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Does Board Social Capital Augment Investment Decisions? Evidence from the Tehran Stock Exchange

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Abstract

This study investigates the impact of the board's social capital on the investment efficiency of listed companies in the Tehran Stock Exchange. Based on the theoretical foundations, the board social capital as a social-behavioral factor can affect the problem of over or under-investment (both of which are examples of the inefficiency of investment decisions). Therefore, when the board's social capital is at a high and favorable level, company

managers show less opportunistic behavior and do their best to increase cooperation and interaction within the company, which leads to the strengthening of investment efficiency. In terms of purpose, the current research is the applied-developmental type and takes a descriptive-correlational manner. We measured board social capital using the Co-Working Experience index. Investment efficiency is also measured through under- and over-investment using the Richardson (2006) model. The control variables also include the size of the board of directors, the independence of the board of directors, the size of the company, the ratio of net profit to sales, the rate of return on assets, and the level of financial leverage. The statistical population of the research includes 183 companies admitted to the stock exchange from 2016 to 2022. In order to test the research hypothesis, a multivariate regression model has been fitted using the panel data method with the fixed effects approach. The results of the research indicate that the hypotheses of the research are confirmed, and there is a positive and significant relationship between the social capital of the board of directors and investment efficiency.

Keywords: Board Social Capital, Investment Efficiency, Board Independence, Under Investment, Over Investment.

Introduction

Investment means the allocation of financial resources to one or more different assets, with the aim of acquiring more valuable resources in the future (Bose, 1968). Making investment decisions, as a basic driver for future cash flows, final evaluation, and risk issues for the company, is of great importance. If the company's investment is effective, the allocation of the company's resources is not done in an optimal way, and ultimately, the company's resources are well-spent. Investment efficiency is considered as a predicted level of investment based on sales growth opportunities. A deviation from the predicted level of investment is considered an inefficient investment, whether it is positive or negative (Gary et al., 2009). Due to the increasing globalization of financial markets, achieving an efficient mechanism and optimizing investment decisions have become vital issues for many companies. In recent years, the role of the board of directors has been discussed as an emerging issue related to companies due to the prevalence of corporate bankruptcy and economic crises (Salem et al., 2019). in many instances, firms deviate from optimal investment levels due to various market imperfections (Agrawal & Knoeber, 1996). Theoretically, agency problems give rise to the cost of equity as they lead firms towards inefficient investment decisions, which causes investors to demand high returns(Ohlson & Juettner, 2005). Investment efficiency is an important

concept because firms with higher investment efficiency are associated with lower agency problems, which means that aligning the interests of management and shareholders of the firms reduces the risk of deviating from the expected level of investment(Omran, 2009). Substantial literature in the area of corporate finance indicates that firms with higher corporate governance practices ensure the balance between the interests of shareholders and management (Ali et al., 2007). As ownership is separated from control, firms with poor corporate governance mechanisms face the issue of conflict of interest between the real owners of the firm and the management (Hope & Thomas, 2008).

One of the most important factors in guiding companies' investment decisions is the board of directors, whose impact on investment efficiency has been well documented in previous studies. The board of directors, as the head of the decision control system, plays a vital role in the implementation of investment decisions and has a clear impact on the prosperity of a company (Nguyen & Nielsen, 2010). Directors monitor managers on behalf of shareholders in order to reduce agency costs and improve the company's information environment (Armstrong et al., 2014; Nguyen & Nielsen, 2010) by minimizing the asymmetry in the disclosure of good and bad news in the performance governance role of directors. In other words, the board of directors is a key factor in the best possible implementation of the corporate governance system at the level of companies (Garcia et al., 2018). Considering this issue, it is very important to understand how the characteristics and efficiency of the board of directors affect the investment decisions of companies (Farihat et al., 2019). Characteristics of board members that influence firm performance have increasingly been of interest to scholars and practitioners (Daily et al., 2003; Gupte & Paranjape, 2014; Agrawal & Chadha, 2005). In this regard, a relevant issue in the academic and practical debates has been to answer the question of what enhances directors' effectiveness in value maximization.

The "Board Capital" is the combination of human and social/relational capital of board members (Hillman & Dalziel, 2003).

Scholars define Board Capital as the sum of knowledge and skills that directors hold thanks to their educational path and work experiences and the set of relationships established by directors with internal and external stakeholders. In general, board social capital is one of the new concepts that has been used in most fields of human sciences, especially sociology, political science, and economics, and is related to relationships and interactions between members of

society (Hasan et al., 2020). In other words, social capital can be defined as interpersonal relationships and trust between them (Mundi, 2022). Social capital refers to actors' ability to secure benefits through membership in social networks or other social structures (Ports, 1998). From the point of view of Woolcock (1998), social capital is defined as the information and reputation that a person obtains from a social network.

Board social capital has attracted considerable attention in modern social science and has been found to be associated with executive compensation (Hoy et al., 2019), corporate innovation (Hasan et al., 2020), financing choices (Dudley, 2021 and Javakhadze et al., 2016) as well as risk-taking (Ferris et al., 2017). Research conducted by Al-Khatib et al. (2015), Engleberg et al. (2013), and Faley et al. (2014) provide convincing evidence that network participation or social capital has important implications for company policies and the company's information environment. One of the basic points unveiled regarding investment efficiency is the effects of board social capital (Duong et al., 2024). The main issue that needs to be addressed in the current research is the impact of the social capital of the board of directors on the efficiency of investment at the level of companies. In fact, social capital as an effective social-behavioral factor can keep the problem of under-over investments of the company at a favorable level and minimize the wasted resources of the company (Wu, 2023). Therefore, when the social capital of a company is at a high and favorable level, company managers show less opportunistic behavior and do their best to increase cooperation and interaction within the company. In fact, the social network is an infrastructure through which social capital is created or used (Fogel et al., 2018).

However, this study has yet to systematically investigate the impact of board social capital on investment efficiency at the firm level. The study overlaps this gap by explicitly examining whether the social capital of the board of directors has an effect on the investment efficiency of companies listed on the Tehran Stock Exchange. One of the distinguishing points of this research compared to other studies is the use of social capital at the level of the board of directors (the most important pillar and center of gravity of corporate governance). This research investigates the impact of the formation of social capital of the board of directors within the organization on the efficiency of companies in investment decisions. For this purpose, the co-working experience index and the correlation of the company's operating profit growth rate with the relevant industry for 181 samples are used to fill the existing knowledge gap and develop investment decision models. Therefore, the main problem of this research is to investigate the impact of the social capital of the

board of directors on the efficiency of companies' investment decisions.

Literature Review

Theoretical Development

So far, several definitions of social capital have been presented. Coleman (1988) believes that social capital is a set of entities that have two characteristics: firstly, that they are part of the same social structure, and secondly, that they facilitate certain actions within that social structure. Fukiyama (1997) considers capital communities to be a collection of soft and informal values that are shared in a group and collect. According to Volcak (2002), social capital is soft and networks that perform the fields of cooperation and assistance. Social capital is defined as the existence of mutual trust in a group or network (Robison, 2002). In sociological sciences, social capital has been considered as an investment in social relations with expected advantages in the market. Kim (2005) was the first person to initially relate the concept of social capital to the board of directors. Considering the theoretical foundations, literature review, and research point of view, it can be stated that the social capital of the board of directors as a social-behavioral factor can keep the problem of high costs of the company at a favorable level (Sandefur & Laumann, 2009). Therefore, when the social capital of the board of directors is at a high level, managers show less opportunistic behavior and strive for more cooperation and interaction in the company. Therefore, reducing the opportunistic behavior of managers through the social capital of the board of directors can lead to an increase in the investment efficiency of the company. In fact, managers of companies with a high level of social capital, in order to maintain the value of the company, use their efforts to actually make investments with a positive net present value (Omaye & Amobi,2023). In general, many criteria have been presented in order to create solutions for increasing social capital, all of which have a common result. One of the most important examples of the aforementioned solutions, although on a small scale, is the new management methods known as the management of human, social, and cultural resources and capital (Bhandari & Yasunobu, 2009). Therefore, based on this argument, the current research examines the relationship between the social capital of the board of directors and investment efficiency, the conceptual model of which is fully described in Figure 1:

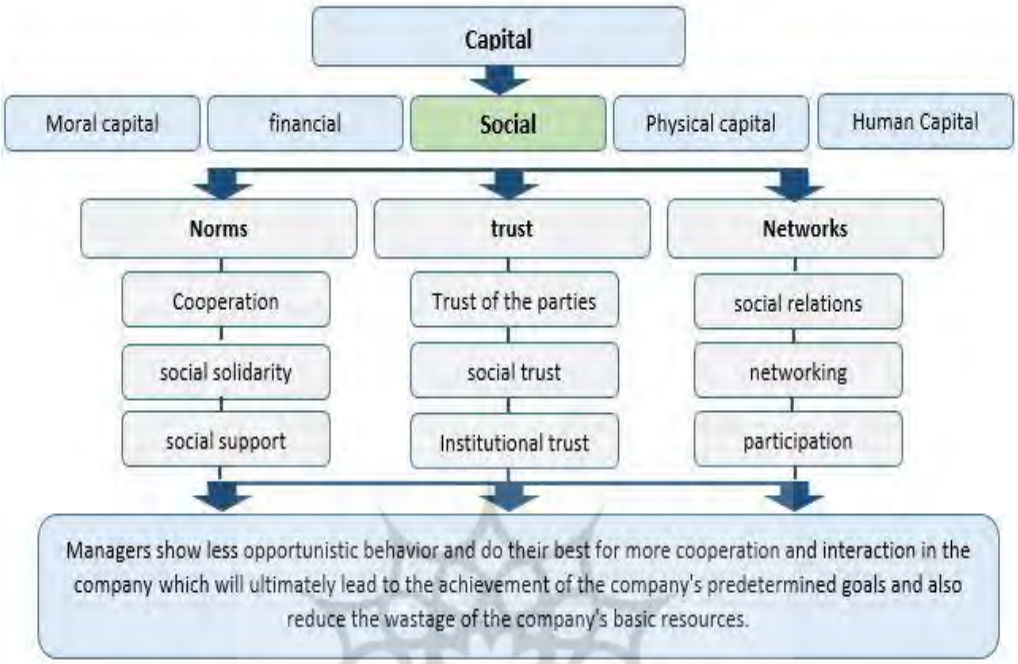

Figure 1. A conceptual model of capital (Mazelis et al., 2018)

In general, the social capital of the board of directors can be formed in two ways: One is the internal social capital, and the other is external social capital, which is called the first composite form and the second link form. In the composite form of social capital or internal social capital, we mean the network ties between board members of a company, which are created as a result of the interaction of those people with each other. In the external or linked form, social capital means the connections and affiliations of board members with institutions and political connections located outside the organization (networks with people in government departments and institutions and other companies). What we emphasize in this research is the internal social capital of the board of directors. The composite form considers the relationships between managers in a central board that facilitates trust, cooperation, and teamwork. However, the link form, like a bridge, considers the network relationships between managers and external connections (Moradi et al., 2019).

The social capital theory applies perfectly to the board of directors. Boards are complex bodies similar to other groups, and most of the board members are non-organizational (non-commissioned) people whose primary affiliation is

considered to be outside the organizations (Debliss et al., 2022). They do not automatically have such a "team" Because there is no regular working basis, and only board meetings are held from time to time (Jabri et al., 2018). The role and position of the board of directors in the company is a very fundamental role in achieving the set goals, so the members of the board of directors are obliged to accept all decisions that may affect the long-term performance of the company (Choy et al., 2023). In other words, the company is governed by the role of the board, which supervises the work of senior managers in coordination and harmony with the shareholders. In Figure No.2, presented in the following section, the types of tasks in a company that are the responsibility of the board of directors and will ultimately lead to innovation, effective management, and effective investment are fully described.

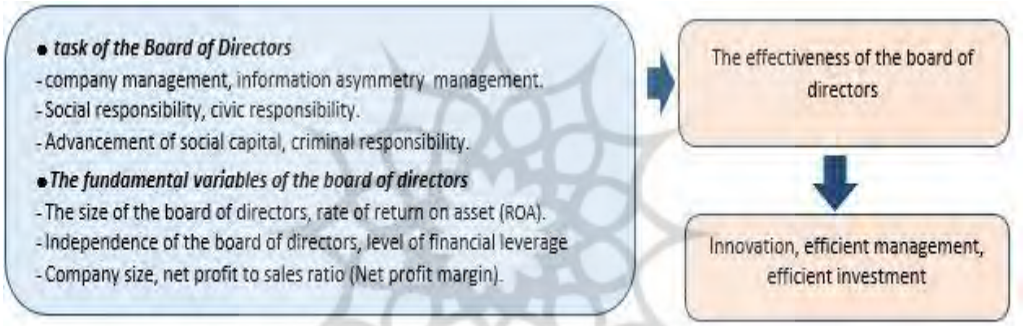

Figure 2. Fundamental tasks of boards (Widen et al., 2008)

Table No. 1 describes the types of capital that are available in a company. In fact, the concept of cultural capital implies the power and ability to acquire cultural goods, as well as the individual's talent and capacity to recognize and use these tools. Every culture has a common pattern of thinking (Bhandari & Yasunobu,2009). The characteristic of thinking in any culture is rooted in the culture's perception of reality and the worldview that culture has. The change in worldview not only causes changes in cultural meanings but also includes what historians call the change of era (Wu et. al., 2023). From Bourdieu's point of view, capital is that which acts as a social relationship within an organization and structure of interactions. This organizational capital includes those moral characteristics, networks, norms, and possibilities that enable managers and participants to pursue their common goals more effectively (Duong et al., 2024). Coleman refers to different sets of actions, consequences, and relationships as social capital. According to him, social capital is

inherently able to work, and social capital is anything that enables individuals and institutions to work. Finally, according to Coleman, social capital is normatively and morally neutral. It means that it is not desirable, and only by providing the necessary resources does it enable the occurrence of actions (Feng et al., 2023).

Table 1. Types of capitals available in the company

Row		Classical Theory	Capital Assumptions			
			Human Capital	Cultural Capital	Social Capital	
1	Theorist	Marx	Schultz/Becker	Bourdieu	Lien/ Bret/Coleman/ Marsden	Coleman/ Bourdieu
2	Description	wage working class	Accumulation of surplus value by workers	Reproducing the dominant symbols and meanings of the organization	Access and use of resources embedded in social networks	Solidarity and group reproduction
3	capital	A- A part of the surplus value between the consumption value and the exchange B- Investing in the productive sector and circulation of goods.	Investing in individual skills and knowledge	Internalization or misrecognition of dominant value	Investing in the organization's social networks	Investment in recognition and mutual recognition
4	level of analysis	Structural	Individual	Individual	Individual	Individual / Group

The moral capital of the organization is the sum of the actual and potential resources available to people, which is caused by the network of relationships belonging to the individual or moral unit. This capital is an effective factor in creating and participating in organizational knowledge. In fact, moral capital refers to the norms and networks that enable people to take collective action. This simple definition picks up several destinations. First, it focuses not on consequences but on sources of moral capital. Secondly, this definition includes different dimensions of moral capital and accepts that communities have more or less access to them (Bartosch, et.al., 2024). The most important pillar of the capital that was examined in the current research is social capital, and its basic components are fully presented in Figure No.3, in the following section.

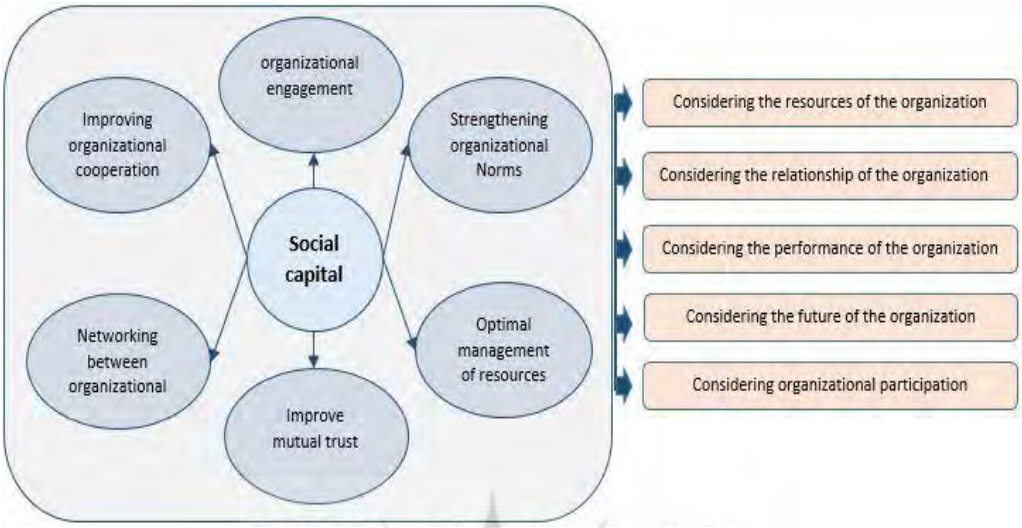

Figure 3. Social capital components (Waithaka, 2014)

Table No. 1 summarizes the literature review of board social capital and study background.

Table 2. Background of board social capital

Authors/ Year	Results	Research Title
brahimi et al. 2023	Examining the company's social capital and the company's investment efficiency	The findings of the research hypothesis indicate that the company's social capital increases the efficiency of the company's investment. The distinguishing point of the current research compared to this research is the focus on the social capital of the board of directors (instead of the company).
Xing et al. 2023	Social capital, independent director connectedness, and stock price crash risk	Further analyses reveal that the negative impact of ineeeeneent ii rectors' social caii tal on stock price crash risk is more prominent for non-state-owned enterprises, firms with strong external monitoring, and firms with high separation of ownership and control. Moreover, we observe that firms whose independent directors possess higher social capital have less financial opacity, less corporate fraud, and less board absenteeism. Our study suggests that social capital is an important variable when investigating the predictors of a stock price crash.

Sun et al. 2023	The Effect of CEO Social Capital, CEO Duality and State-Ownership on Corporate Innovation	Our findings contribute to the scientific understanding of the conditions in which CEO social capital may benefit firm innovation to a greater extent by also considering the effects of CEO duality and state ownership. Moreover, the results of this study provide managers with clear indications about the optimal conditions under which firm innovation may benefit from CEO social capital, which is in the case of CEO duality and state-owned enterprises (SOEs).
Zhang et al. 2023	CEO social capital and litigation risk	We find that firms with high CEO social capital relate to lower litigation risk. Further analyses show that the negative correlation only exists for firms that are non-state-owned enterprises, are located in low-marketized regions, face periods of economic downturns, have high managerial ownership, and retain well-connected independent directors on boards. Our results hold after a battery of robustness checks. Together, these findings provide unique evidence to support the beneficial role of CEO social capital in risk reduction.
Xing et al. 2023	Social capital, independent director connectedness, and stock price crash risk	Further analyses reveal that the negative impact of i. eeeenee. t .. rect. rs' social caii tal on stock price crash risk is more prominent for non-state-owned enterprises, firms with strong external monitoring, and firms with high separation of ownership and control. Moreover, we observe that firms whose independent directors possess higher social capital have less financial opacity, less corporate fraud, and less board absenteeism. Our study suggests that social capital is an important variable when investigating the predictors of a stock price crash.
Joo Kang et al. 2022	Social ties, managerial overconfidence, and investment efficiency	We find that social ties among directors are negatively associated with investment efficiency, and managerial overconfidence aggravates this association. These results suggest that social ties between inside and outside directors weaken board independence, which ultimately has a negative impact on optimal investment decision-making. In addition, stakeholders must effectively monitor managers who are overconfident when board members are socially tied.
Nazari Abarbekuh	Investigating the relationship	Finally, according to the investigations, the research results indicate that the use of board members with

& Azizi 2022	between human capital and social capital of board members and the financial performance of companies	higher human capital and social capital leads to the improvement of the company's market value compared to the book value of the company, which will be beneficial for maximizing the shareholders' wealth.
Mundi 2022	CEO social capital and capital structure complexity	The empirical findings show that CEOs with trust in government and local police, membership in non-profit organizations, altruism, and political participation have more complex and less concentrated capital structures. In contrast, CEOs with trust in government and membership in government organizations have less complex and highly concentrated capital structures. The evidence of determinants of CSC, CEO-specific variables, and firm-specific variables on CSC is also documented. The results also hold in various robustness checks and tests for endogeneity.
Hamid, N., & Purbawangsa 2022	Impact of the board of directors on financial performance and company capital: Risk management as an intervening variable	The results of the SEM model show that risk management and the tenure-chief Executive Officer (CEO) have a significant positive effect on financial performance and company capital. However, CEO duality has a significant negative effect on financial performance. The results also find that the effect of CEO duality and board size are significantly positive on financial performance through risk management.
Yong Joo et al. 2022	Social ties, managerial overconfidence, and investment efficiency	We find that social ties among directors are negatively associated with investment efficiency and managerial overconfidence aggravates this association. These results suggest that social ties between inside and outside directors weaken board independence, which ultimately has a negative impact on optimal investment decision-making. In addition, stakeholders must effectively monitor managers who are overconfident when board members are socially tied.
Dudley, 2021	Social capital and entrepreneurial financing choice	Using a sample of U.S. start-ups, find that social capital, as captured by secular norms and social networks in the entrepreneur's county, increases access to outside financing and reduces reliance on owner equity to finance the new venture. Financing to entrepreneurs located in counties with greater social capital involves higher amounts of leverage in the form of outside debt. This finding persists in a difference-in-difference test that controls for unobservable geographic determinants of capital structure.
Feijóo, Luis	Managerial social	We document that greater managerial social capital is

et al. 2021	capital and dividend smoothing	associated with a statistically and economically significant increase in dividend smoothing. The effect of social capital on dividend smoothing is stronger for financially constrained firms. We also find that social connections are positively associated with passive institutional ownership. Our results are robust to alternative model specifications, different variable measurements, and indigeneity tests. Overall, the findings are consistent with agency-based explanations for corporate dividend smoothing.
Hasan et al. 2020	Is social capital associated with corporate innovation? Evidence from publicly listed firms in the U.S.	Cross-sectional evidence indicates the prominence of the contracting channel through which social capital relates to innovation. Additionally, social capital is also positively associated with trademarks and the effectiveness of corporate R & D expenditures.
Rajkovic 2020	Lead independent directors and investment efficiency	Research shows that the presence of a lead independent director on the corporate board is positively associated with investment efficiency. The result is more pronounced for firms with weaker corporate governance standards, less transparent financial disclosure, and greater financial constraints. The lead director's presence is negatively associated with overinvestment (underinvestment) for firms with large cash balances and low leverage (high cash flow volatility). Moreover, the lead director's investment-related committee membership and CEO's power matters in this setting. The lead director board role is also positively associated with future firm performance.
Moharram Khani and Beshkoh, 2019	Investigating management capital and value creation	Finally, according to the investigations, the research results indicate that among the components of the human capital of board members, professional experience (in the industry) has a positive and significant relationship, and credibility has a negative and significant relationship. Among the components of social capital, external social capital has a negative and significant relationship with value creation.
Lai et al. 2019	How outside ii vectorsr human and social capital create value for corporate international investments	We find significant but distinct non-linear impacts of board members' human capital (U-shaped effect) and social capital (inverted U-shaped effect). The quality of board capital is also influential, as demonstrated by the effect of directors' prior foreign investment performance in addition to the size and degree of internationalization of interlocked companies. The performance measures of both abnormal announcement returns and operating ROA yield similar results. Our findings highlight the

		importance of incorporating factors related to board human and social capital for a more comprehensive analysis of the contribution of outside directors to a cirmss itt eaaatioaal scccess.
Kathy Fogel, 2018	CFO social capital and private debt	The cost and terms of private debt are affected by the social capital of the borrowing firm's chief financial officer (CFO), proxied by measures of social network centrality that identify the relative position of the CFO in the hierarchy of executives. Firms with CFOs possessing higher social capital issue new loans with lower spreads and fewer covenant restrictions, controlling for all direct connections between borrowers and lenders. Spread reductions are stronger for opaque firms and when CFOs lack objective reputation verification. The results hold when controlling for CFO personal characteristics and firm attributes related to network centrality.
Ferris et al. 2017	CEO social capital, risk-taking and corporate policies	Examining the channel, we show that social ties cause corporate policy actions, and these actions lead to greater volatility in stock returns and earnings. In addition, we uncover a number of factors that significantly moderate the effects of social capital on risk-taking. We also show that this increase in risk-taking is value-enhancing to the firm. Our results are robust to alternative proxies for risk-taking, alternative model specifications, and tests for endogeneity.
Javakhadze et al 2016	Social capital, investments, and external financing	Using a large cross-country sample of companies for the period 1999–2012 and a traditional Investment-Q framework, we discover that social capital reduces a firm's dependence on internally generated cash. We find that social capital is positively associated with investment sensitivity to Q. We further determine that social capital positively affects the sensitivity of external finance to Q while inversely influencing the sensitivity of external finance to cash flow. These effects of social capital are stronger in markets characterized by the weak legal protection of investors. Our findings are robust to alternative model specifications, different variable measurements, and tests for endogeneity.
Rahimi et al. 2015	Investigating social capital and profit management	The results of the research indicate that there is a positive relationship between social capital and profit management in companies listed on the Tehran Stock Exchange.

Now, we can hypothesize that there is a positive and significant relationship between the social capital of the board of directors and investment efficiency.

Research Methodology

In terms of the objective, this research is classified as an applied-developmental study. Also, from the aspect of inference regarding research hypotheses, it is placed in the descriptive-correlation research group, because multivariate regression technique and correlation coefficients are used to discover the relationships between research variables. The argument or approach used in this research is the type of inductive reasoning (bottom-up). Also, since we will conclude by testing the available data, this research will be placed in the group of proof theories. The current research is based on the data collection method of retrospective studies. Since the relationships between the variables of the research are investigated among the member companies of the Tehran Stock Exchange and these variables are extracted from the existing records and documents, the strategy of this research is also a library study. The time domain of this research is from 2016 to 2022 for 7 years. The final sample of the research was determined by applying filters such as access to financial statements and information required by the research variables to the number of 183 active companies on the Tehran Stock Exchange.

In this research, the library method and documentary studies have been used to collect the required data and secondary information. The first-hand (primary) data are necessary to test the research hypotheses by referring to financial statements (statement of financial position and profit and loss statement) and explanatory notes of selected companies, independent audit reports, a statistical archive of Tehran Stock Exchange Organization, website of Deputy Management and the information technology of stock exchange, CODAL, website and financial database software of Rahvard Novin have been extracted. The final analysis of the data has been done using multivariate regression analysis using the GLS method with the help of Eviews statistical software. The variables used in the multivariate regression model are as follows:

Social capital (independent variable)

Following Baros et al. (2016), Kim et al. (2016) and Gibran et al. (2022), in this study, the Co-experience index is used to measure the social capital of the board of directors. This index is calculated from Equation 1:

$$INT\ Board - sc_{\ i.t} = \frac{1}{n} * \sum \min(u_i . u_j) \quad (1)$$

In this regard, u_i indicates the number of consecutive years that person i has been a member of the board of directors of the company. Similarly,

u_j represents the number of consecutive years that person j has been a member of the company's board of directors. The parameter n also indicates the number of pairwise comparisons.

The total number of overlapping board tenures is scaled by the number of pairwise comparisons. The higher this index is, the higher the social capital of the board of directors. Although there are other models for measuring board social capital, in this study, since we mean social capital, network and continuous relationships among board members, the Co-experience index is used. This index is a very good criterion for measuring informal robots. Mainly, social capital is formed inside the members of the board of directors and outside the organization (Jebran, et. al., 2022). Therefore, since the internal social capital of the organization is emphasized in this research, the above index is very efficient and effective in discovering latent relationships (Omaye & Amobi, 2023).

The sources of social capital of the board of directors are located in the relationships between the members of the board of directors and being established as a group, and the internal dynamics of the board of directors are affected by the number of relationships between the members of the board of directors, and the strength and nature of these relationships, which is also a function of the duration of cooperation experiences. These lead us to apply the Co-experience index for board social capital (Choy et al., 2023). To calculate this index, first, two members of the board of directors form a pairwise. In the next step, the minimum number of years that each of those two people has been a member of the board of directors is calculated (minimum introductory period). In the same way, this paired comparison is done for all different paired combinations, and their minimum co-working is calculated in terms of years. Finally, the sum of the obtained numbers is divided by the number of paired comparisons to calculate this index (Jebran et al., 2022).

Investment efficiency (dependent variable)

Richardson and colleagues (2006) measured the efficiency in capital allocation as a relationship and correlation between the growth rate of the manufacturing industries to which the company belongs and the growth rate of all members of the same sample of companies. This shows how the flow of capital towards efficient industries has been at the national level. If a company's capital flows to its core business and core industry, there should be a high degree of correlation and consistency between the company's operating profit growth and the operating profit growth in that industry as a whole. The dependent variable

of the research is investment efficiency, which is measured by following the model of Richardson and colleagues (2006) as a correlation between the growth rate of the operating profit of a company and the growth rate of the operating profit of the industry to which the company belongs, based on annual data. The higher degree of correlation leads firms to better capital allocations to core business, as well as, robust investment decisions.

Control variables

Table 3. Control variables of research

Row	Variable Title	Measurement method
1	Board size	It is measured by the number of board members.
2	Board Independence	It has been measured as the ratio of the number of non-obligatory members to all members of the board of directors.
3	Marginal profit ratio	It is measured by dividing the net profit by the total operating income of the company
4	ROA	It is measured by dividing the net profit by the average sum of total assets in each financial period.
5	Leverage	It is calculated by dividing the total liabilities by the total assets of the business unit.

A large board size means that more people are engaged, and as a result, there is a wider network of communication that augments the board's social capital (Waithaka, 2014). From the corporate governance point of view, a larger board of directors is desirable. Coordinating and bonding between members of a large board is not easily possible. This reduces the possibility of agency costs and, as a result, rationalizes investment decisions (Robison et al., 2002). Therefore, board size should be controlled. From the point of view of corporate governance and stakeholder theory, the board of directors whose members are non-compulsory has higher independence (Portes, 2009). In such a board of directors, since there is no financial or non-financial dependence between the board of directors and organizations, they can easily criticize the company's investment decisions and direct the company's capital towards core business. This leads the firm to investment efficiency (Mundi, 2022). In relation to the effect of performance indicators such as operating profit margin and ROA on the investment decisions of companies, attention should be paid to the theory of reinvestment (Hoi et al., 2019). Companies that have a better financial status and performance means that they have more cash to invest in productive opportunities and cash generation units. This prevents under- or over-investment (Garcia-Feijoo et al., 2021). Theories related to capital

structure point to the impact of leverage on capital cost and the bankruptcy risk caused by financial distress in different ways. High leverage leads to the imposition of interest cost burdens on companies, which is one of the barriers to investment. Cash to be spent on productive investments must be spent on the repayment of principal and interest costs (Feng et al., 2023). Therefore, leverage is one of the factors affecting companies' investment decisions.

Results

The results of the research data interpretation are reported in two descriptive and inferential sections. The descriptive section includes mean, median, standard deviation, maximum and minimum, and the inferential statistics section includes tests related to ordinary/generalized least squares regression. Table No.4 shows the results obtained in the descriptive statistics section:

Table 4. Descriptive statistics of research variables

Variables	Variable type	Mean	Middle	standard deviation	Minimum of observations	Maximum of observations
Social capital of the board of directors	Independent	3.4235	2.0000	0.6502	0.0000	6.0000
Investment efficiency	Dependent	0.2216	0.3065	0.8203	-0.1132	0.8236
Board of Directors size	Control	7.7905	6.5000	0.6908	5	12
Independence of the board of directors	Control	0.4209	0.5312	1.0522	0.2412	0.7341
Profit Marigin	Control	0.3664	0.2545	2.0698	-0.4119	0.6967
Return of investment (ROI)	Control	0.2908	0.1988	2.1775	-0.3012	0.5565
Financial Leverage	Control	0.5373	0.3909	3.7559	0.2446	0.8036

Based on the information in Table No. 4, the mean and standard deviation of the independent variable, i.e., the social capital of the board of directors, are equal to 3.4235 and 0.6502, respectively. On average, the working experience (tenure) of the members of the board of directors, which was compared in pairs, was about 3.5 years. In other words, approximately the members of the board of directors of the research sample companies have shared work experience with each other for 3.5 years, which is a suitable time for the formation of social capital among the members. The standard deviation of this

variable is less than one and it shows that the research samples had relatively similar conditions. The investment efficiency index also has an average of 0.2216, which shows that there was an average correlation of more than 22% between the growth rate of operating incomes of companies and related industries. In general, Table 1 shows information about the sample distribution of each research variable.

One of the prerequisites of regression analysis is the normality of the dependent variable. Jargo-Bara statistics showed abnormal distribution. In general, there are many ways and methods to check the normality of the dependent variable. We applied Cox-Box transformation and after transforming the data using the standard probability distribution function, the investment efficiency variable takes a normal distribution. In addition to the normality of the dependent variable, the reliability (stationarity or meanness) of the explanatory variables (independent and control variables) is also required in statistical analyses using panel data. We also used the unit root test of Levin, Lin, and Chu (LLC) at a significance level of 5%. The results are presented in Table No.5. Since at the significance level of 5%, the probability values obtained for each of the explanatory variables are less than 5%, the null hypothesis is rejected.

Table 5. Unit root test of explanatory variables of the research

Variables (Indexes)	LLC statistics	P-Value	Condition
Social capital of the board of directors	-1884.10	0.000	Reliable
Investment Efficiency	-13.81	0.000	Reliable
Board of Directors size	-21.34	0.000	Reliable
Independence of the board of directors	-14.24	0.000	Reliable
Profit Margin	-13.39	0.000	Reliable
Return of investment (ROI)	-7.79	0.000	Reliable
Financial Leverage	-5.65	0.000	Reliable

Before estimating the model using the collected panel data, the appropriate methods and tools for using such data and information in the estimation of decision-making should be evaluated and checked. In single-equation estimates, Limer's F-test statistic is used to make the final decision. Finally, according to the investigations, the results of the F-Leamer test are presented in Table No.6 in full.

Table 6. F-Limer test

Null Hypothesis	T-Statistic	P-Value	Result
H0 Rejected	36.82	0.000	The Pooling Method (Accumulation of Data) Is Suitable

Based on the obtained results, at a significance level of 5%, considering that the P-value obtained is less than 5%, hypothesis H0 is rejected, and the method of using data is panel type (and not polling). Next, the Hausman test should be performed in order to decide between the model with random effects and the model with fixed effects. Table No. 6 summarizes the results of the Hausman-Test. According to Table No.6, since the probability value of the Hausman test is also less than the significance level (5%), the null hypothesis of randomness is rejected and as a result, regression with fixed effects should be used in fitting the model. After determining the estimation method of the regression model, the initial model is fitted using the ordinary least squares method. However, before analyzing the coefficients, we must make sure that the correct conditions of the regression model are established. In the fitted regression model, the mean of the disturbance term (residuals) must be equal to zero.

Table 7. Hausman-Test

Null Hypothesis	T-Statistic	P-Value	Result
H0 Rejected	7.34	0.000	The intercept is the same in all sections

Because there is an intercept in the main model, this principle is not violated by the current research. Also, considering that the number of observations for each independent variable and dependent variable in the research hypothesis is more than 30, the central limit theorem can be used in inferential statistics and its distribution function can be approximated using standard normal distribution functions with zero mean. Hit Also, if there is colinearity between explanatory variables of the model, the estimated coefficients of the model will have a high standard error, and as a result of this problem, the number of significant variables in the equation will decrease. To check the absence of collinearity, the variance inflation factor (VIF) criterion was used and the results are presented in Table 8.

Table 8. Research hypothesis testing using generalized least squares (GLS) method

Explanatory Variables	Collinearity statistics	
	VIF	Tolerance
Social capital of the board of directors	2.44	0.410
Investment Efficiency	2.47	0.404
Board of Directors size	1.63	0.610
Independence of the board of directors	1.58	0.630
Profit Margin	2.13	0.468
Return of investment (ROI)	3.45	0.065
Financial Leverage	2.33	0.056

Due to the fact that the obtained index for the institutionalized variables in the estimated model is less than the critical area (10), as a result, the fitted models do not have the problem of severe collinearity between the explanatory variables. On the other hand, the absence of autocorrelation of disturbance components is another condition for the adequacy of fitted regression models. Since Durbin-Watson's statistic in the model was close to 2, it can be stated that there was no serial autocorrelation between the disturbance components (residuals) in the fitted regression models. On the other hand, another assumption of linear regression is that all remaining sentences have equal variance. The heterogeneity of variance test is used to determine the OLS or EGLS regression method (a common technique and method for estimating the coefficients of linear regression equations that describes the relationship between one or more independent variables and a dependent quantity ((simple or multiple linear regression)) used to estimate the model is used. Since the results of the Breusch–Pagan test indicate that there is heterogeneity of variance among the disturbance components of the regression model, the use of the ordinary least square (OLS) regression model to test the research hypotheses is not correct, and the replacement method of GLS is used for Regression model fitting is used. Considering the explanations and points mentioned in the above section, the research hypothesis test model using the Generalized Least Squares (GLS) method in Table No.9, is fully described in the following section.

Table 9. Final model

Explanatory Variables	Standard Error	Influence Coefficient	Significance Level
Social capital of the board of directors	0.026	0.061	0.017
Board of Directors size	0.002	0.004	0.037
Independence of the board of directors	0.015	0.035	0.031
Profit Marigin	0.004	0.041	0.000
Return of investment (ROI)	0.005	0.009	0.041
Financial Leverage	0.047	-0.135	0.004
Fixed component	0.018	0.070	0.000
Fisher's F-statistic	4.71	Fisher's F-statistic probability	0.001
coefficient of determination of the model (R2)	%41.26	Adjusted R2	%40.52
Number of observations	1281	Durbin-Watson	1.86

Based on Table No.8, considering that the probability value obtained for the model (Fisher's index) is lower than the significance level or 5%, the significance of the specified model is proved. Also, the desired model has a suitable predictive power for estimating the efficiency of investment decisions in companies admitted to the Tehran Stock Exchange. The explained variance or explanatory coefficient of the model is equal to 0.4126, and it shows that, on average, 41.26% of the changes in the dependent variable are explained by the explanatory variables of the model. The independent variable in this research is the social capital of the board of directors. According to Table No.8, the beta coefficient of this variable is equal to 0.061. Considering that the corresponding significance level of this variable is equal to 0.017 and less than 5%, there is a positive and significant relationship between the social capital of the board of directors and the efficiency of investing in the Tehran Stock Exchange. Based on the obtained results, the higher the social capital of the board of directors (that is, the more overlapping the tenures of the board members), the more efficient the company's investment in the core business is. Reflection on the obtained coefficients for the control variables also shows that the greater the size and independence of the board of directors, the more efficient the company's investment decisions are, which is in line with the principles of corporate governance. Profitability variables such as profit margin and asset return rate also have a positive and significant relationship with investment efficiency, while variables related to default risk (leverage situation) reduce the investment efficiency of companies.

Conclusion

The purpose of this research is to investigate the impact of the social capital of the board of directors on investment efficiency. The information from the theoretical foundations and review of the research literature shows that the social capital of the board of directors can keep the problem of under-over investments of the company at a favorable level and minimize the misused resources of the company. Therefore, when the social capital of the board of directors is at a high level, company managers show less opportunistic behavior and do their best to cooperate and interact with the company, which leads to investment efficiency. In order to experimentally investigate this issue in the Tehran Stock Exchange, data related to 183 companies from 2016 to 2022 for 7 years (number of 1281 companies - the year of observation) were collected and analyzed by multivariate regression analysis technique using the generalized least squares method.

The results of the data analysis show that there is a positive and significant relationship between the social capital of the board of directors and the efficiency of the investment decisions. Based on the results, the higher social capital of the members of the board of directors leads the company's resource allocations towards core business. This results in convergence between the company and industry operating income, which is an index of investment efficiency. In other words, the social capital of the board of directors is considered as a set of relationships, networks, norms and values, which can help to optimize the investment decisions of companies by playing a governance role (as part of the umbrella of corporate governance). The results obtained are aligned with the findings of the research of Rahimi et al. (2014), Moharramkhani and Beshkouh (2018), Nazari Abarbekuh and Azizi (2014) and Ebrahimi et al. (2014) in Iran and also with the results of Lai et al. (2020), Mundi (2022), Gibran et al. (2022) and Xing et al. (2023) at the international level.

High social capital among the members of the board of directors can help the flow of information, strengthen participation, and improve economic decisions by reducing information asymmetry between members and the body of the organization. In general, the results of this research confirm the governing role of board members. The results of this research will help investors and lenders to make appropriate investment decisions. It is also expected that according to the results of this research, the legislators and policymakers of the capital market will pay more attention to the issue of the social capital of board members and determine guidelines for their membership

and tenure in order to maximize the social capital of the board of directors. One of the limitations of this study is the complexity of measuring social capital Because it is not easily tangible and measurable. So, we approximated it in terms of the Co-working experience indicator. The second limitation was related to the fact that the criteria for the presence of people on the board of directors was their presence at the end of the year, and all the variables related to human capital were measured based on this, and the changes of members during the financial year were not taken into account, while it is possible the new member must be present in the company and board meetings during a limited period of the year. It is suggested to the researchers and scholars in future research to develop the models for measuring the external social capital of the board of directors members and to study its effect on variables such as investment efficiency and risk appetite (risk appetite) of the companies for longer periods. It is suggested to use accrual models such as Fama & French (2005) models for investment efficiency in future research. Investigating the effect of board social capital on agency costs is also suggested for future scholars.

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