	1.000					
Error-term 2		1.000				
Error-term 3			1.000			
IFA	[-0.570]	[-0.655]	[-0.021]	1.000		
	-10.167	-12.700	-0.321	-----		
	(0.000)	(0.000)	(0.748)	-----		
FS	[-0.606]	[-0.724]	[-0.012]	[0.573]	1.000	
	-11.164	-15.382	-0.181	10.233	-----	
	(0.000)	(0.000)	(0.856)	(0.000)	-----	
NS	[-0.063]	[-0.250]	[0.113]	[0.332]	[0.373]	1.000
	-0.936	-3.777	1.670	5.165	5.882	-----
	(0.350)	(0.000)	(0.096)	(0.000)	(0.000)	-----

Note: The [ ] symbol indicates the correlation coefficient, and the ( ) symbol indicates the probability value.

In accordance with the test results in Table 4, no variable exceeds the critical thresholds, indicating no CDB or endogeneity problem.

Table 5. Variance Inflation Factor (VIF) Test Results

Variables	Model-1 Variance Coefficient	Model-2 Variance Coefficient	Model-3 Variance Coefficient	Central VIF	Avg. VIF
IFA	0.59	0.91	0.35	1.60	
FS	2.01	3.13	1.22	1.60	1.4
NETSALES	1.43	2.22	8.7	1.00	

The average VIF value of the models was calculated as 1.4. The fact that the average VIF value did not exceed 4 indicates that no multicollinearity problem is present in the model (Yerdelen Tatoğlu, 2020). Following the correlation test, the cross-sectional dependence's presence (CSD) in the research article will be evaluated using BIA-Corrected Scaled LM test developed by Pesaran, Ullah and Yamagata (2008). The threshold value for HCS was set at 0.05. According to the test results, if the probability values of the variables exceed this threshold value, there is no HCS problem; if they are below it, an HCS problem exists in the series (Breusch and Pagan, 1980). The outcomes of the aforementioned test are shown in Table 6.

Table 6. Cross-Sectional Dependence (CSD) Test Results

Variable	Stat.	Probability Value
MV/BV	9.935	0.000***
FINPO	17.695	0.000***
ROA	7.618	0.000***
IFA	42.453	0.000***
FS	86.226	0.000***
NS	43.461	0.000***
By Model		
Model 1	9.678	0.000***
Model 2	56.007	0.000***
Model 3	6.266	0.000***

Note: *** indicates statistical significance at the 1% level.

According to BIA-Corrected Scaled LM test outcomes are made visible in Table 6, since the probability values of both models and MV/BV, FINPO, ROA, IFA, FS, and NS variables are below the threshold value, there is a YKB issue in the series. Therefore, tests of second-generation unit root should be applied to determine whether these factors are stationary. The stationarity test for series with cross-sectional dependence will be performed using Pesaran (2007) CIPS test. The threshold values in the stationarity test are 1%, 5%, and 10%. In the literature, 5% is the most commonly used value. According to the outcomes of the panel unit root tests, if the values of probability obtained are lower than the critical threshold of 0.05, the series are stationary; however, if the values of probability are above the critical threshold, the series are accepted as non-stationary. The CIPS test results for the companies are demonstrated in Table 7.

Table 7. CIPS Panel Unit Root Test Results

	LEVEL				1. DIFFERENCE			
FIXED			FIXED+TREND		FIXED		FIXED+TREND	
Variable	*Stat.*	*Prob. Var.*	*Stat.*	*Prob. Var.*	*Stat.*	*Prob. Val.*	*Stat.*	*Prob. Val.*
MV/BV	-2.358	<0.05	-1.511	>=0.10	-2.738	<0.01	-3.029	<0.05
FINPO	-2.289	<0.10	-3.250	<0.05	-	-	-	-
ROA	-3.178	<0.01	-3.020	<0.05	-	-	-	-
IFA	-2.752	<0.01	-2.685	>=0.10	-3.631	<0.01	-3.422	<0.01
FS	-2.213	<0.10	-2.721	>=0.10	-3.771	<0.01	-3.856	<0.01
NS	-3.277	<0.10	-3.738	<0.10	-	-	-	-

In line with the CIPS test outcomes shown in Table 7, the FINPO, ROA, and NS variables are stationary at the level in not only the constant but also in constant + trend models. The MV/BV, IFA, and FS variables are static in the constant but not in the constant + trend. However, when the first-order difference of these variables is taken, they are seen to become stationary at the level. Before estimating the fixed influences model, it is essential to identify the unit and/or time effects of the fixed parameters in the model. If fixed effects are present merely in time dimension or merely in the cross-section dimension, the One-Way Fixed Effects Model is applied.

In contrast, when fixed effects are observed in both time and cross-section dimensions, the Two-Way Fixed Effects Model is preferred. Since the data set used in this study covers a specific period and group of firms, the fixed influences model was employed for the analysis. The fixed influences model will be evaluated using F test. The threshold value for F-test is 0.05. The test outcomes are presented in Table 8.

Table 8. Model Selection Test Results (F-Tests)

	Model 1		Model 2		Model 3	
Test Name	Statistics	Probability	Statistics	Probability	Statistics	Probability
F-test						
F-group_constant	1.855	0.047**	2.582	0.004***	2,405	0.008***
F-time_constant	1.390	0.145	1.297	0.197	1.605	0.071*
F-two-way_fixed	1,400	0.098*	1.552	0.046**	1,828	0.004***

Note: ***, *, and * indicate significance levels at 1%, 5%, and 10%, respectively.

According to F-test outcomes in Table 8, it reveals that the estimates obtained using the model of fixed effects are more effective than those obtained using pooled model. Since F-test results of Model 1 and Model 2 are below the threshold value at the group level but above the threshold value at the time dimension, the one-way fixed effects model will be estimated. Since Model 3 is below the threshold value in both the time and group dimensions, the two-way fixed influences model estimation will be applied.

To obtain accurate and reliable results in panel data analysis, it is of critical importance to test basic assumptions, such as heteroscedasticity and autocorrelation, and to perform analyses that account for these assumptions. In this study, the heteroscedasticity assumption will be tested using Breusch-Pagan-Godfrey Lagrange Multiplier (LM) test, and the autocorrelation assumption will be tested using Baltagi and Li (1991) Lagrange Multiplier (LM) and Born and Breitung (2016) Lagrange Multiplier (LM) tests. The threshold value in these tests is 0.05. The results of the heteroscedasticity and autocorrelation tests are presented in Table 9.

Table 9. Heteroscedasticity and Autocorrelation Test Results

	Heteroscedasticity					
	Model-1		Model-2		Model-3	
	Statistics.	Probability.	Statistics.	Probability.	Statistics.	Probability.
Breusch, Pagan and Godfrey LMh	1140.645	0.000***	1143.270	0.000***	190.082	0.000***
	Autocorrelation					
	Model-1		Model-2		Model-3	
	Statistics.	Probability.	Statistics.	Probability.	Statistics.	Probability.
Baltagi ve Li (1991) LMp	2.499	0.113	31.131	0.000***	6.406	0.000***
Born ve Bretuing (2016) LMp	5.920	0.014	41.628	0.000***	11.671	0.000***

Note: ***, *, and * indicate significance levels at 1%, 5%, and 10%, respectively.

The findings obtained from the test statistics revealed that both heteroscedasticity and autocorrelation problems exist in Models 1, 2, and 3. Robust estimators were employed to solve the heteroscedasticity and autocorrelation issues in the models. The Cross Section (SUR) robust estimator

was used for Models 1, 2, and 3. The robust estimation results for the firms are shown in Table 10.

Table 10. Panel Regression Analysis Results (SUR Estimator)

	Model-1		Model-2		Model-3	
	Company Value		**Financial Policy**		**Financial Performance**	
Dependent Variable	MV/BV		FINPO		ROA	
Explanatory Variable	Coefficient	Probability	Coefficient	Probability.	Coefficient	Probability.
IFA	0.313	0.000^{***}	-0.709	0.000^{***}	-1.420	0.000^{***}
FS	-3.711	0.000^{***}	5.453	0.000^{***}	17,373	0.000^{***}
NS	4.41	0.082^{*}	-8.14	0.000^{***}	0.0002	0.000^{***}
C	0.570	0.000	3.148	0.000	4.003	0.000^{***}
R^2	0.436		0.869		0.767	
Adjusted R^2	0.392		0.859		0.750	
F-statistic	10.377		89.693		44.611	
F-Probability	0.000^{***}		0.000^{***}		0.000^{***}	

Note: ***, *, and * indicate significance levels at 1%, 5%, and 10%, respectively.

The analytical results in Table 10 show that F-probability value, which indicates the overall significance of the model, is statistically significant at 1% significance level for all three models. The adjusted R² values calculated as 0.392, 0.859, and 0.750 for Model-1, Model-2, and Model-3, respectively, reveal that approximately 39.2% of the variation in MV/BV, 85.9% of the variation in FINPO, and 75% of the variation in ROA are elucidated by the independent variables.

When it comes to Model 1, a substantial and positive affiliation was identified between independent variables IFA and NS and the dependent variable MV/BV at the 1% and 10% significance levels, whereas a substantial and negative affiliation was found between the variable FS and MV/BV at the 1% significance level. In comparison, a rise of one unit in IFA variable leads to a 0.313-unit rise in the MV/BV variable, while a one-unit rise in the FS variable results in a 3.711-unit decrease in the MV/BV variable; furthermore, a 1% rise in the NS variable leads to a 4.41% increase in the MV/BV variable. In this context, Hypothesis 1, Hypothesis 2, and Hypothesis 3 developed in the study are accepted.

In Model-2, a significant and negative relationship at 1% significance level was found between the dependent variable FINPO and the IFA and NS variables. A one-unit increase in the IFA variable reduces the FINPO variable by 0.709 units. A 1% rise in the NS variable reduces the FINPO variable by 8.14 units. A substantial and positive affiliation was established between the FS variable and FINPO at a 1% significance level. A one-unit rise in the FS variable boosts the FINPO variable by 5.453 units. In this context, Hypotheses 4, 5, and 6, established in the study, are accepted.

In Model-3, a significant and positive relationship at 1% significance level was found between the FS and NS variables and the dependent variable ROA, while a significant and negative relationship at 1% significance level was found between IFA and ROA. One-unit rise in the FS variable brings about a 17.373-unit rise in the ROA variable. A 1% increase in the NS variable increases the ROA variable by 0.02 units. However, one-unit rise in the IFA variable decreases the ROA variable by 1.420 units. In this context, Hypotheses 7, 8, and 9, established in the study, are accepted.

5. CONCLUSIONS AND RECOMMENDATIONS

In the rapidly advancing technological era, knowledge has gained significant value, and has fostered the development of the knowledge economy. This situation has further enhanced the importance of IFA. The value of corporate assets of the firms is shifting from traditional tangible assets (such as land, fixtures, vehicles, equipment, machinery, and buildings) to IA (including brands, patents, copyrights, intellectual property and rights, computer software etc.). Today, these assets have diversified and begun to occupy a greater place on balance sheets. IFA are used for purposes such as increasing stock prices and creating shareholder value. Furthermore, it exerts significant effects on firms' profitability, efficiency, earnings quality, and the formation of their capital structures

The current research study examined the influence of IFA on the value, FINPO, and FINPER of 12 technology companies that traded continuously on the BIST Technology Index between 2006 and 2023, using panel data analysis. In the study, FIRVE (Model 1) was measured using MV/BV, financial policy (Model 2) was measured using FINPO, and financial performance (Model 3) was measured using ROA variables. The research findings indicated that IFA had a substantial and positive influence on company value (FIRVE) at a 1% significance level, whereas it was determined to have a substantial and negative influence on financial policies (FINPO) and financial performance (FINPER).

The findings revealed that IFA investments exerted a positive influence on FIRVE, as reflected in the MV/BV ratio. Such investments also have the potential to enhance the future revenue and profitability of technology firms.

Effective R&D can result in the generation of innovative products and services; patents can offer firms a competitive edge, strong branding can promote customer loyalty, and advancements in software can improve operational efficiency. Such investments allow technology firms to position themselves as innovation leaders within their industry and attain a sustainable competitive advantage. Markets perceive these companies as more valuable and assign them at higher price-to-earning P/E ratios. Investors often give more weight to a technology firm's future growth prospects than to its current earnings results. In industries shaped by winner-takes-most dynamics, the possession of scalable software, legally protected intellectual property, and continuous R&D effort is generally seen as a source of long-term competitive strength. When such intangible assets are viewed as signals of higher abnormal returns in the future, the market is usually willing to justify higher valuation multiples, despite short-

term volatility or weakness in reported profitability. Additionally, intellectual property represents one of the most valuable assets for firms operating in the technology sector, and the intellectual property generated through IFA investments can serve as a substantial source of revenue for these companies. IFA investments lead to an increase the P/E ratio, which aligns with the findings reported in previous studies (Garanina and Pavlova, 2011; Lew, 2015; Longa and Sitorus, 2024).

The research indicates that IFA investments adversely affect FINPO, as reflected in the companies' debt-to-equity ratios. IFA investments may decrease the reliance on external financing by enhancing firms' future earnings potential and cash flows. These investments indicate that companies are robust innovation and long-term sustainability, leading to perceive them as carrying lower financial risk. Reduced risk perception makes it easier for companies to access equity funding. Although tangible fixed assets can be more easily used as collateral for debt financing, IFA are less liquid; and present greater uncertainty when considered as collateral. Consequently, as technology firms prioritize IFA, debt financing becomes less appealing, and equity financing or internal funding sources gain prominence. Owing to its rapid growth and strong innovation potential, the technology sector initially favors financing options such as equity or venture capital rather than debt. This result aligns with Myers and Majluf's (1984) Capital Structure Theory and is corroborated by previous studies in the literature (Qureshi and Siddiqui, 2020; Alves and Martins, 2014; Gamayuni, 2015).

The results indicate that IFA investments negatively affect FINPER, as reflected by the net profit-to-total assets (ROA) ratio. IFA investments typically entail high initial costs, which are recorded as period expenses, thereby lowering net profit. The conservative character of accounting rules like IAS 38 is primarily responsible for this negative correlation. Significant amounts of internally produced intangible expenses, especially those related to research, are expensed immediately rather than capitalized under these restrictions. As a result, these investments automatically reduce current period's net income even while they create long-term economic benefit. Additionally, the technology industry is known for its long growth periods, which companies spend a lot of money up front on product development long before they see a profit, that momentarily reduces return on assets. It may take time for IFA investments to start generating revenue; during this period, expenses may increase while revenue growth may not occur at the same pace, which can reduce ROA. Furthermore, there is no guarantee that every IFA investment will be successful. Investments in the wrong areas or unsuccessful projects incur costs without generating the expected revenue, thereby reducing ROA. The finding is compatible with studies in the literature (Sundaram et al., 1996; Artz et al., 2010), (Nnado andOzouli, 2016), and (Qureshi and Siddiqui, 2020).

The research findings indicate that FS has a negative influence on FIRVE, but a positive influence on FINPO and financial performance. Large firms may lose their economies of scale advantages. As assets increase, management costs, bureaucracy, and inefficiency may rise. This situation may cause investors to view the future profitability potential of firms with skepticism, leading to a decline in market

value. Global crises (2008, COVID-19) and technology bubbles during the 2006-2023 period may have affected companies' valuation metrics. For example, the low-interest-rate environment after 2020 may have encouraged borrowing, but inflationary pressures may have reduced market values. Large companies generally have higher credit ratings and easier access to debt markets. Lenders may offer more favorable terms to large companies because they perceive them as less risky. Large companies can reduce costs by increasing efficiency and diversifying risks through product and market diversification. This can positively impact net profit margins and improve financial performance. This result is consistent with the findings of investigations carried out by Frank and Goyal (2009), Tükenmez et al. (2017), and Seyhan (2024).

Research findings indicate that NS have a positive influence on FIRVE and FINPER, but a negative effect on FINPO. NS represent the revenue generated from a firm's core activities and are an important indicator of its future revenue-generating potential. Investors consider firms that can generate more revenue and profit in the future to be more valuable. Therefore, a rise in NS directly contributes to a rise in FIRVE. The technology sector is one with the potential to produce high profit margins and strong cash flow. An increase in sales can significantly boost a company's profitability and flow of cash. In this case, companies may require less external financing to support their growth and operational needs. They can use the cash surplus they generate to reduce their existing debt. Growth in sales increases a company's equity. Companies may prefer to finance their growth strategies with equity rather than debt.

Especially in uncertain economic times or high-interest-rate environments, avoiding debt and strengthening equity may be a more rational approach. An increase in NS directly increases the company's revenues. If costs increase in parallel with or at a slower rate than sales, this leads to an increase in net profit. Higher net profit indicates improved FINPER. The outcomes are compatible with the findings of studies in the literature (Biçen and Sezgin, 2017), (Belguith and Abid, 2022), and (Islam et al., 2023).

Technology companies can increase their future revenues and profitability by financing the research and development (R&D), patents, trademarks, and software development. IFA investments can reduce financial risks by favoring equity financing, as they make debt financing less attractive. It is worth noting that IFA investments may initially reduce profitability. Since it may take time for investments to start generating revenue, a long-term perspective is advisable. Large companies should regain the advantage of their scale economies by reducing management costs and inefficiencies. Financial performance should be improved by increasing efficiency and reducing costs. An increase in net sales increases the revenue companies derive from their core activities and indicates future revenue generation potential. Companies should strengthen their marketing and sales strategies to increase sales.

Based on the findings of the study, several practical recommendations can be suggested for key stakeholders in dealing with the financial aspects of intangible assets. Policymakers should set up state-supported credit guarantee funds, especially for IP-backed financing, because conventional credit markets often undervalue firms that rely heavily on intangibles due to the absence of physical collateral. In addition, R&D tax incentives should be further strengthened in order to reduce the negative impact on short-term performance indicators, such as ROA, and to compensate for the initial decline in profitability that may occur. From a regulatory point of view, the noticeable gap between book value and market value points to information asymmetry. Therefore, reporting and disclosure rules need to be updated to allow more detailed disclosure of currently "unrecognized" intangible assets, so that investors can assess the firm's real economic value more accurately. Finally, firm managers are encouraged to adopt a balanced portfolio approach. Although intensive investment in intangible assets can increase market value, it can also put pressure on short-term liquidity. For this reason, a gradual or phased investment strategy, supported by sufficient equity buffers, is important for managing the long development periods associated with intangible investments.

This study is open to extension in various respects for future research. First, the effects of IFA investments can be examined comparatively across companies operating in different sectors such as IT, manufacturing, and services. Furthermore, using alternative indicators, such as ROE and Tobin's Q, instead of dependent variables like FIRVE, financial performance, and FINPO, could bring different perspectives to the literature. Considering the effects of country differences on IFA investments, multicountry comparative studies can increase the generalizability of the findings. Furthermore, intangible fixed assets can be disaggregated into sub-components such as patents, R&D, brand value, and software; and the influences of these components on FINPER can be analyzed separately. Methodologically, causality relationships can be tested more robustly using models that include lagged variables, such as dynamic panel data analysis or the generalized method of moments (GMM). Ultimately, studies examining the impact of IFA investments on intellectual capital will contribute to a more comprehensive and in-depth understanding of this field.

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