The Mediating Role of Investment Efficiency in the Relationship between Managerial Ability and Firm Value

"Empirical Evidence from the Egyptian Stock Market"

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Abstract:

This research aimed to verify the mediation effect of investment efficiency on the relationship between managerial ability and firm value of the Egyptian listed firms. This study depends on a sample of 111 firms listed on the Egyptian stock exchange distributed over 11 sectors during the period 2017 to 2021. In addition, the indirect relationship between managerial ability and firm value is investigated. In order to test the hypotheses of the study, the study relied on Tobin's Q ratio and market capitalization to measure the firm value. In measuring managerial ability, the study relied on Data Envelopment Analysis "DEA" according to Demerjian et al., (2012). In measuring investment efficiency, the study relied on the use of the model that was developed by (Biddle et al., 2009). To test hypotheses, a simple mediation model is tested using path analysis. The results indicate that (1) There is a negative and significant relationship between managerial ability and firm value: the result provide empirical support for the expectations of the agency theory that managerial ability mechanisms can have negative impacts on the behavior and incentives of the management. Therefore, the management ability is against the shareholders' interests and the organizations' effectiveness. (2) There is a positive and significant relationship between managerial ability and investment efficiency. (3)There is a positive relationship between investment efficiency and firm value. The results also reveal that there is mediating role of investment efficiency in the relationship between managerial ability and firm value.

Keywords: *Managerial Ability; Investment Efficiency; Firm Value.*

1. Introduction and study problem:

Managers make strategic decisions that are important to the operation of the firm and plan, direct, and control the firm. Affairs with the changing market environment of firms and the globalizing competition, managerial characteristics can be an important and decisive factor in determining the value and performance of the firm (Andreou et al., 2013; ko et al., 2013). Managers with excellent abilities have excellent future predictive abilities, a high understanding of business, and can accurately analyze the external economic environment. Therefore, capable managers are expected to adopt investments that maximize the net present value of a firm, which will have a positive impact on the growth, sustainability, future performance, and value of the firm (park and Byun, 2021)

Managerial ability refers to chief executive officer's (CEOs) characteristics, such as knowledge, talent, reputation, skills, personal experience which enables them to use available resources and change them into revenues (Berglund et al., 2018; Ma et al., 2019). Managers' behaviors are different in making decisions and depending on their skills, knowledge, ability and reputation that enable them to expect future events and compare between available alternative (Gan, 2019; Park et al., 2017). There are two oppose perspectives to managerial ability: from efficient contracting perspective, it is based on CEOs matter hypothesis and means that managers are able to encourage the best utilization of firm resources in challenging environments with the help of their professional knowledge, skills and experience in achieving sustainable growth (Inam Bhutta et al., 2021; Park et al., 2021). In addition, Chemmanur et al. (2009) demonstrated that competent managers reduce the extent of information

asymmetry between firm insiders and outsiders, which affects firms' financial, investment and compensation policies. Reputable managers can more credibly transfer their firm's intrinsic value to third parties through initial public offering (IPOs) (Chemmanur and Paeglis, 2005).

In contrast, from the perspective of Rent Extraction,The result of the separation of corporate ownership and management can create an agency conflicts between managers and shareholders, which is more likely to produce opportunistic behavior. Manager's more motivated to invest in projects that deviate from shareholders' interests but maximize their own benefits (Kadapakkam et al., 1998). This is matched with agency theory that refers to managerial ability support opportunistic behavior. Anggraini and Sholihin (2023) found that managerial ability could promote earnings manipulation, such that high ability managers may take advantage of opportunities to commit fraud and develop a concealment tactics.

In addition, firm value is closely related to firm ability to achieve investment efficiency (Song et al., 2022). The main determinants for a firm to make efficient investment decisions include knowledgeable and dedicated management teams and sufficient availability of capital (Chen et al.,2017).Thus, managerial ability should also play an important role in implementing investment efficiency because managers with high managerial ability would have better knowledge of their business which enables them to better anticipate future changes, make effective judgments and take appropriate actions, so that it could utilize firm resources effectively and ultimately could achieve better firm performance (Trueman, 1986).

Some of studies interested in examining the determinants of investment efficiency (Biddle et al.,2009;Abdel elhamed,2018) found that the most

important factors are financial reporting quality , raising capital and funding sources necessary to implement investment projects, characteristics and management skills in selecting investment projects that achieve the optimal level of investment and the role of control by activating corporate governance that reduce the effects negative information asymmetries and agency problems.

There are many studies that investigated the relationship between managerial ability and firm value, and the relationship between investment efficiency and firm value, but there is no study that investigated whether investment efficiency plays a mediating role in the relationship between managerial ability and firm value according to the researcher's knowledge. This study uses path analysis as an approach to investigate the mediating role of investment efficiency as mechanism explaining how managerial ability impacts on firm value.

This study depends on three paths to explain the direct and mediation affects between managerial ability, investment efficiency and firm value in the Egyptian stock markets. First path: depends on studies examined the direct relationship between managerial ability and firm value. The second path: depends on studies provided evidence about managerial ability and investment efficiency. The third path: depends on studies provided evidence about investment efficiency and firm value.

Sequel to the overview of the study problem, this study seeks to answer the following essential research question:

Is there a mediating role of investment efficiency on the relationship between managerial ability and firm value in the Egyptian stock markets?

Subsidiary questions include:

1) What is the pattern and nature of the direct effects of managerial ability on firm value in the Egyptian joint stock firms?
2) What is the pattern and nature of the direct effects of firm value on investment efficiency in the Egyptian joint stock firms?
3) What is the mechanism by which managerial ability affects firm value?
4) To what extent investment efficiency constitute a mechanism for transferring the effect of managerial ability to firm value?

The remainder of this paper is organized as follows: section 2 presents literature review and hypotheses development. Section 3 discusses research method. Section 4 reports measurement. Section 5 presents empirical findings. Section 6 presents the discussion.

2. Literature Review and Hypotheses development:

First group: Prior literature about the direct effect of managerial ability on firm value:

Demerjian et al. (2012) that study measured managerial ability based on manager fixed effects (manager's efficiency) in creating revenues. The sample of 177,512 firm-year covering the period 1980 to 2009. The results of that study were: (a) Managerial ability measure has an economically significant association with manager fixed effects. (b) Managerial ability is negatively associated with the price reactions to CEO turnover announcements. (c) Managerial ability is positively associated with the subsequent performance.

Chen et al. (2015) that study investigated whether managerial ability facilitates corporate innovative success. The sample of 42,754 firm-year observations covering the period 1993–2006. The results showed that

managerial ability is an essential component of corporate innovative success and positively associated with innovative output. In eaddition, Shareholders believe that more competent managers are more effective at converting innovative ideas into valuable new products.

Arora et al, (2017) that study investigated whether the ability of managers has any relation to abnormal gains on insider trades. The sample of 1101 insider transactions over 197 firms covering the period of 2009 to 2013. The results found that managerial ability of insiders positively impacts the abnormal return on insider trades.

Chen et al. (2018) that study examined the effect of managerial ability on the profitability of mergers and acquisitions. The results found that mergers and acquisitions by firms with high managerial ability create better returns of stock. In addition, managers with high managerial ability perform better in scenarios with high environmental uncertainty.

Wiratama et al., (2021) that study examined the role of managerial ability on the creation of firm value which is tested directly and indirectly through risk management. That study used a sample of 183 firms listed on Indonesia Stock Exchange from 2018-2020. The results of that study found that: 1)The managerial ability has a positive and significant impact on risk management. 2)The managerial ability has a positive and significant impact on firm value. 3)The implementation of risk management can fully mediate the impact of managerial ability on firm value.

Cui et al. (2019) that study investigated the impact of managerial ability on firms' stock price crash risk. The sample of 53,148 firm-years covering the period 1991–2014. The result found that there is a negative

relationship between managerial ability and firm value. High-ability managers are associated with a higher likelihood of future crashes, which negatively effect on firm value.

Wiranudirja et al. (2022) that study investigated the effect of social responsibility and managerial ability on firm value-mediated profitability. The total sample of 11 companies covering the period from 2018 to 2020. The result revealed that corporate social responsibility and managerial abilities directly have no significant effect on firm value.

These conflicting results call for further investigation in the relationship between managerial ability and firm value. This study extends the managerial ability and firm value literature.

The first hypothesis in this study is as follow:

H1: There is no significant relationship between managerial ability and firm value.

Second group: Prior literature that investigate the indirect effect of managerial ability on firm value:

a) The effect of managerial ability on investment efficiency:

Andreou et al. (2013) that study investigated the impact of managerial ability on crisis-period corporate investment. Using a sample of 2748 US firms from 2007-2009.The result showed that there is a positive relationship between managerial ability (measured by Demerjian et al. (2012)) and corporate investment (measured by capital expenditures divided by beginning of the year net assets).

Habib et al. (2017) that study investigated the effect of managerial ability on firm-level investment efficiency, and the joint effect on stock price crash risk. Using a sample of 64609 observation from 1987-2011. The result showed that there is a significantly positive effect of managerial ability on firms' propensity to overinvest. It indicated the more talented managers over-invest compared to their not-so-able counterparts.

Khurana et al. (2018) that study investigated the impact of managerial ability on the relation between corporate tax avoidance and investment efficiency. Using a sample of US firms 17742 observations from 1994–2015. The result showed that firms with high (low) managerial ability exhibit greater (low) deviations from predicted levels of investment spending and thus increased (reduced) investment efficiency.

García-Sánchez et al. (2018) that study examined the influence of managerial ability on investment efficiency. Using a sample of 2185 firms (10279 observations) from 24 country from 2006 to 2015. The results showed that there is a positive relationship between managerial ability and investment efficiency.

Gan (2019) that study examined how higher ability CEOs behave differently from lower ability CEOs in making investment decisions and, particularly, whether CEO managerial ability contributes to improve investment efficiency. Using a sample of 20323 observations from US firms from 1991-2013. The results showed that higher managerial ability leads to more efficient investment decision-making. High managerial ability helps with overcoming the two sources of investment inefficiency: over- and under-investment.

Salehi et al. (2020) that study investigated that the impact of managerial ability on product market competition and corporate investment decisions, specifically, on risk-taking and investment efficiency. Using a sample of 85 manufacturing companies listed on Tehran stock exchange market during 2011-2015. The results showed that managerial ability has no effect on the association between product market competition and investment efficiency.

Song et al. (2022) that study examined that the moderating effect of property rights on the relationship between managerial capability and investment efficiency. Using a sample 50 companies listed in Shanghai and Shenzhen stock market from 2015 to 2019. The results indicated that managerial capability positively influences investment efficiency.

These conflicting results call for further investigation in the relationship between managerial ability and investment efficiency. This study extends the managerial ability and investment efficiency literature.

The second hypothesis in this study is as follow:

H2: There is no significant relationship between managerial ability and investment efficiency.

b) **The effect of investment efficiency on firm value:**

Huang et al. (2012) that study investigated the relationship among shareholding structure, over-investment and firm value through empirical test. Using a sample of 1704 observations listed on Shenzhen Stock Exchange from 2007 to 2009. The results showed that there is a positive relationship between investment efficiency and firm value.

Chen et al. (2013) that study examined the relationship between managerial optimism, investment efficiency and firm valuation. Based on a sample of 7890 observations from the Compustat Database covering a period of 1992 to 2009. The results showed that there is positive relationship between investment efficiency and firm value.

Feng (2016) that study investigated that the relationship among the efficiency of investment, acquisition behavior and corporation value. Using a sample 77 companies listed in Shanghai and Shenzhen stock markets data between 2011- 2014. The results showed that there are positive relationship between investment efficiency and firm value.

Cao and Rees (2018) that study investigated the relationship between employee treatment and labor investment efficiency and firm value. Using a sample of 2058 US firm observations from (1995 to 2015). The results showed that investment efficiency is positively related with value creation.

Salehi et al. (2022) that study examined that the effect of investment efficiency on firm value with a moderating role of institutional ownership and board independence. Using of a sample 177 companies listed on the Tehran Stock Exchange (TSE). The results showed that investment efficiency has an impact on firm value.

The third hypothesis in this study is as follow:

H3: There is no significant relationship between investment efficiency and firm value.

Overall, managerial ability motivates investment efficiency and there is a relationship between managerial ability and investment efficiency highlighted by positive. Also, there is a relationship between investment efficiency and

firm value, so this research studies investment efficiency as mediator variable in the relationship between managerial ability and firm value.

The fourth hypothesis in this study is as follow:

H4: Investment efficiency does not have a mediating role on the relationship between managerial ability and firm value.

3. Method:

1. Sampling Selection:

For the purpose of the study, a sample of 111 firms that are listed in the Egyptian stock exchange was selected over the period 2017 to 2021, with 555 firm-year observations, is selected from the population. The sample is distributed over eleven sectors including Telecom, Food and Beverage, Healthcare and Pharmaceuticals, Real Estate, Basic Resource, Service and transportation, Industrial Goods, Construction materials and paper and packing materials. All firms drawn from the population must be registered on the Egyptian stock exchange for the period 2017-2021.

Table1: The percentage of sample size to the population:

		Years and number of companies				
No	**Sector**	**2017**	**2018**	**2019**	**2020**	**2021**
1	Telecom	3	3	3	3	3
2	Food and Beverage	20	20	20	20	20
3	Healthcare and Pharmaceuticals	13	13	13	13	13
4	Real Estate	21	21	21	21	21
5	Basic Resource	14	14	14	14	14
6	Transportation and freight services	4	4	4	4	4
7	Tourism and entertainment sector	10	10	10	10	10
8	Engineering contracting and construction sector	7	7	7	7	7
9	Textiles and durable goods	7	7	7	7	7
10	Construction materials	9	9	9	9	9
11	Paper, packaging and wrapping	3	3	3	3	3
Total number of sample companies		111	111	111	111	111
Number of companies listed on the Egyptian Stock Exchange		222	220	218	215	218

Number of companies related to banks and financial institutions sector	47	49	51	45	49
Number of registered non-financial companies	175	171	167	170	169
Percentage of the total sample to the total number of registered non-financial companies	63%	65%	66%	65%	66%

2. Models (path analysis purpose):

Path analysis model is used to study the mediation effect of investment efficiency on the relationship between managerial ability and firm value. The main difference between path analysis and the regression analysis is that in path analysis. The researcher can find the relationships between the variables -regardless of whether these variables are independent or dependent- (direct relationship between independent and dependent variable and the indirect relationship between independent and dependent variable through mediator variable). While the regression models enable the researcher to investigate only the effect of independent variables on dependent variables. It does not enable the researcher to examine the effect of dependent variables on each other.

The main results that are obtained from conducting the path analysis are that the path coefficients that link each pair of variables of the current study. The direct path includes one path parameter. The indirect path (mediation) includes two path parameters, one of which links the source variable (managerial ability) to the mediating variable (investment efficiency), while the other parameter links the mediating variable with the outcome variable (firm value). The indirect path coefficient (mediation) between the managerial ability and firm value variables represents the output of the path coefficient between managerial ability and investment efficiency variables and the path coefficient between investment efficiency and firm value (quoting from Abou-salem,2017).

Modeling Specification:

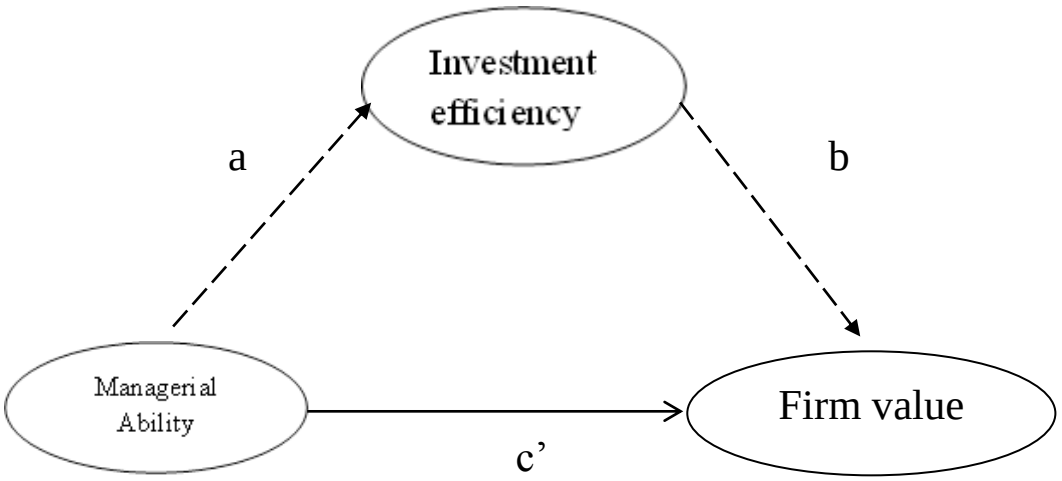
Table 1: Structural Equations to Test the Hypotheses of the Study

Study models	Structural Equations
Model(1)	INV EFF $(_{it})$ = β_0+ a MA $(_{it})$ + β_1 Size $(_{it})$ + β_2 Growth $(_{it})$ + β_3LEV $(_{it})$ +β_4ROA+ε $(_{it})$…… (1)
Model (2)	FV $(_{it})$ = β_0+ c` MA $(_{it})$ + β_1 Size $(_{it})$ + β_2 Growth $(_{it})$ + β_3LEV $(_{it})$ +β_4ROA+ε $(_{it})$…… (2)
Model (3)	FV $(_{it})$ = β_0+ b INVEFF $(_{it})$ + β_1 Size $(_{it})$ + β_2 Growth $(_{it})$ +β_3LEV $(_{it})$ +β_4ROA+ε $(_{it})$…… (3)
Model (4)	FV $(_{it})$ = β_0+ c` MA $(_{it})$ + (a*b) INVEFF $(_{it})$ +β_1 Size $(_{it})$ + β_2 Growth $(_{it})$ + β_3LEV $(_{it})$ +β_4ROA+ε $(_{it})$…… (4)

3. Path design

I will rely on path analysis method to test of the hypotheses of the study by constructing direct and indirect paths between the study variables.

The figure (1): Illustrate the general framework of the direct and indirect effect of managerial ability and firm value.



- **The direct relationship between managerial ability and firm value** ⟶
- **The indirect relationship between managerial ability (through investment efficiency) and firm value** - - - - ⟶

4. Variable identification, definition and measurement:

The current study attempts to test the following:

H1: There is no significant relationship between managerial ability and firm value.

H2: There is no significant relationship between managerial ability and investment efficiency.

H3: There is no significant relationship between investment efficiency and firm value.

H4: Investment efficiency does not have a mediating role in the relationship between managerial ability and firm value.

From the above hypotheses, managerial ability, investment efficiency and firm value are measured as following:

4/1.Measurement of dependent variable (firm value):

Firm value (FV) is measured by Tobin's Q. Tobin's Q value can be used as a measure of the firm value in terms of the potential market value of a firm.

Tobin's Q= (market value of equity + book value of debts)/ the book value of total assets.

Market capitalization: the natural logarithm of market value for firm (i) in the year (t).

4/2.Measurement of independent variable (managerial ability):

Managerial ability is the manager's expertise in taking and implementing decisions that can lead the company to a high level of efficiency (Demerjian et al.,2012). Efficiency is the use of minimal resources (input) to achieve maximum results (output). Demerjian et al. (2012) proposed data envelopment analysis (DEA) for measuring

managerial ability. The first stage, estimates total firm efficiency score, referred to as the ratio of outputs over inputs by solving the DEA optimization model as follow:

$$Max\theta = Sales / [CoGS + SG\&A + PPE\ ]$$

Where:

Max θ: is the efficiency score for which the values range from 0 to 1. Sales are the output variable, and the three input indicators are: (1) cost of goods sold (*COGS*), (2) selling, general, and administrative costs (*SGA*), (3) net property, plant, and equipment (*PPE*). In the second stage, a Tobit regression analysis is employed to separate management efficiency from firm efficiency, since firm efficiency score reflects both firm specific factors and managerial ability.

They estimated the Tobit regression model is as follows:

Firm efficiency(it) = β0 + β1 Ln(Total assets) (it) + β2 market share (it) + β3 Free Cash Flow (it) + β4 Ln(Firm Age) (it) + β5 Foreign Currency Indicator (it)+ β6industry Indicator (it) +ε (it)

Ln (Total Assets): the natural logarithm of total assets for firm (i) in the year (t).

Market share: the ratio of firm's sales to total industry sales.

Free Cash Flow: is the dummy variable equal one if the firm (i) in the year (t) has reported positive free cash flows, zero otherwise.

Ln (Age): the natural logarithm of firm age for the firm (i) in the year (t).

Foreign currency: is a dummy variable equal one if the firm (i) in the year (t) has reported positive value for foreign currency adjustment, zero otherwise.

Industry: express sector which the firm belong to (t).

Residual: is residual from equation which reflects managerial ability score.

4/3. Measurement of mediator variable (investment efficiency):

Investment efficiency is the mediator variable in this study. Investment efficiency was measured based on the research model proposed by Biddle et al.,(2009). The measure of investment efficiency (IE) used in this study is based on expected level of investment by specifying the following model which measure predicted level of investment based on sales growth opportunities. Underinvestment and overinvestment show investment inefficiency. Underinvestment represents passing up investment opportunities with a positive net present value, while overinvestment represents investing in projects with negative value (Houcine, 2013).Furthermore, an estimation of a regression and residual values was carried out. The regression model is as follows:

Investment = β0 + β1 NEG (it-1) + β2 Sales Growth (it-1) + β3 NEG*Sales Growth (it-1) +ε (it)

Investment: total investments at the end of year and represents the ratio net cash flow from investment activities from cash flow of statement divided by total assets

NEG: is a dummy variable takes the value of one for negative sales growth and zero for the opposite.

Sales growth is calculated the following equation:

(Net sales for the current period –Net sales for the previous period)/ Net sales for the previous period

Sales Growth: the percentage of changes in the sales at the end of period (t-1).

Residual: is residual from equation which reflects investment efficiency score.

5. Empirical findings and Discussion:

(1) Descriptive analysis

This is an initial stage of data processing that involves summarizing the numerous variables used into simple measures that are easy to read and compare. The descriptive analysis includes statistical description and the correlation matrix.

Statistical description of data:

This section will utilize appropriate descriptive statistics, such as the arithmetic mean, median, standard deviation, minimum, and maximum, to understand the nature and characteristics of the variables in the structural study model. Additionally, the Jarque-Bera test will be used to examine the normal distribution of variables, as shown in Table (1).

Table (1): Descriptive summary statistics

	Obs.	*Mean*	*Median*	*Std. Dev.*	*Min*	*Max*	*Normality test*
Dependent Variable:							
Tobin's Q (TQ)	540	1.3258	1.0511	1.175	0.1394	11.589	[13673.7]***
Market Capilization (MC)	540	8.6519	8.6366	0.760	5.9679	10.596	[3.58446]
Mediator Variable:							
Investment Efficiency (IE)	540	0.0539	0.0302	0.089	8.59e-5	0.7822	[17352.7]***
a. Under Investment	247	-0.0589	-0.0315	0.099	-0.7599	-8.59e-5	[5056.36]***
b. Over Investment	293	0.0498	0.0289	0.081	0.0001	0.7822	[14909.5]***
Independent Variable:							
Managerial Ability (MA)	540	0.0359	0.0282	0.032	6.55e-5	0.1939	[459.756]***
a. Less Ability	307	-0.0316	-0.0261	0.026	-0.1786	-8.06e-5	[85.2391]***
b. More Ability	233	0.0416	0.0323	0.038	6.55e-5	0.1969	[441.501]***
Control Variables:							
Firm size (FS)	540	20.739	20.526	1.645	17.313	25.475	[22.8089]***
financial leverage (LEV)	540	0.5672	0.4778	0.749	0.0091	9.3932	[119308]***
Growth Opportunity (GO)	540	1.8803	0.0827	12.91	-0.9957	134.52	[106207]***
Return on assets (ROA)	540	0.0344	0.0385	0.158	-1.4407	0.5280	[22850.3]***

***Note*:** *** indicates significance at 1%.

The previous brief statistical summary of all included variables reveals the following:

For general features (normal distribution of data):

- It is shown that the minimum and maximum limits for all study variables for the sample of firms fall within a wide range, leading to a large standard deviation. This discrepancy may be attributed to differences in experiences or circumstances facing each firm, as well as other structural and organizational variables. The normal distribution test confirms this discrepancy, as it was statistically significant for all variables. Consequently, the null hypothesis is rejected, and the alternative hypothesis is accepted, indicating that these variables do not follow a normal distribution. This means that their actual values fall within a wide range and do not revolve around their average, except for the value ratio variable market to book value, which follows a normal distribution.

- Due to the large standard deviation and the non-normal distribution of the study variables, the arithmetic mean statistic is rendered invalid in this context. Therefore, reliance on the median statistic is necessary, as it is not affected by outliers.

For the dependent variables (Firm value):

- The median Tobin's Q scale was 1.051, indicating that the average market values of the assets for the sample firms are approximately equal to the average book values, with almost no profitable investments. The range of this variable was between 0.139 and 11.59, showing that the performance of the sample companies varied between those that had achieved profitable investments in some years and those that had not.

- The market value to book value ratio ranged between 5.968 and 10.59 across the sample firms, with a small standard deviation of 0.76. The overall average was 8.652, indicating the success of all sample firms in generating value for their owners.

Regarding the mediator variable (Investment efficiency):

- Underinvestment was observed in 247 cases, constituting about 45.7% of the total sample. The underinvestment for the sample firms ranged between (-0.760 and -8.6e-5), with an average of (-0.0315). Conversely, excessive investment was observed in 293 cases, representing around 54.3% of the sample. The excess investment ranged between (0.0001 and 0.782), with an average of (0.0289).

- The absolute value of the investment efficiency median for the total sample firms was (0.0302). Additionally, the number of observations indicates that the percentage of investment exceeding the necessary level slightly surpasses the percentage of insufficient investment. This indicates a prevalence of positive or optimistic tendencies among firms, leading to an increased inclination for economic expansions considering the country's current economic outlook.

Regarding the independent variable (Managerial ability):

- In contrast to investment efficiency, deficient managerial ability was observed in 307 cases, accounting for approximately 56.9% of the total sample. The deficient managerial capacity for the sample firms ranged between (-0.179 and -8.1e-5), with a median of (-0.026). On the other hand, excess managerial capacity was observed in 233 cases,

representing about 43.1% of the sample. The excess managerial capacity ranged between (6.6e-5 and 0.197), with an average of (0.032).

- Consequently, the absolute value of the managerial ability median for the total sample firms was (0.028). Furthermore, based on the number of observations, the percentage of lacking managerial capacity slightly exceeds the percentage of excess managerial capacity. This accounts for the overall decrease in the level of managerial capabilities among the managers of the firms in the study sample.

Regarding the control variables:

- The study sample includes firms of various sizes, ranging from small to very large, with the natural logarithm of the firm's total assets during the study period ranging between 25.48 and 17.31, and an overall average of 20.53. The average financial leverage ratio for these firms is 0.478, indicating that the firms' total liabilities are equivalent to 47.8% of the total assets on average, reflecting a high level of owner's equity at 52.2%.
- The growth opportunities for the sample firms varied, with negative growth opportunities reaching a maximum of -99.6% and positive growth opportunities reaching a maximum of 13,452%. The average annual growth opportunities across the sample firms reached 8.3%.
- Lastly, the sample firms achieved an average return on assets of 0.0385, indicating that every 100 pounds of firm assets generated an average return of 3.85 pounds during the study period.

(2) Correlation matrix:

In the next table (2), the zero-order correlation analysis between the variables of the study model is presented. This analysis is based on

bivariate correlations, which help us to initially verify the hypothesized relationships and identify the possibility of multicollinearity in the study model. The correlation coefficient ranges from zero to one (0 - 1)[1], with the value indicating the strength of the correlation and the sign indicating the direction, whether direct or inverse. According to statistical standards, correlations below 50% are considered weak, while those between 50% and 70% are moderately strong. Any correlation above 70% is considered strong. Some statistical standards consider weak correlations to be less than 25%, particularly in large sample.

Table (2): Correlation matrix between study variables

		(1)	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*
Tobin's Q	**(1)**	1							
*Mar**ket** **Capili**zation*	**(2)**	**0.2406** [5.672]***	1						
Investment Efficiency	**(3)**	**0.1143** [2.669]***	**0.0827** [1.927]*	1					
Managerial Ability	**(4)**	**-0.0097** [-0.226]	**-0.0311** [-0.721]	**0.0074** [0.171]	1				
Firm size	**(5)**	**-0.0872** [-2.031]**	**0.7612** [27.23]***	**0.0066** [0.152]	**0.0236** [0.547]	1			
financial leverage	**(6)**	**0.5702** [16.09]***	**0.0046** [0.107]	**0.0729** [1.696]*	**0.0305** [0.708]	**0.1009** [2.352]**	1		
Growth Opportunity	**(7)**	**-0.0065** [-0.151]	**0.0076** [0.177]	**0.1408** [3.299]***	**0.1773** [4.179]***	**0.1672** [3.933]***	**0.0641** [1.489]	1	
Return on assets	**(8)**	**-0.4431** [-11.46]***	**0.1876** [4.431]***	**0.0129** [0.299]	**-0.0317** [-0.736]	**0.1168** [2.728]***	**-0.7753** [-28.47]***	**-0.0432** [-1.002]***	1

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

([1]) To make it easier for the reader, the correlation coefficient is converted to a scale of (0% - 100%), by multiplying the correlation coefficient by 100. This means that the correlation coefficient (0.30), for example, becomes (30%). Which simplifies the meaning of numbers.

The results of the correlation debate can be summarized as follows:

- **Regarding to the correlation between the two firm value variables,** reveals that an average direct correlation of (24.1%) between the "Tobin's Q" measure and the "ratio of market value to book value" measure, which is statistically significant at the 1% level. This suggests that an increase in the firm's value according to the Tobin's Q measure will be associated with or followed by an increase in value based on the ratio of market value to book value. The positive correlation between these two variables supports the consistency of the regression results.
- **Regarding to the correlation of investment efficiency with the two firm value variables,** indicates that the absolute value variable of investment efficiency is directly related to the firm value variables, reaching (11.4%) with the Tobin's Q measure, which is statistically significant at the 1% level, and (8.3%) with the measure of the ratio of market value to book value, which is statistically significant at the 10% level. This implies that increasing the level of corporate investment efficiency will to some extent lead to an increase in the firm's value, whether on the Tobin's Q scale or the ratio of market value to book value.
- **Regarding to the correlation of managerial ability with firm value,** indicates that statistically insignificant inverse correlation. This correlation amounts to (-0.97%) with the Tobin's Q measure and (-3.1%) with the ratio of market value to book value. This weak correlation may stem from an accounting problem, such as the low effectiveness of managers' managerial abilities and their inability to enhance firm value, or it may result from a statistical issue due to non-linear relationships between managerial ability and firm value.

- **In terms of the relationship between managerial ability and investment efficiency,** shows that statistically insignificant direct correlation amounting to (0.74%). This emphasizes the opportunistic behavior of managers.
- **In terms of the correlation of the control variables with the two firm value variables,** indicates that the control variables most closely associated with the Tobin's Q scale were financial leverage with a positive correlation coefficient of (57%), followed by the rate of return on assets with a negative correlation coefficient of (-44.3%), both of which are statistically significant at the 1% level. The size of the firm has a negative correlation coefficient (-8.7%), which is significant at the 5% level, and finally the growth opportunities (-0.7%), which is a very weak correlation and not statistically significant. On the other hand, the control variables most closely related to the "ratio of market value to book value" measure was the size of the firm with a positive correlation coefficient of (76.1%), followed by the rate of return on assets (18.8%), both of which are statistically significant at the 1% level. Then growth opportunities (0.8%), and finally financial leverage (0.5%), both of which are very weak and not statistically significant.
- **When analyzing the correlation of control variables with investment efficiency and managerial capacity,** indicates that growth opportunities have the strongest positive correlation (14.1%) with investment efficiency, followed by leverage (7.3%). The rate of return on assets (1.3%) and firm size (0.7%) showed weaker and statistically insignificant correlations. Similarly, growth opportunities exhibited the highest positive correlation (17.7%) with administrative ability, followed by the rate of return on assets

(-3.2%), financial leverage (3.1%), and company size (2.4%), all of which were weak and not statistically significant.

In general, it can be observed that the correlation coefficients between the independent, mediating, and control variables varied from weak to moderately strong. According to Anderson (1990), correlation coefficients exceeding 0.7 may suggest potential collinearity issues within the model. Consequently, no evidence of multicollinearity problem was detected among the variables in the structural study model. Regarding the initial expectations derived from the correlation coefficients and the strength of the correlation relationships, it is anticipated that investment efficiency will have a positive impact on the firm's value and may also act as an intermediary between managerial ability and the firm's value. Conversely, the direct effect of managerial ability on the firm's value cannot be anticipated due to the very weak correlation between them, and as such, the effect will depend on the estimation method and the treatment of various statistical issues.

Table (3): Goodness of fit measurements and the appropriate range for each

Fit statistic	*Measure*	*Threshold*
Likelihood ratio:		
model vs. saturated	chi2_ms (_)	---
	P > chi2	> 0.05 (not statistically significant)
baseline va. saturated	chi2_ms (_)	---
	P > chi2	> 0.05 (not statistically significant)
Population error:		
Root mean squared error of approximation	RMSEA	< 0.05 good; 0.05 - 0.1 moderate; > 0.1 bad
90% CI,	lower bound	< 0.05 good; 0.05 - 0.1 moderate; > 0.1 bad
	upper bound	< 0.05 good; 0.05 - 0.1 moderate; > 0.1 bad
Probability RMSEA <= 0.05	pclose	> 0.05 (not statistically significant)
Information criteria:		
Akaikes information	AIC	Smaller values indicate a better fit

Fit statistic	*Measure*	*Threshold*
criterion		
Bryesian information criterion	BIC	Smaller values indicate a better fit
Baseline comparison:		
Comparative fit index	CFI	= 1 perfect fit; > 0.95 great; > 0.90 traditional; > 0.80 sometimes permissible
Tuker-Lewis index	TLI	= 1 perfect fit; > 0.95 great; > 0.90 traditional; > 0.80 sometimes permissible
Size of residuals:		
.8 Standardized root mean squared residual	SRMR	= 0 perfect fit; < 0.09 good fit
Coefficient of determination	CD	= 1 perfect fit; A value close to 1 indicates a good fit

Source: Prepared by the researcher depending on (Bentler, 1990), (Brown & cudeck, 1993), (Raftery, 1993), (Gaskin, 2016), (Kline, 2016) & STATA software help.

(3) Result Approval

After confirming the quality of the structural model and its suitability to the collected data, indicates that proceed with the analysis to obtain the path coefficients as displayed in the following table (5)

Table (5): Managerial ability, Investment Efficiency and Firm value: SEM result

Endogenous variables: Investment Efficiency, Tobin's Q, Market Capilization.

Exogenous variables: Managerial Ability, Firm size, financial leverage, Growth Opportunity, Return on assets.

Method: Maximum likelihood with missing values (mlmv) with Observed information matrix (OIM).

Importance weights: Firm size.

Paths	*Unstandardized Coefficients*	*Standardized Coefficients*	*OIM Std. Err.*	*Z*	*P>|z|*
● **Investment Efficiency equation**:					
Managerial Ability → Investment Efficiency	**0.04205**	**0.02168**	**0.0183**	**2.30**	**0.022****
Firm size → Investment Efficiency	-0.00585	-0.16059	0.0004	-16.59	0.000***
financial leverage → Investment Efficiency	0.02467	0.29838	0.0012	20.11	0.000***
Growth Opportunity → Investment Efficiency	0.00107	0.23211	0.00004	25.22	0.000***
Return on assets → Investment Efficiency	0.07456	0.19089	0.0058	12.75	0.000***
Constant	0.14842	2.40137	0.0071	20.86	0.000***
● **Tobin's Q equation**					
Investment Efficiency→Tobin's Q	**0.83756**	**0.04369**	**0.1523**	**5.50**	**0.000*** **
Managerial Ability → Tobin's Q	**-0.88176**	**-0.02371**	**0.2981**	**2.96**	**0.003*** **
Firm size → Tobin's Q	-0.12272	-0.17564	0.0057	-21.36	0.000***
financial leverage → Tobin's Q	0.99496	0.62770	0.0202	49.31	0.000***
Growth Opportunity → Tobin's Q	-0.00223	-0.02526	0.0007	-3.15	0.002***
Return on assets → Tobin's Q	0.50301	0.06718	0.0947	5.31	0.000***
Constant	3.30706	2.79129	0.1169	28.29	0.000***
● **Market Capilization equation**:					
Investment Efficiency → Market Capilization	**0.91899**	**0.07438**	**0.0779**	**11.79**	**0.000*** **
Managerial Ability→ Market Capilization	**-0.84947**	**-0.03545**	**0.1515**	**-5.61**	**0.000*** **
Firm size → Market Capilization	0.34605	0.76845	0.0029	117.77	0.000***
financial leverage → Market Capilization	-0.01097	0.01074	0.0103	-1.06	0.288
Growth Opportunity → Market Capilization	-0.00782	-0.13761	0.0004	-21.65	0.000***
Return on assets → Market Capilization	0.40888	0.08472	0.0485	8.44	0.000***
Constant	1.48173	1.94042	0.0598	24.78	0.000***
Log likelihood = -51830.965		*Number of Obs. = 555*			

Notes: - ***, ** and * are significant at the 1%, 5% and 10% levels respectively.

The table above summarizes the results of the path analysis of the structural model, indicating the following:

Firstly, concerning the results of the investment efficiency equation:

- **In terms of managerial ability,** the path (*Managerial Ability* → *Investment Efficiency*) indicates a direct positive impact of managerial ability on investment efficiency with a statistically significant level of 5%. Based on the unstandardized regression coefficient, a one-degree increase in managerial capacity results in an average increase in investment efficiency by 4.2%. This finding contradicts the verification of the second main hypothesis (2), which claims that there is no relationship between managerial ability and investment efficiency in Egyptian listed companies.

- **Regarding the control variables,** the remaining parts of the equation indicate a positive impact of financial leverage, growth opportunities, and the rate of return on assets on investment efficiency at the 1% level. Conversely, we observe a negative impact of firm size on investment efficiency at the 1% level as well. The non-standard regression coefficient elucidates the magnitude of the effect. For instance, a one-pound increase in the rate of return on assets results in an average increase of (0.0746) degrees in firms' investment efficiency. Conversely, a one-degree increase in company size leads to an average decrease of (0.0059) degrees in the level of investment efficiency.

- **Using Standardized path coefficients,** which standardize units of measurement and reflect the relative importance of the variables, as well as the size of the effect, determined that financial leverage is the most important variable for investment efficiency in Egyptian firms, with an

impact factor of 0.298. This is followed by growth opportunities with a factor of 0.232, the rate of return on assets at 0.191, firm size at -0.161, and administrative ability with an impact factor of 0.022. This highlights the relatively modest importance of managerial ability in increasing the investment efficiency of firms compared to the other control variables.

Secondly, concerning the outcomes of the firm value equation (Tobin's Q):

- **In terms of investment efficiency,** the relationship between Investment Efficiency and Tobin's Q demonstrates a significant direct positive effect at the 1% significance level. As per the unstandardized regression coefficient, a one-unit increase in investment efficiency corresponds to an average 83.8% increase in the value of firms, as measured by Tobin's Q. This finding contradicts sub-hypothesis $H_{(3-1)}$, which posits that there is no relationship between investment efficiency and Tobin's Q.
- **In terms of managerial ability,** the path (*Managerial Ability → Tobin's Q*) indicates a direct negative impact of managerial ability on the Tobin's Q scale at the 1% level. Based on the non-standard regression coefficient, a one-degree increase in administrative capacity results in an average decrease of (-0.8818) degrees on the Tobin's Q scale, equivalent to an 88.2% decrease. This reflects the opportunistic behavior of managers. Therefore, this finding does not support the validation of sub-hypothesis $H_{(1-1)}$, which asserts: "There is no relationship between managerial ability and the Tobin's Q scale in companies".
- **In terms of the control variables,** the remaining paths of the equation reveal a positive impact of financial leverage and the rate of return on assets on the Tobin's Q scale at the 1% level. Conversely, there is a negative impact for firm size and growth opportunities on the Tobin's Q

scale at the 1% level as well. Based on the unstandardized regression coefficients, a 1% increase in leverage, or a one-pound increase in return on assets, is associated with an average increase in the Tobin's Q measure by 0.995 and 0.503 units, respectively. Meanwhile, a one-unit increase in firm size or growth opportunities results in a decrease in the Tobin's Q scale by 0.123 and 0.002 units, respectively.

- **Using Standardized path coefficients,** which standardize units of measurement, and thus their coefficients reflect the relative importance of the variables, in addition to the size of the effect. We find that the most important variable for the Tobin's Q measure for Egyptian firms was financial leverage with an impact factor (0.628), followed by firm size with a factor (-0.176), then the rate of return on assets (0.067), investment efficiency (0.044), and growth opportunities.

Third: In relation to the firm's market capitalization results:

The results were consistent with the Tobin's Q equation, confirming the influence of investment efficiency, managerial ability, and control variables on the firm's value. The only difference is that the impact of financial leverage disappears, and the effect of firm size becomes positive. These results can be explained as follows:

- **In terms of investment efficiency,** the relationship (*Investment Efficiency → Market Capilization*) indicates a direct positive impact of investment efficiency on the market value to book value ratio at a 1% significance level. Based on the non-standard regression coefficient, a one-unit increase in investment efficiency results in an average increase of 0.9189 units in the market value to book value ratio, which translates to a 92% increase in investment efficiency. Consequently, this finding

does not support the validation of sub-hypothesis $H_{(3-2)}$, which posits: "There is no relationship between investment efficiency and the market value to book value ratio of Egyptian firms".

- The managerial ability (*Managerial Ability → Tobin's Q*) has a direct negative effect on the market value to book value ratio at the 1% level. The non-standard regression coefficient indicates that increasing managerial capacity by one degree leads to, on average, a decrease in the ratio of market value to book value by (-0.8495) degrees, equivalent to an 85% decrease. This result is consistent with the agency theory, suggesting that managers with higher managerial ability may behave opportunistically by extracting rents from their firms and concealing bad news for an extended period, contradicting the verification of sub-hypothesis $H_{(1-2)}$, which states: "There is no relationship between managerial ability and the measure of the ratio of market value to book value in Egyptian firms".

- **In terms of control variables,** the analysis indicates a positive impact of company size and return on assets on the market value to book value ratio at the 1% significance level. Conversely, the growth opportunities variable demonstrates a negative impact on the market value to book value ratio at the 1% level, while financial leverage shows no significant effect. Non-standard regression coefficients suggest that increasing firm size or return on assets by one-unit results in an average increase of 0.346 and 0.409 units, respectively, in the market value to book value ratio. Conversely, a one-unit increase in growth opportunities leads to an average decrease of 0.008 units in the ratio.

- **When using Standardized path coefficients,** the most influential variables related to the market value to book value ratio of Egyptian firms are company size (0.768), followed by growth opportunities (-0.138), return on assets (0.085), investment efficiency (0.074), and managerial ability (0.074), with an impact of -0.035.

Table (6) summarizes the study's hypothesis results.

Hypothesis	Hypothesis text	Result
$H_{(1)}$	**There is no effect of managerial ability on the firm value**	**Not supported**
$H_{(1-1)}$	There is no effect of managerial ability on the Tobin's Q scale	Not supported
$H_{(1-2)}$	There is no effect of managerial ability on the Market Capilization scale	Not supported
$H_{(2)}$	**There is no effect of managerial ability on investment efficiency**	**Not supported**
$H_{(3)}$	**There is no effect of investment efficiency on the firm value**	**Not supported**
$H_{(3-1)}$	There is no effect of investment efficiency on the Tobin's Q scale	Not supported
$H_{(3-2)}$	There is no effect of investment efficiency on the Market Capilization scale	Not supported
$H_{(4)}$	**Investment efficiency does not play any mediating role between managerial ability and firm value.**	**Not supported**
$H_{(4-1)}$	Investment efficiency does not play any mediating role between managerial ability and Tobin's Q scale.	Not supported
$H_{(4-2)}$	Investment efficiency does not play any mediating role between managerial ability and Market Capilization scale.	Not supported

6. Conclusion:

Due to the existence of empirical evidence about the relationships between managerial ability, investment efficiency and firm value, this is a motivation for studying and testing the relationship between managerial ability and firm value on one hand, and studying and testing the effect of investment efficiency on that relationship on the other hand. In order to test the study hypotheses, the researcher relied on a sample of 111 Egyptian joint stock firms

listed on the stock exchange (555 observations) and belonging to 11 non-financial economic sectors over the period from 2017 to 2021.

Using path analysis model, the results show that there is a negative relationship between managerial ability and firm value. Also reveal that there is a positive and significant relationship between managerial ability and investment efficiency and a positive relationship between investment efficiency and firm value. The results assure that there is mediation effect of investment efficiency on the relationship between managerial ability and firm value.

The results of the study provide empirical support for the expectations of the agency theory that managerial ability mechanisms can have negative impacts on the behavior and incentives of the management. Therefore, the management ability is against the shareholders' interests and the organizations' effectiveness.

7. Future Research

1. The current study investigated the mediation effect of investment efficiency on the relationship between managerial ability and firm value; however, a multitude of research areas still exists. Further research is needed to investigate whether earnings management has an impact on this relationship.
2. Using another measurement for investment efficiency (e.g. Return on equity (ROE) or model of (Richardson's, 2006) is needed.
3. Another area for research is to study and test another mechanism of the managerial ability such as role of capital structure on the relationship between managerial ability and firm value.

4. The moderating effect of compensation incentives on the relationship between managerial ability and firm performance in the Egyptian listed corporations.
5. Studying and testing the relationship between managerial ability and tax avoidance in the Egyptian listed corporations is also needed.

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الأثر الوسيط لكفاءة الاستثمار على العلاقة بين القدرة الإدارية و قيمة الشركة

"دراسة اختبارية على الشركات المساهمة المصرية"

ملخص

تهدف هذه الدراسة الى اختبار العلاقة بين القدرة الإدارية و قيمة الشركة بالتطبيق على الشركات المساهمة المصرية ، وما اذا كانت العلاقة بين القدرة الإدارية وقيمة الشركة تتأثربكفاءة الاستثمار. ومن اجل اختبار فرضيات الدراسة، قد اعتمدت الدراسة على نسبة توبين كيو،والقيمة السوقية لحقوق الملكية لقياس قيمة الشركة. كما اعتمدت الدراسة فى قياس كفاءة الاستثمار على استخدام نموذج (Biddle et al.,2009). كما اعتمدت الدراسة فى قياس القدرة الإدارية على مقياس تم تطويره بواسطة (Demerjian et al., 2012). تختبر الدراسة الفرضيات لعينة مكونة من 111 شركة مساهمة مقيدة بالبورصة المصرية خلال الأعوام من عام 2017 حتى عام 2021. وباستخدام طريقة (Path Analysis) لتحليل المسار، توصلت الدراسة الى:(1) وجود علاقة سالبة ودالة بين القدرة الإدارية وقيمة الشركة.(2) وجودعلاقة موجبة و دالة بين القدرة الإدارية وكفاءة الاستثمار.(3) وجود علاقة موجبة و دالة بين كفاءة الاستثمار و قيمة الشركة.وتتمثل نتيجة الدراسة الهامة فى وجود تاثير وسيط ذى دلالة لكفاءة الاستثمار على العلاقة بين القدرة الإدارية و قيمة الشركة.

المصطلحات الأساسية: *قيمة الشركة Firm Value، القيمة السوقية Market Capitalization، القدرة الإدارية Managerial Ability ، كفاءة الاستثمار Investment Efficiency.*