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Sensitivity of firm size measures to practices of corporate finance: evidence from BRICS

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Abstract

Firm size has remained a major area of investigation for researchers from a long time. This study aims at examining impact of different measures of firm size (total assets, total sales, market capitalization and number of employees) on seven important practices of corporate finance which are financial policy, dividend policy, investment policy, diversification, firm performance, compensation and incentives and board structure (corporate governance). Moreover, this study also examines the sensitivity of different proxies of firm size on these practices of corporate finance. Data from BRICS (Brazil, Russia, India, China and South Africa) have been analysed. Overall results supported the hypotheses. Study concludes that different proxies of firm size are differently related to practices of corporate finance based on sign, significance and R^2. All proxies capture different aspects of firm size and have different implications for corporate finance. Thus, this study confirms "measurement effect" in "size effect". Unfortunately, this means that many of past studies may not be robust and are biased. Researchers thus need to be careful when selecting any proxy of firm size for their research keeping in mind the scope and context of their work. Choosing a proxy thus is a theoretical and empirical question.

Keywords: Firm size, Size effect, Practices of corporate finance, Sensitivity, BRICS

Introduction

Firm size has remained a major area of investigation in corporate finance. Coase [1] is credited for the seminal work in this area. He raised questions on what determines firm boundaries and how these boundaries affect allocation of resources. What determines firm size has remained a major question under investigation by the researchers. Different theories of firm explain the reasons behind the existence of a firm [2]. You [3] surveyed diverse literature on the theories of firm size (determinants and distribution) and classified the literature into four streams including technological approach or the conventional microeconomics approach, institutional approach commonly known as transactional economics approach, industrial organizational (IO economics) approach and dynamic modelling approach.

Researchers have examined the impact of organizational/firm size on different kinds of outcomes in different fields of organizational management including but not limited to executive compensation [4–6], innovation [7–11], organizational change [12], functional complexity [13], hiring practices and job search behaviour [14], unemployment [15], managerial succession [16], buying influences [17], job shift patterns [18], individual's ethical predispositions [19] and corporate social responsibility [20, 21]. Researchers in finance have also tried to examine the relationship between firm size and different variables. Firm size has been studied in relation to capital structure [22, 23], financial policy [24], dividend policy [24–27], leverage [28] and merger and acquisition [29].

Although these empirical studies in corporate finance agree that firm size matters, no study till date has comprehensively examined effect of different measures or proxies of firm size on important practices of corporate finance. Only such study known to the researcher is of Dang et al. [30] who investigated the impact of firm size on eight practices of empirical corporate finance which

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were financial performance, financial policy, corporate governance, dividend policy, compensation policy, investment policy, diversification and lastly mergers, acquisition and corporate control. They used data from Latin America and called for future research on the issue. Recently, Hashmi et al. [31] have also conducted research on the same issue using data from Sharı 'ah compliant firms. Obviously, for a discipline to be regarded as scientific there shall be sufficient evidence for a construct to become a well-established theory. Further, researchers argued that no study in finance using firm size as a variable has provided any justification for the use of any proxy/measure employed in that research. This means that until now researchers have decided by their own will about selection of firm size measure without providing any logic.

This point carries serious repercussions. It must be noted that all measures of firm size are theoretically different and capture different aspects of size. A researcher might use a proxy/measure while examining firm size in relation to any area of corporate finance which might be irrelevant or has no connection to that specific area. Previous researchers have noted this problem, e.g. while examining leverage in relation to size, Ebel Ezeoha [24] argued that mixed results of past researchers on relationship between size and leverage does not mean that size simultaneously is positively and negatively related to leverage neither does it mean that all these findings are contextually wrong nor that size and leverage are uncorrelated. He noted that it is the difference in definitions of firm size employed by all the papers (employing different measures/proxies) which resulted in different results. Thus, examining sensitivity of different proxies of firm size in relation to practices of corporate finance is essential.

Therefore, this study examines the impact of different measures of firm size, namely total assets, total sales, market capitalization and total number of employees on seven important areas/practices of corporate finance including financial policy, investment policy, dividend policy, diversification, managerial compensation and incentives, firm performance and corporate governance. Specifically, study checks for R^2 sensitivity, beta coefficient sensitivity and significance level sensitivity of all four different measures of firm size with these seven areas. Further, this study uses data from five emerging economies, i.e. Brazil, Russia, India, China and South Africa (BRICS). Our study adds to the existing body of knowledge in several ways: we have examined the effect of different measures of firm size on different corporate finance policies or simply corporate choices comprehensively. Our study is replication and extension of Dang et al. [30] who examined the same. However, we used different data sets and different years. We also included another measure of firm size, i.e. number of employees. We have used data from economic block of five emerging economies, i.e. BRICS. Overall, our results supported the formulated hypotheses. Different proxies of firm size have been found to differently relate to all areas/practices of corporate finance based on beta coefficient value, R^2 and sign of coefficient.

Theory and hypotheses

Firm size and financial policy

Financial policy of a firm describes a firm's decision regarding debt–equity mix (capital structure, leverage), maturity structure, cash holdings and method of financing and hedging decisions. From theoretical perspective, large firms will be more levered then small firms. As large firms have more investment opportunities to grow, Ebel Ezeohai [24] argued that this means large firms would be able to get more financing because of its growth. Taking it from another perspective, banks are always more willing to give debt to those customers whether individual or institutional who have more creditworthiness. Large firms because of their reputation in society would thus appeal more suitable to be given loan than small firms.

Previous research has shown mixed results with some researchers reporting positive relationship between the two, i.e. firm size and leverage [24, 28, 31–37], while some other reporting negative relationship between two [38, 39]. However, the first school of thought appears to be dominating in the literature. Further, as previously mentioned Ebel Ezeoha [24] in his study mentioned that these mixed results do not mean that size simultaneously is positively and negatively related to leverage neither does it mean that all these findings are contextually wrong nor that size and leverage are totally not correlated. According to Ebel Ezeoha [24], it is the difference in definitions of firm size employed by all of the papers. It must be taken in notice that this study employed four best possible measures of firm size to check the impact on leverage; it is thus expected that results of this study will provide direction as to which measures can yield positive and which can yield negative relationship with leverage. Based on all the above discussion, this study hypothesizes that:

H1 Firm size has a significant impact on financial policy

Firm size and dividend payout policy

Dividend policy explains that whether a firm pays out dividend to investors or retains its earnings for future investments. According to theoretical perspective, small firms focus more on growth and this factor causes them to pay fewer dividends and retains their earnings for future expansion of business. Conversely, large firms are more stable and give dividend to the investor to gain trust of them.

Taking it from the perspective of signalling theory, large firms issue dividend to give a "good" signal to the market that the firm is earning much and is financially stable and in good position. Alternatively, not issuing dividend will be considered as "bad" sign by the market because market might feel that the firm has not enough money and is not financially viable causing market price of the shares of large firm to decline.

Agency theory of Jensen and Meckling [40] provides another explanation of this phenomenon. Agency theory argues that investors perceive dividend as a shield of their investments as they feel that dividend will reduce the cash available to managers which can be used against the will of shareholders. Previous research has shown that the more a firm expands, grows and tries to cross national boundaries (become large), the more agency cost it has to face (e.g. see [41]). This means that investors of large firms want dividend and that large firms will issue dividend to satisfy its investors and reduce the agency cost. Empirical evidence also supports link between firm size and dividend policy [25–27, 42–44]. It is thus hypothesized that:

H2 Firm size has a significant impact on dividend policy

Firm size and investment policy

Investment policy refers to the investment decision of a firm which means the capital expenditure a firm is willing to make. Large companies must deal with larger projects, while dealing with large projects they can easily make cost of sophisticated investment appraisal techniques look small. This means that large companies would have a significant investment policy being shown by large NPVs and other appraisal techniques. Empirical evidence suggests a relationship between firm size and investment policy. (e.g. see [30, 45–48]). Similarly, large firms have more access to financing and have more internal resources thus which makes large firms able to make more capital expenditure as compared to small firms [31].

H3 Firm size has a significant impact on investment policy

Firm size and diversification

Diversification is widely studied in managerial research. Researchers in strategic management, industrial organization and financial management have long been studying diversification and its impact on different organizational outcomes [49].

Firm size plays a vital role in determination of business diversification of a firm. Business diversification is not cost free, and it requires financing. It is previously well established in this study that large firms can get financing from banks (because of their repute) and from stock market (by issuing shares for new business segments) more conveniently than small firms. This means that large firms can easily diversify their businesses as compared to small firms.

Small firms might have expertise in one production and operational area in which that firm is operating. On the other hand, because of vast business operations and huge links with the industry (both related and unrelated), large firms have the advantage of know-how of the operations of other firms operating in industry. Diversification needs minds from other business sectors, minds which know how work is done in that industry and minds that can yield profit for the firm. These minds are certainly the experts of those industries in which a company is going to operate. Cost of hiring those experts is also flying high, and it is well established that large firms give huge managerial compensations and incentives. So, it will be easier for a large firm as compared to small firm to hire those experts.

Growing by diversifying is not the only option for growth. In fact, small firms will tend to grow by using concentration strategy, i.e. by gaining superiority in the product it is manufacturing or the market it is operating in. On the other hand, most of the large firms would already have concentrated in their industry and will thus go for diversifying its product and business portfolio.

Previously, certain studies have examined this relationship in mergers and acquisitions (e.g. see [50]). Using event analysis technique and examining 44 mergers and acquisitions, they found that diversification is related to the firm size when it comes to M&A's. Dang et al. [30] examined firm size in relation to business diversification. Their results for both business segments and Herfindahl index were robust. They concluded that large firms are more diversified than small firms. Based on the above discussion, this study hypothesizes that:

H4 Firm size has a significant impact on diversification

Firm size and firm performance

According to Deshpande et al. [51], organizational performance has different aspects, such as relationship-building performance, short-term and long-term performance, financial and non-financial performance. Firm performance in finance strictly refers to financial performance, i.e. return on investments made by the firm and its shareholders in firm itself. It excludes all other types of performance specifically social performance of the firm. Theoretically speaking, the larger the firm is, the larger its operations will be, and the more it will produce resulting in more sales. Higher sales will lead to higher revenue and higher revenue means high profit; high profit will ultimately mean high income, and the more the income or profit after taxes, the more will be the return on investments/assets and return on equity.

From another perspective, large firms can generate investor's trust more than small firms. This means that investor will trust the company and this trust would be shown in equity market by the investor. High trust of investor means high investment by the investor in the market, and high investment by the investor would ultimately raise the market value of equity (ignoring the fact that it might get overvalued). A high value of equity is another strong financial indicator.

Empirical evidence also suggests a relationship between firm size and performance/profitability (e.g. see, [30, 31, 52, 53]). Keeping in view the above discussion, this study hypothesizes that:

H5 Firm size has a significant impact on firm performance

Firm size and managerial compensation and incentives

Managerial compensation and incentives refer to the salary and other benefits which top executive of any company receive. Although managerial compensation or compensation in particularly is not a new topic at all and is existing since the existence of mankind or at least from the existence of "labour market", however, it was only in late 80s and early 90s when the area of managerial compensation started emerging in managerial research.

Researchers in strategic management have been credited for making existence of this body of knowledge possible; by using the area of financial economics, they have studied the influence of top executives on organization [54]. Agency theory [40] has provided a framework of how firms can minimize the conflict of interest between principle, i.e. shareholders, and agent, i.e. managers. A stream of researchers studying agency theory have thus studied managerial compensation and incentives as a prospect to minimize the agency cost or what is commonly known as conflict of interest between management and shareholders. Fama [60] noted that agency literature on executive compensation has emphasized incentives and risk-bearing issues.

Graham et al. [55] in their study examined unobservable firm and managerial characteristics, e.g. latent management skills on compensation. They decomposed the variation in executive compensation and found that time-invariant firm and managers fixed effects explain most of the variation in executive pay. When it comes to observable firm characteristics like firm size, [55] noted that the relation between firm size and compensation of executives is well documented in the literature.

Taking it from the perspective of RBV [56], i.e. resource-based view of firm, RBV assumes top management as a unique pool of resources that are valuable, rare, imperfectly imitable and non-substitutable (VRIN), and thus, this top executive human resource is one which is the source of competitive advantage of firm. So, in order to remain competitive a firm needs to keep its top management intact as minds once gone cannot be replaced. Large firms will thus enhance and increase the compensation and benefits of their top management so that they do not leave that firm. From perspective of agency theory, as previously mentioned large firms and especially multinationals are more prone to agency cost and agency conflict. This means large firms will do more measures to reduce agency cost and conflict. One prospective way as presented by Jensen and Meckling [40] themselves to reduce conflict and cost was to increase management incentives and give them stock options. Thus, large firms according to agency perspective will be able to pay more and give more incentives to the managers as compared to small firms. Small firms on the other hand are mostly family owned and cannot afford to lose or change shareholding pattern, so they will hesitate more in giving stock options to employees.

Empirical evidence supports this notion. This is well established in the literature that firm size has an impact on executive compensation and incentives [30, 55, 57]. It is thus hypothesized that:

H6 Firm size has a significant impact on compensation and incentives

Firm size and corporate governance mechanism (board structure)

Corporate scandals and corporate failures of recent times including but not limited to Enron, Tyco, WorldCom, etc., swung the whole world, and researchers and practitioners deemed it necessary to have governance mechanisms resulting in a full-fledged area in managerial

sciences, i.e. corporate governance. Litch [58] defined governance as rules and structures for wielding power over interest of people including use and abuse of power.

Daily et al. [59] summarized the decades of dialogues and data on corporate governance. According to them, three theories are base of the governance mechanisms: agency theory of Jensen and Meckling [40], resource dependence theory and stewardship theory. All of these three have different implications for governance in organizations.

One of the most important areas in governance is board of directors. By definition, board of directors is elected by shareholders in company's annual general meeting. It has been argued from a long time that effective board structure would consist of outside independent directors (e.g. see [60]) and the debate got more importance after the corporate scandals. Advocates of corporate governance argue that there shall be more non-executive directors and in fact more independent directors who shall be outsiders to the company in order to ensure the efficiency of board. Theoretically, with increase in size of firm, owners of firm, i.e. shareholders, will increase. Increase in shareholders would mean an increase in size of board in order to make board more representative. Dang et al. [30] found support of this argument too. They reported a positive R^2 for the relationship between firm size and board size.

In a same way, large firms have more regulations to follow as they are mostly public and have to follow the regulations of the regulatory authorities. Regulatory authorities in most of the world nowadays demand more outside and especially independent directors. It is thus believed that large firms will tend to have more independent directors than small firms. Dang et al. [30] found empirical support for such an argument. Dang et al. [30] however used board independence, board size and CEO duality to check impact of size on board dynamics. This study adopted board independence as it is most important for governance mechanism. Keeping in view the above discussion, this study proposes that:

H7 Firm size has a significant impact on board structure.

Sensitivity of firm size measures

It is evident up till now that firm size has remained a major area of investigation in finance and a lot of researchers not only in finance but also in other managerial sciences believe that firm size does really matter. However, no research till now has provided any reason for using a specific measure of firm size for a specific variable [30]. This is a reason that different measures of firm size have yielded different results and results of many variables with firm size appeared mix [31].

Researchers have noted this problem. As mentioned earlier, Ebel Ezeoha [24] noted that the mixed results on size–leverage relationship in past do not mean that size simultaneously is positively and negatively related to leverage neither does it mean that all these findings are contextually wrong nor that size and leverage are totally not correlated. According to Ebel Ezeoha [24], it is the difference in definitions of firm size employed by all of the papers which is the primary cause of this scenario. Dang et al. [30] also noted that overall assessment of firm size measures in corporate finance is missing. It is thus believed that different measures of firm size, i.e. total assets, total sales and market value of equity, will be differently related to different variables of corporate finance. Thus, this study hypothesizes that:

H8 Different measures of firm size would have different sensitivities regarding different practices of corporate finance

Methods

Data

This study used data from BRICS, i.e. Brazil, Russia, India, China and South Africa. BRICS includes nations with high growth potential, and all are emerging economies. Together, BRICS covers more than 40% of world's population, contributes about 15% of global GDP and has more than 30% of world reserves [61]. All of the five economies are leading emerging economies and have been seen as a shift in global economic power away from developed economies [62]. It is thus prudent to look at these emerging markets to examine sensitivity of firm size measures to practices of corporate finance.

For analysis purpose, BRICS was treated as one block rather than separate countries. In line with the convention of standard finance, this study also used data from non-financial sector and excluded any financial firm. Data of 25 companies from each country over a period of 10 years, i.e. 2006–2015, were collected. Selection of companies was based on capitalization. For measures of firm size, data were collected from annual reports of companies, and board structure's data were collected from company's filings to SEC of that respective country; data on fundamentals of firm were collected from either website of that firm, annual reports or independent websites.

In case of pay level, unavailability of data forced researcher to set different levels based upon which it was decided that whether company will be given a 0 (i.e. no pay levels disclosed) or 1 (i.e. pay levels disclosed). The

decision was made on the fact that which company has better disclosures. It must be kept in mind that it is mandatory requirement of SEC throughout the world that companies should disclose the compensation and benefits given to board of directors and three main officers of the company. This was thus settled as the base requirement. For a company to get a 1 and be considered as disclosing information regarding pay level, researcher checked that whether that specific company go beyond these criteria and disclosed much or some information regarding things mentioned as follows:

- Disclosure regarding salary of different managerial cadres
- Disclosure regarding stock compensation
- Disclosure regarding any salary and compensation of other major officers of the company.

If any company had disclosed any significant information about these points, it was given 1 or else 0.

Measures

Measures employed in study are summarized in form of table (Table 1)

Control variables

Control variables for each model have been identified based upon the benchmark papers of that area and those as used by Dang et al. [30]. The study has not used all the controls as identified in the benchmark papers which could have caused an unmanageable scope of the study. The benchmark paper for firm performance was of Mehran [63]; for board structure, it was of Linck et al. [64]; Frank and Goyal [65] for leverage; and Coles et al. [66] for investment policy and diversification. Our selection of control variables is also in line with those of Dang et al. [30] and Hashmi et al. [31].

Results

Correlation analysis

Table 2 shows descriptive statistics and correlation analysis for the study. The total number of observations of the study was 1250. It can be seen in the table that different proxies of firm size are differently related to corporate choices. Firm size as measured by total assets is significantly correlated with financial leverage (assets/equity) ($r=0.11$, $p<0.05$), financial leverage (debt/equity) ($r=0.17$, $p<0.05$), business segments, i.e. diversification ($r=0.20$, $p<0.05$), dividend policy ($r=0.18$, $p<0.05$), CAPEX, i.e. investment policy ($r=0.16$, $p<0.05$), independent directors ($r=0.20$, $p<0.05$), non-executive directors ($r=0.23$, $p<0.05$), pay level ($r=0.18$, $p<0.05$), ROA ($r=0.19$, $p<0.05$) and ROE ($r=0.06$, $p<0.10$). Similarly, it can be seen that size as measured by total sales is significantly correlated with financial leverage (assets/equity) ($r=0.19$, $p<0.05$), financial leverage (debt/equity) ($r=0.16$, $p<0.05$), business segments, i.e. diversification ($r=0.19$, $p<0.05$), dividend policy ($r=0.25$, $p<0.05$), CAPEX, i.e. investment policy ($r=0.34$, $p<0.05$), independent directors ($r=0.23$, $p<0.05$), non-executive directors ($r=0.18$, $p<0.05$), pay level ($r=0.20$, $p<0.05$), ROA ($r=0.13$, $p<0.05$) and ROE ($r=0.17$, $p<0.05$). It can also be seen that size as measured by market value of equity is significantly correlated with financial leverage (assets/equity) ($r=-0.08$, $p<0.05$), financial leverage (debt/equity) ($r=-0.06$, $p<0.10$), business

Table 1 Measures employed in the study

Variable	Nature of variable	Proxy	Measure
Firm size	Independent variable	Total assets	Ln (total assets)
		Total sales	Ln (total sales)
		Market value of equity	Ln (market cap)
		Number of employees	Ln (number of employees)
Financial policy	Dependent variable	Financial leverage	Book value of debt/equity
		Financial leverage	Total asset/total equity
Payout policy	Dependent variable (dummy)	Dividend payout	Dividend payment (dummy)
Investment policy	Dependent variable	CAPEX	Net CAPEX/total asset
Diversification	Dependent variable	Business segments	Ln (no. of business segments)
Firm performance	Dependent variable	ROA	Profit after taxes/total asset
		ROE	PAT/total equity
Managerial compensation and incentives	Dependent variable	Pay level	Pay level and disclosers (dummy)
Corporate governance (board structure)	Dependent variable	Board independence	Ln (no. of independent directors on board)
			Ln (no. of non-executive directors on board)

Table 2 Descriptive statistics and correlation

	Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. FL (assets to equity)	0.04	0.08	1.00													
2. FL (debt to equity)	0.76	0.63	0.31*	1.00												
3. Business segment	0.70	1.20	−0.07	−0.03	1.00											
4. Dividend policy	0.75	0.69	−0.11*	−0.07	−0.07*	1.00										
5. CAPEX	0.85	0.36	−0.02	−0.03	0.12*	0.05	1.00									
6. Independent directors	1.37	0.60	−0.06*	−0.11*	0.26*	0.25*	0.07*	1.00								
7. Non-executive director	0.57	0.56	−0.11*	−0.02*	0.16*	0.18*	0.06*	0.52*	1.00							
8. Pay level	0.68	0.47	−0.03	−0.03*	0.19*	0.08*	0.06*	0.24*	0.06*	1.00						
9. ROA	8.83	4.77	−0.13*	−0.19*	0.18*	0.09*	0.19*	−0.01	0.03	0.59*	1.00					
10. ROE	8.02	4.26	−0.13*	−0.15*	0.09*	0.06*	0.11*	0.01	0.08*	0.03	0.56*	1.00				
11. Size: Ln (MVE)	12.43	2.72	−0.08*	−0.06*	0.21*	0.23*	0.05*	0.46*	0.14*	0.27*	0.33*	0.16*	1.00			
12. Size: Ln (total asset)	11.18	1.90	0.11*	0.17*	0.20*	−0.18*	0.16*	0.20*	0.23*	0.18*	0.19*	0.06	0.37*	1.00		
13. Size: Ln (total sale)	10.60	2.12	0.19*	0.16*	0.19*	0.25*	0.34*	0.23*	0.18*	0.20*	0.13*	0.17*	0.43*	0.83*	1.00	
14. Size: # of employees	9.82	1.83	−0.05*	−0.04	0.24*	0.28*	0.14*	0.13*	0.19*	0.24*	0.01	0.13*	0.34*	0.41*	0.47*	1.00

FL financial leverage, *SD* standard deviation

*$p<0.10$, $n=1250$

segments, i.e. diversification ($r=0.21$, $p<0.05$), dividend policy ($r=0.23$, $p<0.05$), CAPEX, i.e. investment policy ($r=0.05$, $p<0.05$), independent directors ($r=0.46$, $p<0.05$), non-executive directors ($r=0.14$, $p<0.05$), pay level ($r=0.27$, $p<0.05$), ROA ($r=0.33$, $p<0.05$) and ROE ($r=0.16$, $p<0.10$). Likewise, size as measured by total number of employees is significantly correlated with financial leverage (assets/equity) ($r=-0.05$, $p<0.10$), business segments, i.e. diversification ($r=0.24$, $p<0.05$), dividend policy ($r=0.28$, $p<0.05$), CAPEX, i.e. investment policy ($r=0.14$, $p<0.05$), independent directors ($r=0.13$, $p<0.05$), non-executive directors ($r=0.19$, $p<0.05$), pay level ($r=0.24$, $p<0.05$) and ROE ($r=0.13$, $p<0.10$). However, size as measured with total number of employees has no relation with financial leverage (debt/equity) ($r=-0.04$, ns) and ROA ($r=0.01$, ns).

Regression analysis

Firm size and financial policy

Table 3 shows the results of pooled OLS regression for firm size and financial leverage. ROA is the control variables. It can be seen in the table that all proxies of firm size are significantly related to financial leverage of firm: total assets–financial leverage ($\beta=-0.03$, $p<0.01$), total sales–financial leverage ($\beta=-0.21$, $p<0.01$), MVE–financial leverage ($\beta=-0.37$, $p<0.01$) and number of employees and financial leverage ($\beta=-0.003$, $p<0.01$). Value of R^2 for all these four models was 0.03, 0.17, 0.05 and 0.02, respectively. Before estimation of fixed effect regression, Hausman test was done to see whether fixed effect model is appropriate or random is appropriate. Results of Hausman test for financial policy are shown in Table 4.

In the table, it can be seen that for financial leverage (assets to equity), fixed effect regression is appropriate in all relationships except in case of total assets. Result of fixed/random effect regression as shown in the table shows that all proxies of firm size are significantly yet differently related to financial leverage: total assets–financial leverage ($\beta=0.05$, $p<0.1$), total sales–financial leverage ($\beta=-0.07$, $p<0.01$), MVE–financial leverage ($\beta=-0.19$, $p<0.05$) and number of employees and financial leverage ($\beta=-0.01$, $p<0.01$). The value of R^2 for these relationships was 0.07, 0.07, 0.07 and 0.20, respectively.

In case of debt–equity as DV, pooled OLS regression as shown in Table 5 shows that firm size as measured by total assets is significantly related to debt–equity ($\beta=0.07$, $p<0.01$), total sales are also significantly related to debt–equity ($\beta=0.08$, $p<0.01$), MVE is significantly related to debt–equity ($\beta=0.03$, $p<0.01$) and number of employees and debt–equity relationship is also significant ($\beta=0.03$, $p<0.01$). The value of R^2 for these relationships was 0.04, 0.04, 0.03 and 0.09, respectively. Results of Hausman test as shown in Table 4 show that random effect regression is appropriate in case of number of employees–debt/equity relationship, and fixed effect is appropriate otherwise.

Results of fixed/random effect are also mentioned in Table 5. The table shows that there exists insignificant relationship between firm size as measured by number of employees and debt–equity ($\beta=0.02$, ns). However, relationship between firm size as measured by total

Table 3 Regression analysis of firm size (total asset, total sales, MVE and number of employees) and financial leverage

	(1) Pooled OLS	(2) Pooled OLS	(3) Pooled OLS	(4) Pooled OLS	(5) RE	(6) FE	(7) FE	(8) FE
C	−3.50***	−3.78***	−3.17***	0.08***	−3.76***	−3.79***	−3.49***	0.21***
ROA	−0.05***	−0.18***	−0.11***	0.004***	0.01^{ns}	0.01^{ns}	0.01^{ns}	−0.001^{ns}
Size: Ln(assets)	−0.03***				0.05*			
Size: Ln(sales)		−0.21***				−0.07***		
Size: Ln(MVE)			−0.37***				−0.19**	
Size: number of employees				−0.003***				−0.01***
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.03	0.17	0.05	0.02	0.07	0.07	0.07	0.20
#Observations	1250	1250	1250	1250	1250	1250	1250	1250

F test

Chi2(3) = 9.25

p value = 0.026

Explanatory Variable: Leverage (TA/TE)

Models (1)–(4) represent simple pooled OLS results i.e. Common effect

Model (5)–(8) represent Fixed/Random effect regression based on results of Hausman test stated above

***, **,* represent 1%, 5% and 10% level of significance respectively, ns represents not significant

assets and debt–equity is significant ($\beta = 0.21$, $p < 0.01$), firm size as measured by MVE and debt–equity is significant ($\beta = 0.06$, $p < 0.01$) and firm size as measured by total sales and debt–equity is significant ($\beta = 0.11$, $p < 0.01$). The value of R^2 for model 5, i.e. total assets–financial leverage (debt to equity), is 0.04, for model 6, i.e. total sales–financial leverage (debt to equity), it is 0.05, for model 7, i.e. MVE–financial leverage (debt to equity), is 0.02 and for model 8, i.e. number of employees–financial leverage (debt to equity), is 0.12. These results thus support hypothesis H1.

Firm size and investment policy

Table 6 shows results for pooled OLS of firm size measures on CAPEX as scaled by total assets. Stock return and leverage are the control variables. Results as shown in the table indicate that all proxies of firm size are significantly negatively related to CAPEX, i.e. total assets ($\beta = -0.08$, $p < 0.01$), sales ($\beta = -0.09$, $p < 0.01$), MVE ($\beta = -0.08$, $p < 0.01$) and number of employees ($\beta = -0.09$, $p < 0.01$). Value of R^2 for all these four models was 0.18, 0.19, 0.17 and 0.14, respectively. Results of fixed effect regression show that relationship of number of employee–CAPEX is insignificant ($\beta = 0.002$, ns), total assets–CAPEX relationship is significant ($\beta = -0.04$, $p < 0.05$), total sales–CAPEX is insignificant ($\beta = -0.01$, ns) and MVE–CAPEX relationship is also insignificant ($\beta = -0.0001$, ns). The value of R^2 for these models was 0.09. These results thus support hypothesis H3.

Firm size and diversification

Table 7 shows results for pooled OLS of firm size measures on number of business segments. Leverage and performance are the control variables. Results as shown in the table indicate that firm size as measured by total assets is significantly related to business segments of firm ($\beta = 0.0731$, $p < 0.05$) and total sales–business segments relationship is also significant ($\beta = 0.058$, $p < 0.05$). There exists insignificant relationship between MVE and business segments ($\beta = 0.032$, ns) and number of employees and number of business segments ($\beta = 0.0057$, ns). Value of R^2 for all these four models was 0.06, 0.06, 0.05 and 0.05, respectively. Results of random effect show that there exists significant relationship between firm size as measured by number of employees and number of business segments ($\beta = -0.123$, $p < 0.01$). Relationship between total sales and number of business segments is also significant ($\beta = 0.055$, $p < 0.1$), relationship of MVE and number of business segments is significant ($\beta = 0.0309$, $p < 0.1$) and total assets and number of business segments is insignificant ($\beta = 0.0232$, ns). The value of R^2 for these models was 0.03, 0.03, 0.02 and 0.06 approximately. These results support hypothesis H4.

Firm size and firm performance

The table shows results for pooled OLS of firm size measures on ROA. Business segments and debt–equity ratio are the control variables. Results as shown in Table 8 indicate that all proxies are significantly related to ROA: total assets and ROA ($\beta = -1.18$, $p < 0.01$), MVE–ROA

Table 4 Results of Hausman test

	Chi-square	d.f	*p* value	Decision
Financial leverage (assets to equity)				
Size: Ln (total asset)	3.15	2.00	0.21	Random Effect
Size: Ln (total sales)	30.62	2.00	0.00	Fixed effect
Size: Ln (MVE)	7.12	2.00	0.03	Fixed effect
Size: number of employees	9.71	2.00	0.01	Fixed effect
Financial leverage (debt to equity)				
Size: Ln (total asset)	14.61	3.00	0.00	Fixed effect
Size: Ln (total sales)	7.48	3.00	0.06	Fixed effect
Size: Ln (MVE)	21.36	3.00	0.00	Fixed effect
Size: number of employees	1.94	3.00	0.58	Random effect
CAPEX				
Size: Ln (total asset)	9.90	2.00	0.01	Fixed effect
Size: Ln (total sales)	15.71	2.00	0.00	Fixed effect
Size: Ln (MVE)	15.89	2.00	0.00	Fixed effect
Size: number of employees	19.30	2.00	0.00	Fixed effect
Business segment				
Size: Ln (total asset)	2.24	3.00	0.52	Random effect
Size: Ln (total sales)	2.19	3.00	0.53	Random effect
Size: Ln (MVE)	5.83	3.00	0.12	Random effect
Size: number of employees	6.64	3.00	0.08	Random effect
ROA				
Size: Ln (total asset)	313.37	3.00	0.00	Fixed effect
Size: Ln (total sales)	217.43	3.00	0.00	Fixed effect
Size: Ln (MVE)	409.33	3.00	0.00	Fixed effect
Size: number of employees	13.40	3.00	0.00	Fixed effect
ROE				
Size: Ln (total asset)	460.89	3.00	0.00	Fixed effect
Size: Ln (total sales)	415.57	3.00	0.00	Fixed effect
Size: Ln (MVE)	458.01	3.00	0.00	Fixed effect
Size: number of employees	45.95	3.00	0.00	Fixed effect
Independent directors				
Size: Ln (total asset)	4.05	3.00	0.26	Random effect
Size: Ln (Total Sales)	2.14	3.00	0.54	Random effect
Size: Ln (MVE)	8.15	3.00	0.04	Random effect
Size: number of employees	36.58	3.00	0.00	Fixed effect
Non-executive directors				
Size: Ln (total asset)	53.01	3.00	0.00	Fixed effect
Size: Ln (total sales)	15.67	3.00	0.00	Fixed effect
Size: Ln (MVE)	54.97	3.00	0.00	Fixed effect
Size: number of employees	106.51	3.00	0.00	Fixed effect

relationship ($\beta = -1.24$, $p < 0.01$), total sales and ROA ($\beta = -1.23$, $p < 0.01$) and number of employees and ROA ($\beta = 0.95$, $p < 0.01$). Value of R^2 for all these four models was 0.08, 0.08, 0.07 and 0.03, respectively, for total asset–ROA, total sales–ROA, MVE–ROA and number of employees–ROA.

Results of Hausman test as shown in Table 4 show that fixed effect regression is appropriate for all models. Results of fixed effect are also mentioned in Table 8. The table shows that there exists significant relationship between firm size as measured by total assets and ROA ($\beta = 0.20$, $p < 0.01$). The relationship between firm size as measured by total sales and ROA is insignificant ($\beta = -0.84$, $p < 0.01$). The relationship of firm size as measured by MVE and ROA is significant ($\beta = 0.39$, $p < 0.01$). The relationship between firm size as measured by number of employees and ROA is also significant ($\beta = 0.56$, $p < 0.01$). The value of R^2 for these models was 0.08, 0.07, 0.09 and 0.09 approximately, respectively. In case of ROE as DV, pooled OLS regression as shown in Table 9 shows that all proxies are significantly related to ROE: total asset ($\beta = -1.05$, $p < 0.01$), total sales ($\beta = -1.10$, $p < 0.01$), MVE ($\beta = -1.12$, $p < 0.01$) and number of employees ($\beta = 0.84$, $p < 0.01$). Value of R^2 for all these four models was 0.08, 0.08, 0.07 and 0.03, respectively, for total asset–ROE, total sales–ROE, MVE–ROE and number of employees–ROE.

Results of Hausman test as shown in Table 4 show that fixed effect regression is appropriate in all models. Results of fixed effect are also mentioned in Table 9. The table shows that total asset–ROE relationship is significant ($\beta = 0.11$, $p < 0.01$), total sales–ROE relationship is insignificant ($\beta = -0.03$, ns), MVE–ROE relationship is significant ($\beta = 0.11$, $p < 0.01$) and number of employee–ROE relationship is significant ($\beta = 0.17$, $p < 0.01$). The value of R^2 for model 5, i.e. total assets–ROE, is 0.08, for model 6, i.e. total sales–ROE, it is 0.08, for model 7, i.e. MVE–ROE, is 0.09 and for model 8, i.e. number of employees–ROE, is 0.09. Support for hypothesis H5 is thus found from this result.

Firm size and board structure

Table 10 shows results for pooled OLS of firm size measures on number of independent directors. Business segments and performance are the control variables. Results as shown in the table indicate that firm size as measured by total assets is significantly related to number of independent directors ($\beta = 0.03$, $p < 0.05$). It can also be seen that number of employees–number of independent directors relationship ($\beta = 0.09$, $p < 0.01$) and MVE and number of independent directors relationship ($\beta = 0.05$, $p < 0.01$).are significant. There exists an insignificant relationship between total

Table 5 Regression analysis of firm size (total asset, total sales, MVE and number of employees) and financial leverage (debt to equity)

	(1) Pooled OLS	(2) Pooled OLS	(3) Pooled OLS	(4) Pooled OLS	(5) FE	(6) FE	(7) FE	(8) RE
C	0.10^{ns}	0.08^{ns}	0.43***	0.48***	−0.69***	-0.19^{ns}	0.09^{ns}	0.56***
Profitability: ROA	0.05***	0.06***	0.02***	−0.01**	0.11***	0.08***	0.05***	-0.01^{ns}
Tangibility	0.00^{ns}	0.00^{ns}	0.00^{ns}	0.00^{ns}	0.00^{ns}	0.00^{ns}	0.00^{ns}	0.00^{ns}
Size: Ln(assets)	0.07***				0.21***			
Size: Ln(sales)		0.08***				0.11***		
Size: Ln(MVE)			0.03***				0.06***	
Size: number of employees				0.03***				0.02^{ns}
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.04	0.04	0.03	0.09	0.04	0.05	0.02	0.12
#Observations	1250	1250	1250	1250	1250	1250	1250	1250

F test

Chi2(3) = 7.41

p value = 0.041

Explanatory variable: debt to equity (TD/TE)

Models (1)–(4) represent simple pooled OLS results, i.e. common effect

Models (5)–(8) represent fixed/random effect regression based on results of Hausman test stated above

***, **, * represent 1%, 5% and 10% level of significance, respectively; ns represents not significant

Table 6 Regression analysis of firm size (total asset, total sales, MVE and number of employees) and CAPEX

	(1) Pooled OLS	(2) Pooled OLS	(3) Pooled OLS	(4) Pooled OLS	(5) FE	(6) FE	(7) FE	(8) FE
C	0.90***	0.86***	1.00***	−0.32***	0.85***	0.76***	0.75***	0.72***
Leverage	0.05*	0.06**	0.04^{ns}	-0.01^{ns}	0.00^{ns}	0.00^{ns}	-0.001^{ns}	-0.001^{ns}
Size: Ln(assets)	−0.08***				−0.04**			
Size: Ln(sales)		−0.09***				-0.01^{ns}		
Size: Ln(MVE)			−0.08***				-0.0001^{ns}	
Size: number of employees				0.09***				0.002^{ns}
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.18	0.19	0.17	0.14	0.09	0.09	0.09	0.09
#Observations	1250	1250	1250	1250	1250	1250	1250	1250

F test

Chi2(3) = 10.49

p value = 0.01

Explanatory variable: CAPEX (net capital expenditure scaled by total assets)

Models (1)–(4) represent simple pooled OLS results, i.e. common effect

Models (5)–(8) represent fixed/random effect regression based on results of Hausman test stated above

***, **, * represent 1%, 5% and 10% level of significance, respectively; ns represents not significant

sales and number of independent directors ($\beta = 0.02$, ns). Value of R^2 for all these four models was 0.15, 0.15, 0.16 and 0.29, respectively, for total asset–number of independent directors, total sales–number of independent directors, MVE–number of independent directors and number of employees–number of independent directors.

Results of Hausman test for board structure and firm size are shown in Table 4. Results of Hausman test as shown in the table indicate that random effect regression is appropriate for MVE–independent director relationship and number of employees–number of independent directors relationship, and fixed effect is better in rest of two. Results of fixed/random effect are also mentioned in

Table 7 Regression analysis of firm size (total asset, total sales, MVE and number of employees) and diversification

	(1) Pooled OLS	(2) Pooled OLS	(3) Pooled OLS	(4) Pooled OLS	(5) RE	(6) RE	(7) RE	(8) RE
C	0.92***	0.72***	1.10***	0.82***	0.55**	0.55***	0.13^{ns}	1.01**
Leverage	−0.13**	−0.12**	−0.10*	−0.11**	−0.04^{ns}	−0.04^{ns}	−0.02^{ns}	−0.02^{ns}
Performance	−0.01^{ns}	0.00^{ns}	−0.03*	−0.01^{ns}	0.01^{ns}	0.01^{ns}	0.02^{ns}	0.08**
Size: Ln(assets)	0.073**				0.023^{ns}			
Size: Ln(sales)		0.058**				0.055*		
Size: Ln(MVE)			−0.03^{ns}				0.0309*	
Size: number of employees				0.0057^{ns}				0.123***
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.06	0.06	0.05	0.05	0.03	0.03	0.02	0.06
#Observations	1250	1250	1250	1250	1250	1250	1250	1250

F test

Chi2(3) = 21.58

p value = 0.000

Explanatory variable: number of business segment (Ln business seg)

Models (1)–(4) represent simple pooled OLS results, i.e. common effect

Models (5)–(8) represent fixed/random effect regression based on results of Hausman test stated above

***, **, * represent 1%, 5% and 10% level of significance, respectively; ns represents not significant

Table 8 Regression analysis of firm size (total asset, total sales, MVE and number of employees) and ROA

	(1) Pooled OLS	(2) Pooled OLS	(3) Pooled OLS	(4) Pooled OLS	(5) FE	(6) FE	(7) FE	(8) FE
C	11.26***	10.57***	12.85***	−2.46***	8.12***	10.08***	7.28***	1.77***
Log (segments)	−0.02^{ns}	0.01^{ns}	−0.10*	−0.13^{ns}	0.02^{ns}	0.02^{ns}	0.01^{ns}	0.04**
Debt/equity	0.59***	0.64***	0.31***	−0.33*	0.27***	0.34***	0.29***	0.20***
Size: Ln(assets)	−1.18***				0.20***			
Size: Ln(sales)		−1.23***				−0.84***		
Size: Ln(MVE)			−1.24***				0.39***	
Size: number of employees				0.95***				0.56***
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.08	0.08	0.07	0.03	0.08	0.07	0.09	0.09
#Observations	1250	1250	1250	1250	1250	1250	1250	1250

F test

Chi2(3) = 9.79

p value = 0.000

Explanatory variable: return on assets (ROA)

Models (1)–(4) represent simple pooled OLS results, i.e. common effect

Models (5)–(8) represent fixed/random effect regression based on results of Hausman test stated above

***, **, * represent 1%, 5% and 10% level of significance, respectively; ns represents not significant

Table 10. The table shows that there exists insignificant relationship between firm size as measured by number of employees and number of independent directors ($\beta = -0.01$, ns). All other models are insignificant: total assets and number of independent directors ($\beta = 0.04$, $p < 0.01$), sales and number of independent directors ($\beta = 0.03$, $p < 0.05$) and MVE and number of independent directors ($\beta = 0.09$, $p < 0.01$). The value of R^2 for all of these models was 0.14, 0.14, 0.08 and 0.09 for models 5, 6, 7 and 8, respectively. In case of NEDs as DV, pooled OLS regression as shown in Table 11 shows that all proxies are significantly related to number of non-executive directors, i.e. total assets ($\beta = 0.18$, $p < 0.01$), total sales ($\beta = 0.20$, $p < 0.01$), MVE ($\beta = 0.16$, $p < 0.01$) and number

Table 9 Regression analysis of firm size (total asset, total sales, MVE and number of employees) and ROE

	(1) Pooled OLS	(2) Pooled OLS	(3) Pooled OLS	(4) Pooled OLS	(5) FE	(6) FE	(7) FE	(8) FE
C	10.62***	10.04***	11.91***	− 2.28***	7.75***	7.95***	7.63***	5.88***
Log (segments)	0.00^{ns}	0.02^{ns}	− 0.05*	− 0.16^{ns}	0.03**	0.03**	0.03*	0.03**
Debt/equity	− 1.51**	− 1.34**	− 1.94**	3.27**	− 0.16^{ns}	− 0.16^{ns}	− 0.15^{ns}	0.02^{ns}
Size: Ln(assets)	− 1.05***				0.11***			
Size: Ln(sales)		− 1.10***				0.03^{ns}		
Size: Ln(MVE)			− 1.12***				0.11***	
Size: number of employees				0.84***				0.17***
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.08	0.08	0.07	0.03	0.08	0.08	0.09	0.09
#Observations	1250	1250	1250	1250	1250	1250	1250	1250

F test

Chi2(3) = 44.68

p value = 0.000

Explanatory variable: return on equity (ROE)

Models (1)–(4) represent simple pooled OLS results, i.e. common effect

Models (5)–(8) represent fixed/random effect regression based on results of Hausman test stated above

***, **, * represent 1%, 5% and 10% level of significance, respectively; ns represents not significant

Table 10 Regression analysis of firm size (total asset, total sales, MVE and number of employees) and independent director

	(1) Pooled OLS	(2) Pooled OLS	(3) Pooled OLS	(4) Pooled OLS	(5) RE	(6) RE	(7) RE	(8) FE
C	0.76***	0.87***	0.59***	0.13***	0.63***	0.70***	0.52***	0.82***
Log (segments)	− 0.04***	− 0.04***	− 0.04***	− 0.04***	0.00^{ns}	0.00^{ns}	− 0.01^{ns}	0.00^{ns}
Performance	0.06***	0.06***	0.07***	0.01***	0.07***	0.07***	0.06***	0.08***
Size: Ln(assets)	0.03**				0.04***			
Size: Ln(sales)		0.02^{ns}				0.03**		
Size: Ln(MVE)			0.05***				0.09***	
Size: number of employees				0.09***				− 0.01^{ns}
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.15	0.15	0.16	0.29	0.14	0.14	0.08	0.09
#Observations	1250	1250	1250	1250	1250	1250	1250	1250

F test

Chi2(3) = 97.6

p value = 0.000

Explanatory variable: independent directors on board (Ln Ind Dir)

Models (1)–(4) represent simple pooled OLS results, i.e. common effect

Models (5)–(8) represent fixed/random effect regression based on results of Hausman test stated above

***, **, * represent 1%, 5% and 10% level of significance, respectively; ns represents not significant

of employees ($\beta = 0.03$, $p < 0.01$). The value of R^2 for these relationships was 0.07, 0.08, 0.07 and 0.06, respectively.

Results of Hausman test as shown in Table 4 indicate that fixed effect regression is appropriate in all cases. Results of fixed effect are also mentioned in Table 11. The table shows that all proxies are significantly related to number of non-executive directors, i.e. total assets ($\beta = 0.16$, $p < 0.01$), total sales ($\beta = 0.11$, $p < 0.01$), MVE ($\beta = 0.15$, $p < 0.01$) and number of employees ($\beta = 0.04$, $p < 0.01$). The value of R^2 for these relationships was 0.07, 0.08, 0.08 and 0.09, respectively. Hypothesis H7 is thus supported.

Table 11 Regression analysis of firm size (total asset, total sales, MVE and number of employees) and non-executive directors

	(1) Pooled OLS	(2) Pooled OLS	(3) Pooled OLS	(4) Pooled OLS	(5) FE	(6) FE	(7) FE	(8) FE
C	0.30***	0.34***	0.40***	1.59***	0.45***	0.38***	0.49***	0.29**
Log (segments)	−0.05***	−0.05***	−0.04***	−0.05***	−0.07***	−0.08***	−0.07***	−0.08***
Performance	−0.02***	−0.01**	−0.04***	−0.15***	−0.03***	0.00^{ns}	−0.04***	−0.02^{ns}
Size: Ln(assets)	0.18***				0.16***			
Size: Ln(sales)		0.20***				0.11***		
Size: Ln(MVE)			0.16***				0.15***	
Size: number of employees				0.03***				0.04***
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.07	0.08	0.07	0.06	0.07	0.08	0.08	0.09
#Observations	1250	1250	1250	1250	1250	1250	1250	1250

F test

Chi2(3) = 12.91

p value = 0.000

Explanatory variable: non-executive directors on board (Ln NED)

Models (1)–(4) represent simple pooled OLS results, i.e. common effect

Models (5)–(8) represent fixed/random effect regression based on results of Hausman test stated above

***, **, * represent 1%, 5% and 10% level of significance, respectively; ns represents not significant

Firm size and dividend policy

Dividend policy was a dummy variable, i.e. its value is 1 if a firm pays dividend and 0 if it does not. Results for logit and logistic regression are reported in Table 12 for both dummy dependent variables, i.e. dividend policy and pay level.

Results as shown in Table 12 show that firm size as measured by total assets is insignificantly related to dividend policy ($\beta = 0.013$, ns). For total sales as measure of firm size, results are also same, i.e. insignificant ($\beta = 0.045$, ns). Relationship between MVE and dividend policy is significant ($\beta = 0.136$, $p < 0.01$). The last proxy of firm size taken by this study, i.e. number of employees, is significantly related to dividend policy ($\beta = 0.185$, $p < 0.01$) and positive. Pseudo-R^2 values for these models were 0.001, 0.001, 0.02 and 0.019, respectively. These results thus support hypothesis H2.

Firm size and pay level

Pay level was also a dummy variable. Results for this variable are also shown in Table 12. These results show that all proxies are significantly related to pay level, i.e. total assets ($\beta = 0.71$, $p < 0.01$), total sales ($\beta = 0.53$ $p < 0.01$), MVE ($\beta = 0.51$, $p < 0.01$) and number of employees ($\beta = 0.21$, $p < 0.01$). Value of R^2 for these relationships was 0.18, 0.16, 0.20 and 0.02, respectively. Odds ratio reveals a positive relationship between all relationships. These results are thus supporting hypothesis H6.

Sensitivity of firm size measures

Tables 13 and 14 show sensitivity of firm size measures with different practices of corporate finance based on pooled OLS and fixed effect regression, respectively, for South Africa. As hypothesized in H8, results show that different measures of firm size are differently related to different practices. Results show that although results are

Table 12 Regression analysis of dummy dependent variables

	Dividend policy				Pay level			
	Coefficient	Odds ratio	$p > \|z\|$	R^2	Coefficient	Odds ratio	$p > \|z\|$	R^2
Total assets	.013	1.01	0.70	0.001	.71	2.02	0.00	0.18
Total sales	.045	1.05	0.19	0.001	.53	1.70	0.00	0.16
MVE	.136	1.15	0.00	0.02	.51	1.66	0.00	0.20
Number of employees	.185	1.20	0.00	0.019	.21	1.24	0.00	0.02

Dependent variable: dividend policy (Dummy); pay level (Dummy), $n = 1250$

Table 13 Sensitivity of firm size measures in pooled OLS regression

	Sign				Significance				R^2			
	Total assets	Total sales	MVE	Number of employees	Total assets (%)	Total sales (%)	MVE (%)	Number of employees (%)	Total assets	Total sales	MVE	Number of employees
Financial leverage	−	−	−	−	< 1	< 1	< 1	< 1	0.03	0.17	0.05	0.02
Financial leverage (debt to equity)	+	+	+	+	< 1	< 1	< 1	< 1	0.04	0.04	0.03	0.09
CAPEX	−	−	−	+	< 1	< 1	< 1	< 1	0.18	0.19	0.17	0.14
Business segment	+	+	+	+	< 5	< 5	> 10	> 10	0.06	0.06	0.05	0.05
ROA	−	−	−	+	< 1	< 1	< 1	< 1	0.08	0.08	0.07	0.03
ROE	−	−	−	+	< 1	< 1	< 1	< 1	0.08	0.08	0.07	0.03
Independent directors	+	+	+	+	< 5	> 10	< 1	< 1	0.15	0.15	0.16	0.29
Non-executive director	+	+	+	+	< 1	< 1	< 1	< 1	0.07	0.08	0.07	0.06
Dividend policy	+	+	+	+	> 10	> 10	< 1	< 1	0.001	0.001	0.02	0.019
Pay level	+	+	+	+	< 1	< 1	< 1	< 1	0.18	0.16	0.20	0.02

Table 14 Sensitivity of firm size measures in fixed/random effect regression

	Sign				Significance				R^2			
	Total assets	Total sales	MVE	Number of employees	Total assets (%)	Total sales (%)	MVE (%)	Number of employees (%)	Total assets	Total sales	MVE	Number of employees
Financial leverage	+	−	−	−	< 10	< 1	< 5	< 1	0.07	0.07	0.07	0.20
Financial leverage (debt to equity)	+	+	+	+	< 1	< 1	< 1	> 10	0.04	0.05	0.02	0.12
CAPEX	−	−	−	+	< 5	> 10	> 10	> 10	0.09	0.09	0.09	0.09
Business segment	+	+	+	+	> 10	< 10	< 10	< 1	0.03	0.03	0.02	0.06
ROA	+	−	+	+	< 1	< 1	< 1	< 1	0.08	0.07	0.09	0.09
ROE	+	+	+	+	< 1	> 10	< 1	< 1	0.08	0.08	0.09	0.09
Independent directors	+	+	+	−	< 1	< 5	< 1	> 10	0.14	0.14	0.08	0.09
Non-executive director	+	+	+	+	< 1	< 1	< 1	< 1	0.07	0.08	0.08	0.09

robust in sign and significance in most cases, firm size does change its sign from proxy to another even for a same area. These results are thus supporting hypothesis H8 and have serious implications.

Robustness test

For robustness issue, we used firm fixed effect regression as suggested by Dang et al. [30]. Although none of the papers in the field have applied GMM to look for dynamic modelling, we applied GMM to test for dynamic modelling. Our results of GMM however forced us to stick with original OLS estimates.

Discussions

This study was done with the purpose of determining impact of different measures of firm size on seven important areas of corporate finance. Besides examining this impact of proxies on major practices of corporate finance, another major objective of the study was to check the sensitivity of different proxies of firm size on practices of corporate finance. Practices were financial policy, dividend policy, investment policy, diversification, firm performance, compensation and incentives and board structure (corporate governance).

Overall, the results indicate that firm size is significantly related to these areas of corporate finance. More importantly, results show that different measures of firm size are differently related to these areas. This difference can be seen in the beta coefficient value. It can also be seen that in some cases, for one practice different measures of firm size have different signs of coefficient meaning that they are differently related to that practice, i.e. one might be positive, and the other proxy is negatively related to that practice. Similarly, each proxy has different explanatory powers towards each practice of corporate finance (in most cases). This means that different proxies have different relationship towards different areas of corporate finance.

Previous studies have also pointed out that these different proxies of firm size are different concepts and thus cannot be replaced with each other (e.g. see [30, 31]). This means that a proxy which is more related to the concept should be used while examining firm size in relation to that practice. Firm size has been examined in almost every field. A lot of research has either examined it as explanatory variable or control variable, but the issue with past research is that use of proxy of firm size in that context is not well justified, e.g. consider a study on financial policy which used number of employees as a proxy of firm size, while number of employees may be the least statistically related proxy of firm size with financial policy. Unfortunately, this may suggest that some research of past in this area is not robust and may have biased results.

The first hypothesis of the study was that firm size has a significant impact on financial policy. This hypothesis has been supported by the results. Our result is in line with the previous research done in this area (e.g. [28, 34, 67]). Theoretically, the relationship between size and financial policy also seems justifiable. With the increase in size of firm, total assets of that firm also increase which will increase the financial leverage of firm. Similarly, large firms need more financing than small firms; they might have large operations and more projects for which they require funds which cannot be met only from the internal resources. Large firms thus need to move towards external financing. Debt is undoubtedly the cheapest and easily available source of financing. Large firms thus will be more levered than small firms. Small firms may be family owned, or if not, they might only be revolving around certain people; they can even be a total equity financed firm. It is thus rational to think that large firms are more levered than small firms and thus moving from smaller to larger firms will change the financial policy of the firm.

The second hypothesis of the study was that firm size has a significant impact on dividend policy. This hypothesis has also been supported. This result is in line with the previous research in this area, e.g. [25–27] have all found a significant relationship between size of a firm and dividend policy. Large firms pay more dividend than smaller firms. The explanation of this result may be supported from signalling theory of Ross [68]. According to signalling concept, large firms will give off more dividends to give a positive signal to the market about the financial health of the company. Paying dividend will boost the confidence of market and investor on the firm, and a continuous policy of paying dividend will also help investor to distinguish between poor performing firms which may give dividend to show that they are performing well (which actually they are not) and a good firm. As large firms have more resources, they should and they do continue to pay dividend to give good signal to the market. Take it from the perspective of agency cost theory of Jensen and Meckling [40]. From agency argument, as with the rise in size of firm, agency cost increases; dividends act as a protection for investors because dividends reduce the excess cash available to managers after investment and operating activities. So, in order to reduce agency problem, large firms do give more dividends.

The third hypothesis of the study was that firm size has a significant impact on investment policy. Results support this hypothesis too. Rise of firm in size demands more expansion of firm's operations either geographically or in products or services it is rendering. This expansion is not cost free. Expansion of business requires resources, money above all. Thus, moving from small to large firm's investment expenditures increases. Large firms make

more investments in form of plant, property and equipment. Prerequisite to CAPEX that is capital expenditure done for investment are the investment appraisal techniques, i.e. NPV, IRR, etc. These appraisal techniques are all costly and represent sunk cost. Affording such high-cost techniques just to examine the profitability of a new venture is not possible for small firms. Researchers in past have also shown that the use of these techniques by a firm is size dependent (e.g. [47, 48]). Dang et al. [30] also used CAPEX as a measure of investment policy. Although not hypothesized there results also suggest significant relationship between size and investment policy.

The fourth hypothesis of the study was that firm size has a significant impact on diversification. This hypothesis has also been supported by the results of the study. Size of a firm increases by increase in operations. Increase in operations comes from increase in number of business segments a firm operates in. Thus, rationally a larger firm should be operating in more segments than a smaller firm. Increase in number of segments reduces the risks associated with operating in a single segment. The risk is of low profitability, new entrants, high market volatility, etc. To reduce these risks, firms thus diversify theirselves either in a related way or in an unrelated way; either by merging with other firms or by acquiring other firms. The rationale of diversification by firms is present in the previously mentioned phrase of Markowitz, i.e. "Don't put all your eggs in one basket". Although the statement of Markowitz was related to the portfolios, it is applicable in this context too. This diversification and moving into other segments (product segments or geographical segments) require financing. Large firms have large pools of financing available which makes it easier for large firms to diversify than small firms. Small firms than mostly use concentration strategy and put all of their resources in one segment they are operating in. No study exclusively has studied this relationship in past. However, Wilcox et al. [50] study on mergers and acquisition showed that diversification is related to size of a firm.

The fifth hypothesis of the study was that firm size has a significant impact on firm performance. Using ROA and ROE as measures of performance study found support for the relationship between size and performance. Dang et al. [30] also found support for such a relation using ROA and Tobin Q as measures of performance. Agyei and Marfo-Yiadom [52] also reported the same result. Larger firms have large revenues; large revenues are a source of more profits. More profit means more return to investors and thus a high performance. Thus, large firms have high financial performance than small firms.

The sixth hypothesis of the study was that firm size has a significant impact on compensation and incentives. Using pay level as proxy of compensation, study has found some support towards hypothesis. Study used pay level as a dummy variable because of less availability of data and set criteria for giving 0 or 1 to any firm which already has been explained in methodology. Despite of the fewer disclosures by the firms, the study has found support. This is because larger firms must make more disclosures as they have to comply more with the regulations, plus disclosures and compliance with regulations build trust among investors and give a positive signal to the market. Larger firms thus may report their level of salaries given to the staff of the firm.

The seventh hypothesis of the study was that firm size has a significant impact on board structure. Results of the study support this hypothesis. We used both NEDs and independent directors to study board structure. Using only NEDs, Dang et al. [30] also found support for such result. (They did not hypothesize it though.) With increase in size of firm, governance compliance becomes more important and regulatory authorities impose more strict regulations. Thus, large firms appoint more NEDs and independent directors. In particular after 2008 and corporate governance scandals, firms are now paying more attention towards the independence of board. Further, the presence of independent and non-executive directors is felt good by investors as these directors typically protect rights of shareholders, especially minority shareholders. Thus, again to give a positive signal to the market, large firms have more an independent board than small firms.

Last hypothesis of the study was that different measures of firm size have different sensitivities regarding different practices of corporate finance. The hypothesis has been fully supported. This was the main objective of the study. As previously mentioned, this result is important and shows that different proxies have different explanatory powers towards different areas. Necessary care thus is required while selecting firm size proxy for studying any specific area.

Conclusion

The aim of the study was to examine impact of different measures of firm size on seven important areas of corporate finance which are financial policy, dividend policy, investment policy, diversification, firm performance, compensation and incentives and board structure (corporate governance). Besides examining this impact of proxies on major practices of corporate finance, another major objective of the study was to check the sensitivity of different proxies of firm size on these practices of corporate finance. Data of five countries, i.e. Brazil, Russia, India, China and South Africa, were analysed. Overall results supported the hypotheses. Study concludes that different proxies of firm size are differently related to practices of corporate finance based on sign, significance

and R^2. All proxies capture different aspects of firm size and have different implications for corporate finance. Thus, this study confirms "measurement effect" in "size effect". Unfortunately, this means that many of past studies are not robust and are biased. Researchers thus need to be careful when selecting any proxy of firm size for their research keeping in mind the scope and context of their work. Choosing a proxy thus is a theoretical and empirical question.

Our study provides important guidelines for researchers, managers and investors at large. Firstly, study showed that different proxies yield different results for a same area. Care and attention thus must be paid while selecting proxy of firm size in relation to the variable it is being studied for. Results of the study otherwise may become biased and do not reflect the actual reality. It is better to check that which proxy is suitable in the context before using it. Secondly, investors should pay special attention while making investment decision. Large firms do have large payment of dividend and are more diversified. Investors choosing small firms to invest for should do some work (cost and benefit analysis) before investing. Thirdly, managers of large firms should keep on diversifying, paying off dividends to give a good signal to market as to distinguish themselves from poor performing firms. Managers while making internal decisions like decisions to take on new project or decision to change capital mix should also use proper proxy of firm size.

Every study has its own merits and demerits. Similarly, this study also has some limitations. Some of these limitations are: (1) data availability was the major limitation of the study. We did not have access to any database of data because of which the study had to rely on available resources and included data from independent websites. Chance of error in such a data may be high. Future researchers may try to access data from reliable databases. (2) The study used data only for 10 years. Future researchers may use data over a larger period of time like 25 years. (3) The study used data only from five countries and from only 25 companies of each country. Future researchers may use more cross sections, more countries with more number of companies. (4) The study used only four proxies of firm size which were felt most important. There are other proxies available too which were not studied. Researchers in future may use any other proxies of firm size. A comprehensive study of all possible firm size measures may be conducted. (5) Study used only seven major practices of corporate finance. There can be many other practices as corporate finance is a vast field. Researchers in future may study the sensitivity of firm size measures on any other practices of corporate finance. (6) Study used sign, significance and R^2 sensitivity. There may be software or techniques for measuring sensitivity. Future researchers may use them. (7) Study used dummy variable for dividend policy. Future studies may use dividend payout ratio to measure dividend policy.

Abbreviations

BRICS: Brazil, Russia, India, China and South Africa; CAPEX: Capital expenditure; FL: Financial leverage; MVE: Market value of equity; OLS: Ordinary least square; RBV: Resource-based view; ROA: Return on assets; ROE: Return on equity.

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Authors contributions

This paper is from Masters' dissertation of author SDH. Authors SG and ZG are supervisors of author SDH. SDH conceptualized, designed and drafted the study, ZG provided data for the study, and SG finalized the manuscript. IN helped in review stage and addressed the reviewers' comments. All authors read and approved the final manuscript.

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Availability of data and materials

Data from open sources like annual reports of companies was extracted. Data used in the study can be provided/ uploaded by the corresponding author where required. List of companies can also be provided. The data has not been used from any data stream as they were not accessible to the authors. All data is available in annual reports of the companies used in the study and on websites like Morningstar.com.

Competing interests

Authors declare that there are no competing interests.

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