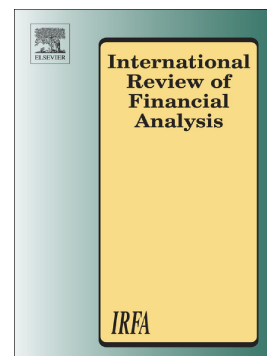


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# **Corporate Investment Efficiency: The Role of Financial Development in Firms with Financing Constraints and Agency Issues in OECD Non-Financial Firms**

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## **Corporate Investment Efficiency: The Role of Financial Development in Firms with Financing Constraints and Agency Issues in OECD Non-Financial Firms**

### **Abstract**

Corporate investment in firms deviates from optimal level due to financing and agency issues. Managers of the affected firms trap into over- or under-investment causing investment inefficiencies. Earlier research fails to address the ramifications of financial development on over- and under-investment of firms. This study tries to fill this gap. Analyzing an annual unbalanced panel dataset of non-financial firms in 35 OECD member countries from 1990 to 2015, our empirical results show that 1) financial development has a positive impact on corporate investment; and 2) for a one standard deviation increase in financial development, it can help to increase investment efficiency by 0.423 percent for under investing firms (mostly due to financing constraints), and to reduce investment inefficiency in firms that are currently over investing (mostly due to agency issues) by 0.902 percent. When economic growth is taken into consideration, financial development is most effective on improving investment efficiency for both under- and over-investment firms in countries with high GDP growth rates. Overall, these findings suggest that monitoring and financing mechanisms of financial development have positive implications on corporate investment efficiency. Our findings are robust to alternative specifications.

**Keywords:** Corporate investment; Under-investment; Over-investment; Financial development; OECD.

**JEL classification:** C33, G31, G34, O16, O43.

## 1. Introduction

Investment in good capital projects brings additional value to the firm and it is rational for managers to pursue as many value-maximizing investment opportunities as available. But, scarce resources available to firms render a limit to this possibility of indefinite investments. Managers have discretionary powers to assign funds among competing investment projects. Funds, if, allocated in an efficient manner, inculcates corporate investment efficiency which leads to sustainable profitability and growth for the firms. Since future of a firm depends on its investment efficiency, it is presumed that firm resources will be used in a best possible way and with minimum wastage.

Ideally, fiduciary duty of managers conforms them to critically evaluate investment projects and choose only those that enhance corporate value. However, prior research show that managers do not always allocate resources efficiently (Jensen, 1986; Jensen & Meckling, 1976). Managers have the tendency to waste funds by either, over-utilizing funds in valueless projects, or, under-utilizing them by withholding investments despite the existence of profitable opportunities. This over- and under-utilization of funds impedes investment efficiency. Love (2003) and Castro et al. (2015) suggest that higher financial development should increase investment efficiency by reducing financing constraints in a firm. Their finding leads to a further question whether higher financial development is linked with a decrease in either under-investment or over-investment. In this regard, our study aims to find empirical evidence to demonstrate the association between financial development and corporate investment efficiency. Our results show that through fixing both under-investment and over-investment problems, improvement in financial development is conducive to investment efficiency.

Understanding the main reasons that cause investment inefficiency will help to formulate policies that can address the problem. Various factors contribute to this anomaly.\* These factors can broadly be classified as; 1) internal factors, which are within the domain of managerial influence; and 2) external factors, which are generally beyond the control of managerial ambit. Under the perfect-capital-market hypothesis of Modigliani and Miller (1958), in the presence of frictionless markets, it is irrelevant whether a firm finances its investments from internal or external sources. However, due to the existence of imperfect capital markets and information asymmetries between different stakeholders, firms are not

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\* Shleifer and Vishny (1997) provide an extensive survey on these factors.

treated equally in capital markets. Indeed, some firms are more creditworthy for lenders and they are willing to extend credit at lower rates than to less-creditworthy firms (Cole, 1998; Diamond, 1984). Firms that face difficulty in obtaining financing from financial markets at attractive rates (or sometimes fail to obtain funding at any rates at all) are considered as 'financially constrained firms'. Fazzari et al. (1988) point out that financially constrained firms frequently have to rely on internally generated funds for investments. Inclusion of debt in capital structure enables firms to leverage their potential with limited capital amount. Due to the inability to raise debt externally, and when internal funds are scarce, some firms are unable to invest in many positive Net Present Value (NPV) projects and must forgo profitable growth opportunities. Incapability of getting funds competitively in the external markets together with finite internal funds, hinder firm growth. Such firms consequently face the issue of under-investment.

Despite a strong support in literature claiming that financing cost is the main determinant of investment decisions, Kaplan and Zingales (1997) argue that financing cost is not the only driver for investment decisions. They posit that managers choose costly financing even when cheaper financing options are readily available. The conscientious choice of costly options for investments suggests a conflict of interest between managers and shareholders. This conflict is encompassed by the Agency Theory as stipulated by Jensen and Meckling (1976). Some major causes of conflict of interest between owners and managers, with respect to investment, are: empire building preferences (Jensen, 1986), short-termism (Bebchuk & Stole, 1993; Stein, 1989), own career concerns (Holmström, 1999) and overconfidence (Malmendier & Tate, 2005). These conflicts are often discerned by over investment of firms' resources in unprofitable projects that subsequently causes a fall in firm value. Hence, in the presence of agency issues, financing constraints are not the only factors that lead to investment inefficiency, over-investment also weakens investment efficiency by wasting firms' resources owing to misalignment of principal-agent interests. This study shares Zhang et al. (2016)'s definition of investment efficiency which refers to the situation where the degree of over-investment and under-investment in firms are reduced from previous years. Alternatively, investment inefficiency arises when over-investment and under-investment are kept unchecked.

It has been observed that financing constraints and agency issues are more prominent in economies which have less-developed capital markets, fewer numbers of financial institutions, less stringent laws and regulations, and ineffective monitoring and transparency

mechanisms (King & Levine, 1993a; La Porta et al., 1998; Levine, 2005). Since, these characteristics are largely the constituents of a country's financial structure; it implies that financing and agency problems faced by firms will be less prevalent in countries which make advancement towards financial development. According to Levine (2005), financial development involves a set of financial system (e.g. banks, capital markets, banking laws and regulations) that mainly plays a role in reducing barriers to financing, providing monitoring mechanisms and lowering cost of acquiring financial information.

Financial development could impact corporate investment in various ways. For instance, financial development helps to channel capital from suppliers to users more smoothly, thus mitigating the financing constraints faced by firms. Brown and Petersen (2009) find that firms, including the smaller ones who are most likely to be financially constrained, are able to raise funds with less friction through equity financing in developed financial markets. Levine (2005) argues that large number of financial intermediaries operate in countries with high level of financial development means more funds suppliers are available to provide funds which reduces the cost of financing due to increase in competition among lenders.

Love (2003) highlights that improvement in financial development addresses information asymmetries between funds suppliers and funds seekers, which helps to reduce the financing constraints in a firm. In sum, through improvement in financial markets, financial development could have an impact on investment efficiency of firms by providing greater availability of fund suppliers, thus lessening its financing constraints; and reducing information asymmetries between fund users. Based on these conjectures, this study predicts that financial development will address the under-investment issue in firms that are financially constrained. Furthermore, financial development aids to improve efficient allocation of funds through proper evaluation and monitoring mechanisms. Expropriation of funds by firm managers are less likely in countries with developed financial systems as monitoring of managers is more effective in such countries (Levine, 2005; Masahiro et al., 2018). Developed financial markets have a large number of formal and informal institutions who regularly monitor and evaluate corporate actions. These institutions ensure that a publicly traded company adheres to the high standards of transparency and corporate responsibility. This eliminates the need for individual monitoring by small investors which stimulates investors' confidence. Proper monitoring ensures that firms' resources are not wasted on investment in dubious projects. Therefore, it is plausible that improvements in

financial development mitigate the over-investment issue faced by firms. Based on this premise, this study expects that financial development will alleviate the over-investment problem that is caused by agency issues.

This study contributes to the existing literature in two major ways. Firstly, a newly constructed over-investment measure is used in the study. Previous studies on over-investment are mostly based on firms' cash flow and leverage conditions. We maintain that firm size is an important determinant of over-investment in firms. Researchers, such as Almeida and Campello (2007) and Hadlock and Pierce (2010), also stress the importance of firm size in gaining easy access to external funding. Therefore, the exclusion of firm size can affect the unbiased categorization of firms that are more prone to over-investing. Secondly, we extend the literature on financial development and investment efficiency. Guariglia and Yang (2016) show that financing and agency issues cause under- and over-investment in firms respectively, while, Castro et al. (2015) and Khan et al. (2017) find that financial development affect investment decisions of firms. We extend this line of investigation by adding insights into how investment efficiency is improved through the various aspects of financial development, i.e. how it addresses under-investment, over-investment or both problems. Moreover, with the advancement in the financial structure of a country, we unravel how financing and agency issues are being rectified. This is an area with limited prior research.

This study utilizes a Fixed Effects analysis on an unbalanced panel of 11,015 non-financial listed firms in the 35 OECD member countries over the period 1990 -2015 collected annually. Through the testing of three hypotheses, our results suggest that 1) financial development has a positive and significant impact on corporate investment, 2) financial development helps to mitigate the under-investment issue in financially constrained firms, and 3) financial development helps to address over-investment problem in firms that are facing agency issues. Our findings propose that these positive effects of financial development on corporate investment decisions are achieved through its monitoring and financing mechanisms. Checks for robustness are performed through alternative specifications and our findings remain mostly unchanged.

## **2. The Three Hypotheses**

We perform our investigation progressively through the testing of three hypotheses. The first hypothesis aims to establish a general relationship between financial development and

corporate investment, it is then followed by two further hypotheses that investigate how financial development mitigates financial inefficiencies that are instigated by financial constraints and agency problems individually.

### 2.1. Financial Development and Corporate Investment

Rajan and Zingales (1998) find that financial development reduces the financing costs of a firm, which has positive implications for firm growth. Financial development can also impact corporate investment through other means such as, by lowering transactions costs, by channeling savings to the firms, enhancing innovative activities, and removing the barriers to exchanges of transactions (Hsu et al., 2014; Levine, 2005). This study predicts that, besides addressing investment inefficiencies as discussed later on, as a whole, corporate investment of firms will increase in an economy with the progress in the financial development of a country. Hypothesis 1 of the study tests this notion:

***Hypothesis 1 (H1). Overall, financial development increases level of corporate investment in a country.***

### 2.2. Financial Constraints, Investment Efficiency, and Financial Development

Financial condition of a firm is initially overlooked in the literature since it is assumed that in a market without frictions and information asymmetry problems, it is irrelevant how an investment project is financed (Modigliani & Miller, 1958). This assumption implies that the difference in financing costs between internal and external sources is trivial. However, when the perfect market assumption is relaxed, it is realized that the financial condition of a firm becomes an important deliberation while undertaking investment decisions (Myers, 1977; Myers & Majluf, 1984).

Fazzari et al. (1988) (hereinafter FHP) also point out that the financial condition of a firm determines how its investment projects are financed. They find that firms that have difficulty in obtaining external funding (financially constrained firms), use internal cash flows to pursue their investment goals. Other studies (e.g., Campello et al., 2010; Guariglia, 2008; Hubbard, 1998; Kashyap et al., 1994; Mulier et al., 2016; Whited, 1992) find consistent support for FHP and maintain that the dearth of resources, especially externally, is a reason which results in the distortion of investment decisions. FHP's proposition suggests that firms that face obstacles in obtaining external financing will look inwardly to meet investment requirements. Since, these internal resources are limited; it is not possible for firms to exploit



all investable opportunities. Thus, the inability to raise external financing at low capital costs precludes firms to achieve investment efficiency. Investment deficiency in this case can be termed as ‘under-investment’ which has adverse effects on a firm’s future value. Based on this premise, it is assumed that firms will suffer from under-investment when faced with financial constraints.

Inasmuch, under-investment as a form of investment inefficiency mainly due to the difficulty in raising external finances from outside sources; financial development in a country can tackle the issue by reducing the frictions and barriers faced by firms in obtaining external financing, vis-à-vis, financial development induces investment efficiency by easing the financial burden of financially constrained firms.

Love (2003) analyses the association between investment efficiency and financial development and observes that financial development improves investment efficiency by reducing financing constraints in firms. Financial development largely imparts its benefits of removing financing constraints through development in capital markets and the banking sector. Improvements in financial markets reduce frictions for firms to finance their investment projects through banks loans and equity-financing. Demirgüç-Kunt and Maksimovic (1998) show that in countries with high legal and financial development, because of an increase in competitions among banks, long-term loans become more attractive to firms. Brown and Petersen (2009) empirically investigate investment-cash flow sensitivity and equity markets development, and find that this sensitivity has diminished over time, indicating an improvement in the financial condition of a firm. They suggest that development in equity markets is a reason for the decline in the degree of financing constraints of firms. Marcellin and Mathur (2014) also highlight that financing costs are low in countries with strong legal and financial institutional base. These prior studies indicate that financial development has positive implications for financially constrained firms. Therefore, it is reasonable to expect that financial development will help to lessen the difficulties experienced by firms which are financially constrained and are under-investing, hence, an inverse relationship is likely to be observed. Based on this conjecture, we predict a second testable hypothesis as follows:

***Hypothesis 2 (H2). Financial development reduces investment inefficiency by negatively impacting under-investment in financially constrained firms.***

### 2.3. Agency Issues, Investment Efficiency, and Financial Development

Agency Theory stipulates the conflict of interest between managers (agent) and shareholders (principal); where the agent, who have a control over firms' resources will work for their self- interest at the expense of the principal (Jensen & Meckling, 1976). Stein (2003) highlights agency issues between different stakeholders that cause investment inefficiencies. He suggests that the dominant role of agency theory in affecting investment decisions is through promoting over-investment in the firm. These underlying agency issues include empire building, overconfidence, career motives, herding behavior and short-termism (e.g. Bebchuk & Stole, 1993; Holmström, 1999; Jensen, 1986; Malmendier & Tate, 2005).<sup>†</sup> In particular, almost all of these agency issues lead to over-investment by managers thereby inflicting investment efficiency in a negative way. Although, it is difficult to directly measure the existence and intensity of agency problems that cause over-investment in firms, a number of researchers have documented evidences predominantly linking the presence of high level of free cash flow with over-investment (such as, Bates, 2005; Blanchard et al., 1994; Guariglia & Yang, 2016; Jensen, 1986; Richardson, 2006, among others). Based upon agency theory, it is probable that firms that are facing agency problems will over-invest their resources in projects with or without justifiable returns.

It has been suggested that the underlying cause for agency issues is due to a failure of corporate governance in firms (Shleifer & Vishny, 1997). Corporate governance concerns are also translated into financial market misconducts which exacerbate agency issues (see Cumming et al., 2017 for an overview). Financial development can help to re-align the goals of different stakeholders by reinforcing effective corporate governance mechanism. This is because; through advancement in the banking and stock market sectors, financial development can enhance the monitoring and transparency mechanisms. Masahiro et al. (2018) also point out that earning managements in firms are reduced with increase in the financial development of a country.

The role of banks in monitoring managers and thereby firms cannot be undermined. Since some shareholders are generally unable to understand financial information, they regularly rely on others to analyze and monitor firms. Beck and Levine (2004) maintain that, even if these investors have the expertise to comprehend and study complex data, they are still at the mercy of managers who control the flow of information. Banks come to the rescue in such

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<sup>†</sup> Although, short-termism can also lead to under-investment as suggested by Stein (1989). Another agency issue which is also linked with under-investment is risk aversion as indicated by Lambrecht and Myers (2017).

case as they have incentives and capabilities to suitably monitor the actions of managers. The survival of banks is much dependent upon the loans they extend to customers, thus, banks closely monitor managers to assess the sustainability of firms. Hoshi et al. (1990, 1990b) also empirically provide evidence about the importance of this intermediation in monitoring managers and the resultant reduction in agency issues. Similarly, Qian and Yeung (2015) find that corporate governance practices of firms can be badly affected when banks fail to effectively monitor them.

In some instances when bank monitoring is ineffective, capital markets can offer remedial functions. Wurgler (2000) finds that development in financial markets helps to curb agency issues of over-investment and improve allocation of capital. He notices that in countries with high financial development, firms allocate resources efficiently and increase (decrease)<sup>‡</sup> investment in growing (declining) industries. This efficient allocation is due to the reduction in information asymmetries and the increase in protection of investors in financial developed countries. Moreover, Boyd and Smith (1998) illustrate that banks and the equity markets support each other and financial development is achieved through the co-evolution and development in both sectors.

Studies noted thus far demonstrate that development in both banking and stock markets renders effective monitoring and controlling mechanisms. These functions of financial development have positive ramifications for improving investment efficiency by reducing agency problems. Therefore, it is expected that firms that are over-investing will cut their investment spending as financial development occurs. Accordingly, this study predicts that:

***Hypothesis 3 (H3). Financial development reduces investment inefficiency by negatively impacting over-investment in firms that have agency issues.***

Figure I summarizes the background of our three testable hypotheses. The diagram shows that *ceteris paribus* financial constraints and agency issues contribute to the problem of investment inefficiency. Financial constraint issues are most likely to bring on under-investment in firms whereas; agency problems foster managers to over-invest. With a low level of financial development, the under-investment and over-investment problems will lead to investment inefficiency. Financial development in a country can address investment inefficiency in firms through its financing and monitoring functions. Financial development

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<sup>‡</sup> Lambrecht and Myers (2007) provide a useful theoretical and empirical study on the reasons for disinvestment in declining industries.

also impacts corporate investment through other means such as; by lowering transactions costs, channeling savings to the firms, enhancing innovative activities, and removing the barriers to exchanges of transactions.

[insert Figure 1 here]

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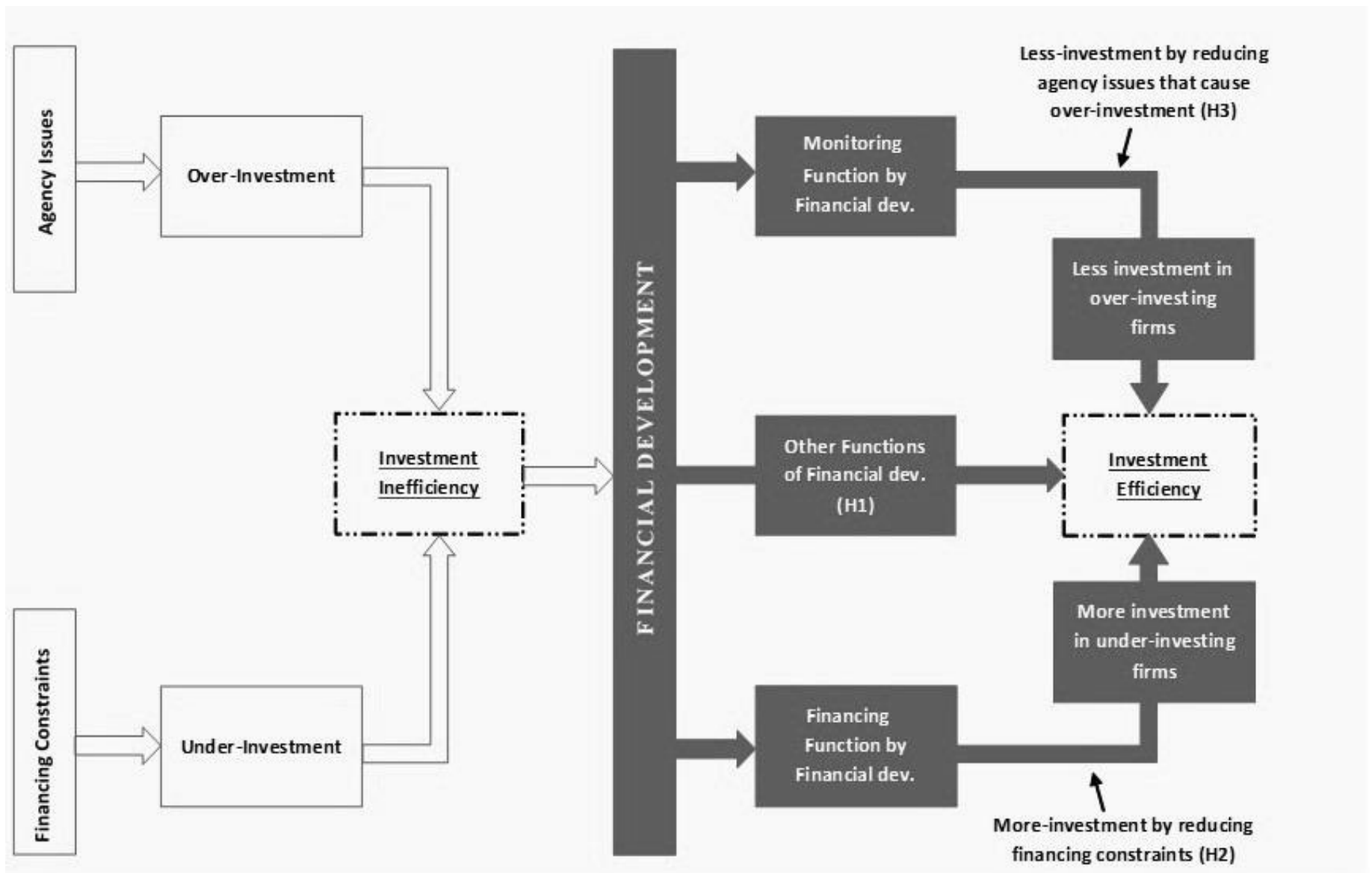


Figure I. Conceptual Framework

### 3. Research Design

#### 3.1. Over-Investment – A New Measure

An improved measure of over-investment is constructed in this study. Biddle et al. (2009) employ a ranking variable based on the amount of cash flow and level of debt of firms to measure the likelihood of over-investment. They suggest that firms which have higher amount of cash and low level of debt are prone to over-investing. This is because; a control over higher amount of cash flow coupled with lower debt saturation tempts managers to pursue their own agendas which results in over-investment. In the similar vein, lower values of this ranking variable could be taken as a proxy for under-investment.

Intuitively, this variable used in Biddle et al. (2009) depends upon the accessibility of external funds. Lower amount of debt and higher amount of cash flow improves the capacity of firms to obtain funding from external markets at attractive rates. For that, bigger firms are generally favored over smaller firms in the external markets. Almeida and Campello (2007) stress the importance of firm size in gaining an easy access to the external markets for funding requirements. They suggest that bigger firms have greater accessibility to financing sources than smaller ones. Similarly, Hadlock and Pierce (2010) also argue that financial accessibility is difficult to measure when firm size is ignored.

Moreover, small firms, which have huge amount of cash flows and low level of debt, can be termed as over-investing firms by Biddle et al. (2009). We believe that this cannot be necessarily true, as small firms have extensive growth opportunities can invest aggressively without being indulging in over-investment. Although, is likely to capture over-investment tendencies in firms, financing availability and growth opportunities owing to firm size can affect the unbiased categorization of firms based only on cash flow and leverage amount. Ranking of firms solely on the basis of cash and debt can overstate the probability of over-investment in such firms and it can potentially lead to biased measurements of over-investment. Therefore, we propose that firm size, which is measured by the amount of total assets, can resolve the issue by placing bigger firms in categories that are likely to over-invest. Our new measure is expected to be robust, as at one end, it will be unbiased for small firms, and on the other, it can also account for bigger firms appropriately. Therefore, our measure considers that CEOs, who are managing larger firms, and have large amount of cash and low level of debt at their disposal, are more prone to involve in

over-investment activities than otherwise. In sum, our new construct *Over\_investment* is based on the values of three firm level variables, i.e., cash holdings, amount of debt and firm size. Firms that score high on these three variables are more likely to over-invest and vice versa.

### 3.2. Model Specifications

The three hypotheses developed in this study are tested through the use of three equations.

#### Corporate investment and financial development

The relationship between corporate investment and financial development of a country as outlined in H1 is estimated by the following regression equation:

$$\begin{aligned}
 Corp\_investment_{i,t} = & \alpha + \beta_1 Fin\_development_{c,t-1} + \beta_2 Cash_{i,t-1} + \beta_3 Sales_{i,t-1} + \beta_4 Fin\_leverage_{i,t-1} \\
 & + \beta_5 Firm\_size_{i,t-1} + \beta_6 Tangibility_{i,t-1} + \beta_7 TobinQ_{i,t-1} + \beta_8 Slack_{i,t-1} + \beta_9 Loss_{i,t-1} \\
 & + \beta_{10} Dividend_{i,t-1} + \varepsilon_{i,t}
 \end{aligned} \tag{1}$$

In Eq. (1), the subscripts  $c$ ,  $i$  and  $t$  denote country, firm and year respectively. Dependent variable *Corp\_investment* is the amount of corporate investment of a firm and is measured as the ratio of capital expenditures to the beginning of year total assets and multiplied by 100. Independent variable *Fin\_development* represents financial development of a country and is measured as a standard deviation of sum of credit provided by banks and stock market capitalization to the GDP. Consistent with previous studies, e.g., Biddle et al. (2009) and Guariglia and Yang (2016), a set of control variables are also included in the model. *Cash* is the amount of cash and cash equivalents of a firm divided by lagged total assets. *Sales* is the sales revenue of a firm divided by lagged total assets. *Fin\_leverage* is the sum of long-term debt and short-term debt and divided by lagged total assets. *Firm\_size* is measured by the market capitalization of a firm divided by lagged total assets, while; *Tangibility* is the ratio of property, plant and equipment to lagged total assets. *TobinQ* is computed as the market-to-book ratio of assets and measures the growth opportunities of firms. We also control for other firm characteristics such as financial slack, loss and dividends after Myers and Majluf (1984). They suggest that firms with higher financial slack, no *ex ante* loss and higher dividend are able to invest more than their counterparts. Hence, *Slack* measures the financial slackness of the firm and is a ratio of cash to property, plant, and equipment, *Loss* is a dummy variable that takes the

value of ‘1’ if the earnings before extraordinary items are negative and zero otherwise, and, *Dividend* is also a dummy variable which takes the value of ‘1’ when a firm pays a dividend or else zero. Finally,  $\varepsilon_{i,t}$  is idiosyncratic error term. To alleviate the potential simultaneity problem, we lag all our independent variables. Description of variables together with their expected directions of relationship with the dependent variable are presented in Table 1.

### 3.3. Investment Efficiency and Financial Development

The relationship between investment efficiency and financial development is investigated in multiple ways. Both H2 and H3 are firstly examined through the use of Eq. (2), which is adapted after Biddle et al. (2009). H2 is then further analyzed by dividing the sample according to the Kaplan and Zingales index (KZ index), while H3 utilizes a methodology of Richardson (2006) and Guariglia and Yang (2016) to verify the hypothesized relationship. The two different methods are used according to how the hypotheses are constructed. We use KZ index due to two reasons; a) it is the most cited measure of financial constraints in the literature according to google scholar citations, and b) KZ index employs the same concept of identifying constrained firms that is close to our study. KZ index identifies firms as financially constrained that have less cash and high leverage, while Whited and Wu (2006) and Hadlock and Pierce (2010) indexes classify firms as constrained that are characterized by less leverage, are younger and smaller (Farre-Mensa & Ljungqvist, 2016). Details of the KZ index and Richardson’s model are presented in Appendix A.

H2 and H3: Eq. (2)

$$\begin{aligned}
 Corp\_investment_{i,t} = & \alpha + \beta_1 Fin\_development_{c,t-1} + \beta_2 Fin\_development_{c,t-1} \times Over\_investment_{i,t} \\
 & + \beta_3 Cash_{i,t-1} + \beta_4 Sales_{i,t-1} + \beta_5 Fin\_leverage_{i,t-1} + \beta_6 Firm\_size_{i,t-1} \\
 & + \beta_7 Tangibility_{i,t-1} + \beta_8 TobinQ_{i,t-1} + \beta_9 Slack_{i,t-1} + \beta_{10} Loss_{i,t-1} \\
 & + \beta_{11} Dividend_{i,t-1} + \varepsilon_{i,t}
 \end{aligned} \tag{2}$$

All variables except *Over\_investment* have been explained previously. *Over\_investment* is a ranking variable based on the values of cash flow, debt and assets. This variable has a value between 0 and 1 with higher values are associated with the likelihood of over-investing. Firms that have abundance amount of cash and total assets, but low-levels of debt are assigned higher



rankings in this *Over\_investment* variable. This is because such firms not only have huge amount of internal resources at their disposal, but also have better accessibility to external financing, thus more likely to over-invest.

It is predicted that financial development will increase (decrease) corporate investment in firms that are under-investing (over-investing).  $\beta_1$  and the sum of  $\beta_1$  and  $\beta_2$  will indicate the impact of financial development on corporate investment of firms conditional on the values of the *Over\_investment* variable.

$\beta_1$  in Eq. (2) captures the relationship between corporate investment and financial development when *Over\_investment* equals to zero, i.e. when under-investment is most likely. Therefore, it is predicted that  $\beta_1$  will be positive and significant, which signals financial development helps to ease the financing burden of financially constrained firms, therefore more corporate investment.

As *Over\_investment* is an incremental variable with values ranging between 0 and 1, the sum of  $\beta_1$  and  $\beta_2$  is expected to be negative when *Over\_investment* equals to 1 (i.e., over-investment is most likely). Furthermore, due to an anticipated increase in monitoring, as a result of financial development, it will lessen agency issues in firms which should reduce over-investment in them. Therefore, it is expected that the sum of these two coefficients will be negative and significant when over-investment is most likely (such that  $\beta_1 + \beta_2 < 0$ ). Intuitively, it is predicted that  $\beta_2$  will also have a negative and significant impact on determining *Corp\_investment*.

Eq. (1) and Eq. (2) are estimated by the panel Fixed Effects and Random Effects models. Hausman test is applied to select a suitable estimation technique between these two models. The significant value of Hausman test suggests that Fixed Effects model is the more appropriate one to utilize. We control for country, firm and year fixed effects to address the differences of macro-economic variability among countries, global shocks in a year and firms' individual differences. This approach also largely addresses a potential impact of financial crisis on our analysis. Moreover, robust standard errors are clustered at country level and are calculated to account for heteroscedasticity, auto-correlation and serial-correlation (Petersen, 2009). Additionally, as suggested by Guariglia and Yang (2016), lagged values of the regressors are used in the

estimations to remove the influence of simultaneity. Table 1 presents a summary description of variables.

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Symbol	Description	Measurement	Expected Relationship
<b>Dependent variable</b> <i>Corp_investment</i>	Corporate investment	Capital expenditures (Capex) divided by lagged total assets and multiplied by 100.	
<b>Independent variables</b>			
* <i>Fin_development</i>	Financial development of a country	Sum of credit by banks and stock market capitalization divided by GDP.	+
<i>Over_investment</i>	Firms that are more likely to overinvest	Ranking variable with values between 0 and 1 and is based on high-cash, high assets and low-debt value.	-
* <i>Bank_development</i>	Development of a bank	Private credit by banks divided by GDP.	+
* <i>Stock_development</i>	Development of a stock market	Stock market capitalization divided by GDP.	+
<b>Control variables</b>			
<i>Cash</i>	Cash	Cash and cash equivalents of firms divided by lagged total assets.	+
<i>Sales</i>	Sales revenue of a firm	Net sales revenue divided by lagged total assets.	+
<i>Fin_leverage</i>	Financial leverage of a firm	Sum of long-term debt and short-term debt and divided by lagged total assets.	-
<i>Firm_size</i>	Size of a firm	Market capitalization to the lagged total assets value of a firm.	+
<i>Tangibility</i>	Tangibility of a firm	Ratio of property, plant and equipment to the lagged total assets.	+
<i>TobinQ</i>	Tobin's Q	Market value of assets divided by book value of assets, calculated as shares outstanding $\times$ price – deferred taxes/total assets.	+
<i>Slack</i>	Financial slack	Ratio of cash to lagged property, plant and equipment value.	-
<i>Loss</i>	Loss incurred by firm	A dummy variable with the value of one if income before extraordinary items is negative, zero otherwise.	-
<i>Dividend</i>	Dividend paid by firm	A dummy variable with the value of one if a firm pays dividends, zero otherwise.	+

\*Variables measured in terms of standard deviation.

All other control variables except *Loss* and *Dividend* are measured as ratios.

Data source: World Bank Financial Structure Dataset and Datastream.

**Table 1. Variable Definition and Expected Relationship**

H2: Eq. (3)

H2 is further confirmed by dividing the sample according to the Kaplan and Zingales (KZ) index. The KZ index is developed by Lamont et al. (2001) by using the dataset of Kaplan and Zingales (1997). The index employs different accounting measures to gauge the level of financial constraints faced by the firms. Higher values are attributed to firms that are financially constrained and, hence, having obstacles in raising financing, and are likely to under-invest. H2 predicts that the financial condition of a firm is expected to improve in parallel with developments in the financial system of a country. It is, therefore anticipated that firms in the upper quartiles as per KZ index (i.e. financially constrained firms) will exhibit a positive relationship with corporate investment in the presence of financial development. To test this prediction, Eq. (2) is modified and becomes Eq. (3) as follows:

$$\begin{aligned}
 Corp\_investment_{i,t} = & \alpha + \beta_1 Fin\_development_{c,t-1} + \beta_2 Fin\_development_{c,t-1} \times Fin\_constraints_{i,t} \\
 & + \beta_3 Cash_{i,t-1} + \beta_4 Sales_{i,t-1} + \beta_5 Fin\_leverage_{i,t-1} + \beta_6 Firm\_size_{i,t-1} \\
 & + \beta_7 Tangibility_{i,t-1} + \beta_8 TobinQ_{i,t-1} + \beta_9 Slack_{i,t-1} + \beta_{10} Loss_{i,t-1} \\
 & + \beta_{11} Dividend_{i,t-1} + \varepsilon_{i,t}
 \end{aligned} \tag{3}$$

Where, *Fin\_constraints* represents firms' financial constraints and is based on KZ index<sup>4</sup> value of more than and equal to the median value which is -2.37 (un-tabulated). All other variables have been defined previously. It is expected that the sum of coefficient of *Fin\_development* ( $\beta_1$ ) and interaction term *Fin\_development* × *Fin\_constraints* ( $\beta_2$ ) will be positive and significant such that  $\beta_1 + \beta_2 > 0$ . Fixed Effects estimators are obtained for Eq. (3) with robust standard errors.

H3: Eq. (4)

A methodology of Richardson (2006) and Guariglia and Yang (2016) is used to confirm the findings of H3. By predicting the amount of cash flow that are beyond the levels necessary for undertaking and pursuing positive NPV investment projects, Richardson (2006) develops a model to measure agency cost which causes over-investment.

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<sup>4</sup> The construction of KZ index is describe in Appendix A.

To analyze the relationship between over-investment and financial development of a country, our sample is divided according to free cash flow and abnormal investment. Firms that have positive values of these two cases represent the situation of excess free cash flow and over-investment. In our sample, 8,236 firms meet this criterion. The following equation is used to confirm the earlier findings of the H3:

$$\begin{aligned}
 Abn\_investment_{i,t} = & \alpha + \beta_1 Fin\_development_{c,t-1} + \beta_2 Fin\_development_{c,t-1} \times Free\_CF_{i,t} \\
 & + \beta_3 Cash_{i,t-1} + \beta_4 Sales_{i,t-1} + \beta_5 Fin\_leverage_{i,t-1} + \beta_6 Firm\_size_{i,t-1} \\
 & + \beta_7 Tangibility_{i,t-1} + \beta_8 TobinQ_{i,t-1} + \beta_9 Slack_{i,t-1} + \beta_{10} Loss_{i,t-1} \\
 & + \beta_{11} Dividend_{i,t-1} + \varepsilon_{i,t}
 \end{aligned} \tag{4}$$

Where, *Abn\_investment* is the unexpected investment and *Free\_CF* is the amount of free cash flow.<sup>5</sup> All other variables are defined previously. Both *Abn\_investment* and *Free\_CF* have values greater than zero. Again, the findings of H3 will be consistent if the sum of coefficients of *Fin\_development* ( $\beta_1$ ) and its interaction term *Fin\_development* $\times$ *Free\_CF* ( $\beta_2$ ) is found to be negative and significant (i.e.  $\beta_1 + \beta_2 < 0$ ). We again use fixed effects estimators with robust standard errors for Eq. 4.

#### 3.4. Sample and Descriptive Statistics

35 member countries in ‘The Organization for Economic Co-operation and Development’ (OECD) are selected for this study.<sup>6</sup> The dataset includes a rather comprehensive set of industrial countries that will provide important insights while analyzing the impact of financial development in affecting investment efficiency than focusing on a single country like the US. Further, information collected from the OECD countries could offer more reliability to statistical analysis. The main data sources are Datastream and World Bank Financial Structure Dataset. Data about financial variables is collected from Datastream, while, macro-data is collected from World Development Indicators (WDI) published by the World Bank Financial Structure Dataset.

We exclude financial firms (SIC codes ranging from 6000 to 6999) from the data as financial firms have different accounting measures and the nature of their investment is different. Our

<sup>5</sup> The measurement of *Abn\_investment* and *Free\_CF* are explained in detail in the Appendix A.

<sup>6</sup> Dataset consists of all member countries as on January 2018. Lithuania joined the OECD afterwards on July 5, 2018. List of countries is provided in Table A1 of Appendix A.

final dataset involves an unbalanced panel of 11,015 non-financial listed firms through 1990 to 2015 as the data beyond these years are not available for most countries. We collected the data on annual basis and all variables are winsorized at the 1<sup>st</sup> and 99<sup>th</sup> percentiles to mitigate the effect of outliers.

Table 2 presents descriptive statistics of all the variables used in this study.<sup>7</sup> *Corp\_investment* has a mean and median value of 6.86 percent and 3.98 percent respectively, and a standard deviation of 9.24, which is the highest following *Slack*, and it infers a relatively large fluctuation in firm investments. The mean value of *Corp\_investment* suggests that listed firms in the OECD countries are investing, on average, at the rate of seven percent of the total assets. These values are consistent with Julio and Yook (2012) for a set of international countries. *Fin\_development* offers us a total of 443,613 observations which is the largest amongst all variables. It measures the sum of banking development and stock market development in a country, and its minimum and maximum values are 4.89 and 11.02 respectively. Since our sample encompasses 35 OECD countries, a standard deviation of 1.07 for *Fin\_development* shows that changes in the financial systems of these countries have remained rather stable during our sample period.

[insert Table 2 here]

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<sup>7</sup> The correlation matrix is provided in Table A2 of Appendix A.

	Obs.	Mean	S.D.	Min	P25 <sup>th</sup>	Median	P75 <sup>th</sup>	Max
<i>Corp_investment</i>	220,970	6.86	9.24	0.05	1.74	3.98	8.11	81.77
<i>Fin_development</i>	443,613	9.31	1.07	4.89	8.72	9.57	10.08	11.02
<i>Over_investment</i>	193,129	0.28	0.13	0.00	0.18	0.28	0.37	0.72
<i>Cash</i>	233,218	0.21	0.31	0.00	0.05	0.11	0.25	1.50
<i>Sales</i>	224,422	1.14	0.81	0.00	0.60	1.00	1.49	5.08
<i>Fin_leverage</i>	198,310	0.27	0.23	0.00	0.11	0.24	0.39	1.09
<i>Firm_size</i>	229,292	12.26	2.38	5.55	10.69	12.35	13.91	17.79
<i>Tangibility</i>	229,452	0.32	0.20	0.00	0.12	0.28	0.49	1.09
<i>TobinQ</i>	161,934	0.97	0.95	0.04	0.36	0.67	1.21	6.65
<i>Slack</i>	241,234	2.30	5.85	0.00	0.13	0.43	1.49	50.10
<i>Loss</i>	257,360	0.26	0.44	0.00	0.00	0.00	1.00	1.00
<i>Dividend</i>	239,621	0.55	0.50	0.00	0.00	1.00	1.00	1.00

The table describes descriptive statistics of winsorized data at 1<sup>st</sup> and 99<sup>th</sup> percentiles. *Corp\_investment* is measured as a ratio of capital expenditures to the beginning of year total assets and multiplied by 100. Independent variable *Fin\_development* is measured as a standard deviation of sum of credit provided by banks and stock market capitalization to the GDP. *Cash* is the amount of cash and cash equivalents of a firm divided by lagged total assets. *Sales* is the sales revenue of a firm divided by lagged total assets. *Fin\_leverage* is the sum of long-term debt and short-term debt and divided by lagged total assets. *Firm\_size* is measured by the market capitalization of a firm divided by lagged total assets, while; *Tangibility* is the ratio of property, plant and equipment to lagged total assets. *TobinQ* is computed as the market-to-book ratio of assets and measures the growth opportunities of firms. *Slack* measures the financial slackness of the firm and is a ratio of cash to property, plant, and equipment. *Loss* is a dummy variable that takes the value of '1' if the earnings before extraordinary items are negative and zero otherwise. *Dividend* is also a dummy variable, which takes the value of '1' when a firm pays a dividend or else zero. Description of variables are presented in Table 1.

**Table 2. Descriptive Statistics**

## 4. Empirical results

4.1. *H1: Overall, financial development improves level of corporate investment in a country.*

Table 3 reports estimation results of Eq. (1) which is aimed to analyze the relationship between corporate investment and financial development through the testing of H1. It is found that financial development is positively associated with corporate investment at 1 percent significance level ( $\beta_1 = 0.209$ ,  $t\text{-stat} = 2.97$ ). It implies that, improving *Fin\_development* by one standard deviation is likely to increase *Corp\_investment* by approximately 0.209 percent in OECD non-financial firms. This finding lends support to H1. The correlations of our control variables with the dependent variable are also in congruence with previous studies (e.g., Biddle et al., 2009; Guariglia & Yang, 2016; Lara et al., 2016).

H1 tests the prediction that financial development is an important impetus for firm investments. The result confirms this prediction. This is because as the financial system develops, costs and frictions to obtain financing are reduced. Firms, including those that previously encountered difficulties in obtaining financing from external markets, are able to get the required funding. Removing the barriers to financing increases capital spending which boosts firm investments. Based on this evidence, it can be inferred that the financial development helps to increase investments activities in an economy. Our findings here are consistent with the view that financial development helps to promote economic growth of a country. For instance, Hsu et al. (2014) show that higher financial development is associated with increased research and development spending in 32 countries. In a larger context, Beck and Levine (2004) document that financial development improves the growth of the economy by reducing financing barriers for firms. While recently, Castro et al. (2015) demonstrate that improvement in financial development increases the supply of capital to the firms that are financially constrained.

The result of this estimated relationship is depicted in Figure II. The figure shows that *Corp\_investment* is positively related to *Fin\_development*. Overall, it is evident in the regression plots that the high values of investment spending are associated with the increase in the level of financial development.

[insert Table 3 here]

[insert Figure II here]

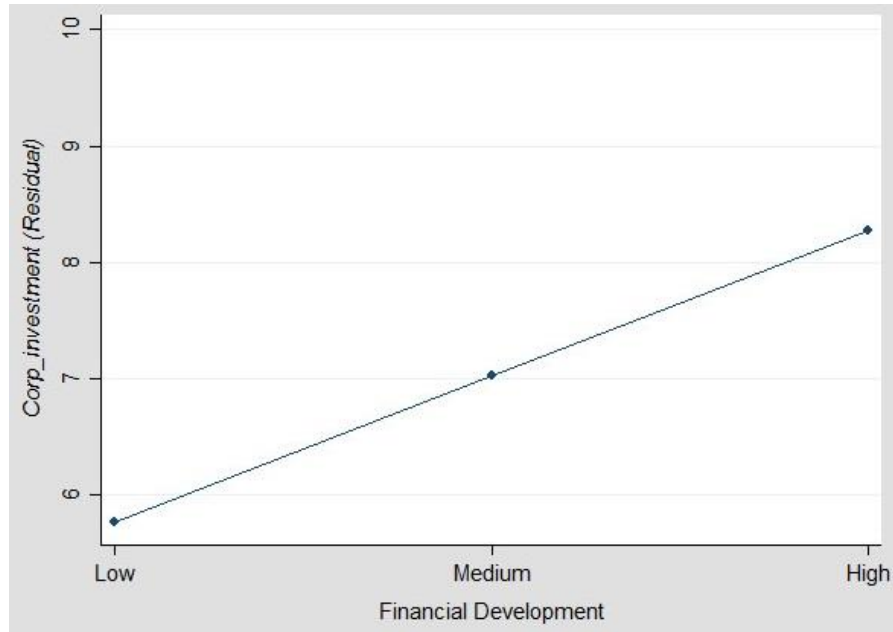


	Eq. (1) H1	Eq. (2) H2, H3	Eq. (3) H2	Eq.(4) H3
<i>Fin_development</i>	0.209*** (2.97)	0.423*** (3.85)	0.287** (2.08)	-0.001 (-0.40)
<i>Fin_development</i> × <i>Over_investment</i>		-1.324*** (-3.43)		
<i>Fin_development</i> × <i>Fin_constraints</i>			0.034* (1.89)	
<i>Fin_development</i> × <i>Free_CF</i>				-0.022** (-2.10)
<i>Joint impact</i> ( $\beta_1 + \beta_2$ )		-0.902*** (-2.94)	0.321** (2.24)	-0.023*** (-2.74)
<i>Cash</i>	1.818*** (6.26)	2.860*** (9.10)	4.803*** (3.37)	0.150*** (12.84)
<i>Sales</i>	0.416*** (5.38)	0.382*** (4.95)	1.318*** (3.88)	0.067*** (9.25)
<i>Fin_leverage</i>	-2.100*** (-10.86)	-2.400*** (-12.85)	-3.691*** (-4.67)	0.015 (0.84)
<i>Firm_size</i>	-1.662*** (-20.71)	-1.283*** (-17.97)	-1.993*** (-9.11)	0.105*** (5.83)
<i>Tangibility</i>	5.148*** (15.16)	5.177*** (15.25)	4.174*** (5.00)	-0.326*** (-20.27)
<i>TobinQ</i>	1.635*** (26.15)	1.613*** (25.34)	2.383*** (10.16)	-0.018*** (-5.02)
<i>Slack</i>	-0.023*** (-3.47)	-0.021*** (-3.11)	-0.381*** (-4.52)	-0.001* (-1.82)
<i>Loss</i>	-0.796*** (-13.85)	-0.854*** (-15.15)	-0.887*** (-4.81)	-0.015** (-2.05)
<i>Dividend</i>	0.634*** (8.00)	0.655*** (8.49)	0.200 (0.87)	-0.005 (-1.26)
Constant	25.24*** (24.53)	21.30*** (23.25)	32.48*** (11.10)	-1.59*** (-6.96)
Firm fixed effects	Included	Included	Included	Included
Country fixed effects	Included	Included	Included	Included
Time fixed effects	Included	Included	Included	Included
Observations	107,809	104,895	15,882	64,799
Firms	10,909	10,681	3,123	8,160
Adjusted R-squared	0.147	0.152	0.165	0.071

Data is collected from Datastream and World Bank's World Development Indicators (WDI). *Corp\_investment* is a dependent variable and is measured by a ratio of capital expenditure to the lagged total assets value. *Fin\_constraints* is constructed on the value of KZ index, while, *Free\_CF* is based on positive value of free cash flow after deducing the expected investment and maintenance amount. All other variables have been explained in Table 1. *t*-statistics are in parentheses and are based on robust standard errors.

\*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.10$ .

**Table 3. Regression Results between Corporate Investment and Financial Development**



**Figure II. Regression Relationship (Hypothesis H1).** The figure shows the relationship between residuals of *Corp\_investment* and *Financial development*. Data is collected from Datastream and World Bank's World Development Indicators (WDI).

4.2. H2: *Financial development reduces investment inefficiency by inversely impacting under-investment in financially constrained firms.*

Through the use of Eq. (2), H2 tests the inverse relationship between corporate investment and financial development, in firms that are financially constrained and are likely to under-invest. Estimation results in Table 3 show that *Fin\_development* is positively and statistically linked to *Corp\_investment* at 1 percent significance level ( $\beta_1 = 0.423$ ,  $t\text{-stat} = 3.85$ ), when *Over\_investment* is likely to be zero. It implies that, all else being constant, a one standard deviation increase in *Fin\_development* can increase *Corp\_investment* (and thus decrease under-investment) by approximately 0.423 percent in firms that are financially constrained. Consistent with the prediction, financial development of a country helps to improve the under-investment issue by inducing more investment in firms that are facing financing problems. This finding supports H2 as discussed in preceding section of *Model Specification*.

A probable explanation of this relationship might be due to the improvement in credit availability in a financially developed country. This could be conducted through two channels: 1) banking, and 2) stock markets. Firstly, financial development brings about large number of banks and other financial intermediaries to the country, which helps to smooth the flow of funds to users. This benefit extends to firms that are financially constrained and provides them with greater opportunities to obtain financing with less friction due to competition among banks. Easing of financing burden is likely to increase corporate investment spending of such firms. Barkat and Zuobao (2017) also indicate that banks help to grow firms faster than other informal sources of finance.

Secondly, development of capital markets also plays an important part in relieving the financial burden of financially constrained firms. With the development in financial systems, fewer chances for frauds arise, hence, investors' confidence is boosted, and consequently, investors are more willing to offer funds to firms via investments in their stocks. Moreover, raising finance through stock market is relatively cheaper than taking up banks' loans or using the bond market. Lewis and Tan (2016) point out managers generally prefer equity financing over debt financing while pursuing corporate investment decisions. Liu (2013) finds evidence showing that firms' dependence on cash, and hence financial constraint, decreases in a liquid stock market.

Large number of financing channels and fewer frictions for fund users enable capital to flow smoothly in the economy. The development of the banking and stock market sectors helps to improve financial outlays of constrained firms, which exerts positive impact on their corporate investment.

The finding that financial development helps to lessen financial constraints of firms that are under-investing is inconsistent with Antzoulatos et al. (2016). They report that financial development is not significant in reducing (or increasing) financial constraints of firms. However, our finding is not entirely in contrast to their conjecture. This is because their analysis is based on firms that are considered ‘lemons’ or below investment grade firms, whereas, financially constrained firms in our sample are not necessarily lemons.

Nonetheless, a large body of literature favors the amplification of financial development on improving the financing issues faced by financially constrained firms. For example, Rajan and Zingales (1998) demonstrate that financing of firms is improved after development in the financial system of a country. Holmstrom and Tirole (1997) develop a model to show that financial development in a country eases the financing burden of firms that are financially constrained. Beck and Levine (2004) also find that financial development is important in reducing financial constraints of firms that encounter troubles in using external markets. Castro et al. (2015) document that financial constraints of firms are decreased with the development in financial structure. These studies are consistent with results of the extant study.

When H2 is re-examined through Eq. (3), results in Table 3 show that the interaction effect of  $Fin\_development \times Fin\_constraints$  ( $\beta_2$ ) is found to be positively and statistically significant at 10 percent level ( $\beta_2 = 0.034$ ,  $t$ -stat = 1.89). This suggests that, *ceteris paribus*, when  $Fin\_development$  in a country is increased by one standard deviation, it is expected that  $Corp\_investment$  will increase by 0.034 percent in firms that are financially constrained and are likely to under-invest.

These results are consistent with our Eq. (2) findings in which financial development is found to have a positive impact on corporate investment of firms that are under-investing. Again, these results support H2.

4.3. H3: *Financial development reduces investment inefficiency by negatively impacting over-investment in firms*

H3 tests the prediction that financial development reduces over-investment in firms that are likely to over-invest due to agency issues. Following the methodology of Biddle et al. (2009), H3 is firstly tested by the coefficient of the interaction term  $Fin\_development \times Over\_investment$  ( $\beta_2$ ) in Eq. (2). As discussed earlier, to find supporting evidence for H3,  $\beta_2$  is expected to be negative and statistically significant.

The testing results of Eq. (2) in Table 3 show that in firms that are likely to be over-investing, the overall impact of financial development is found to be negatively and highly statistically significant at 1 percent level ( $\beta_1 + \beta_2 = -0.902$ ,  $t\text{-stat} = -2.94$ ). This infers that, *ceteris paribus*, when  $Fin\_development$  in a country is increased by one standard deviation, it is expected that  $Corp\_investment$  will decrease by 0.902 percent in firms that are more prone to over-investing. In a similar vein, the effect of the interaction term  $Fin\_development \times Over\_investment$  ( $\beta_2$ ) is also found to be negatively and highly statistically significant in determining  $Corp\_investment$  at 1 percent level ( $\beta_2 = -1.324$ ,  $t\text{-stat} = -3.43$ ).

The findings of the H3 support the prediction that financial development helps to address the over-investment problem in firms that are facing agency issues. These issues persist due to the incapability of diffused, and unwillingness of concentrated shareholders in properly monitoring and controlling the management. Many shareholders rely on others to analyze and monitor firms and are generally unable to fully understand information available to them. Even, if they have the expertise to comprehend and use complex data, firm managers still maintain great control over the availability of information (Levine, 2005). Concentrated ownership on the other hand exercises and exerts powers on managers to adopt policies which are beneficial to them at the cost of firms' resources (Morck et al., 2005). According to them, these factors impede the fostering of good corporate governance policies which results in failure to properly monitor and evaluate managers' over-investing decisions.

The negative relationship between over-investment and financial development can also be attributed to the benefits of improvement in the banking and stock market sectors. Indeed, financial development helps to curb the over-utilization of firms' resources in various ways.

Firstly, development of a banking sector enhances the capacity of banks to acquire extensive and accurate information about firms, and to monitor them effectively. Banks have an incentive to closely observe and evaluate firms' decisions as they provide a huge amount of loans to the enterprises. Banks constantly monitor and oversee the performance and governance of firms so that funds are only allocated to those that have good future prospects and adhere to good governance practices (Greenwood & Jovanovic, 1990). These activities performed by banks present a monitoring mechanism which limits managers to involve in activities detrimental to firms' value (Diamond, 1984).

Secondly, with financial development, more banks are available to extend credits to firms, thereby, intensifying the competition among them. This makes debt an attractive financing option and tempts managers to include more debt in the capital structure. Beneficial ramifications of debt contracts to discipline managers from over-investing are well cited in the literature (Aghion et al., 1999; Aivazian et al., 2005; Hovakimian, 2011; Jensen & Meckling, 1976). As, over-investment is likely to happen where managers have large sum of free cash flow at their disposal, Aghion et al. (1999) develop a model to show that debt is useful in disciplining managers as it reduces the amount of free cash flow under their disposal. Since, removing a substantial amount of cash flow via debt commitments puts pressure on firms' financial position; managers give due evaluation to current and future investment decisions. Hovakimian (2011) finds that managers adjust their capital allocation and give priority to valuable investment projects when diversified firms are faced with financial constraints. Inclusion of debt in the capital structure helps to induce managers from over-investing as they have obligations to pay fixed payments. More importantly, removing a large chunk of free cash flow impairs managers' ability to pursue their personal motives and undertake unnecessary risks. This in turn reduces over-investment and improves investment efficiency in firms.

Similarly, stock markets can play an important role in reducing agency issues related to over-investment in several ways. Firstly, along with banks, financial markets exert parallel influence on listed firms to incorporate good corporate governance practices. Developed stock markets have adopted and enacted numerous codes of conduct that set the standard of good corporate governance structure. Indeed, stock markets regulate listed firms to ensure that they adhere to acceptable governance practices which reduce the manifestation of agency issues. Black and

Moersch (1998) even stress that stock markets are superior in addressing governance issues than banks, as the latter can lose impartiality by overlooking the performance of inefficient managers who are dearer to banks.

Secondly, stock markets can also influence corporate governance in firms indirectly. Conflict between managers and shareholders can be minimized by linking the compensation of CEOs with the stock performance of the firm (Datta et al., 2001; Kang et al., 2006). This arrangement reduces managers' incentive to engage in over-investment activities which can adversely affect firm stock value. In this way, with an efficient stock market environment, where stock price manipulation is at the very least, it can reinforce good corporate governance and can address the over-investment issue.

Thirdly, in a financially developed country, numerous financial intermediaries, credit agencies and professional analysts are constantly evaluating the actions and decisions of firms. This offers valuable information to investors about the outlook of firms. Levine (2005) suggests that investors attach great importance to the critical information available about firms, but acquiring information about firms is not only costly but also difficult. Boyd and Smith (1992) also show that investors prefer to invest their capitals in countries where monitoring mechanisms are strong and information about firms is transparent. Investors give considerations to expert opinions which have implications on resource allocation by managers. Generally, investors favor those firms that endorse efficient investment decisions.

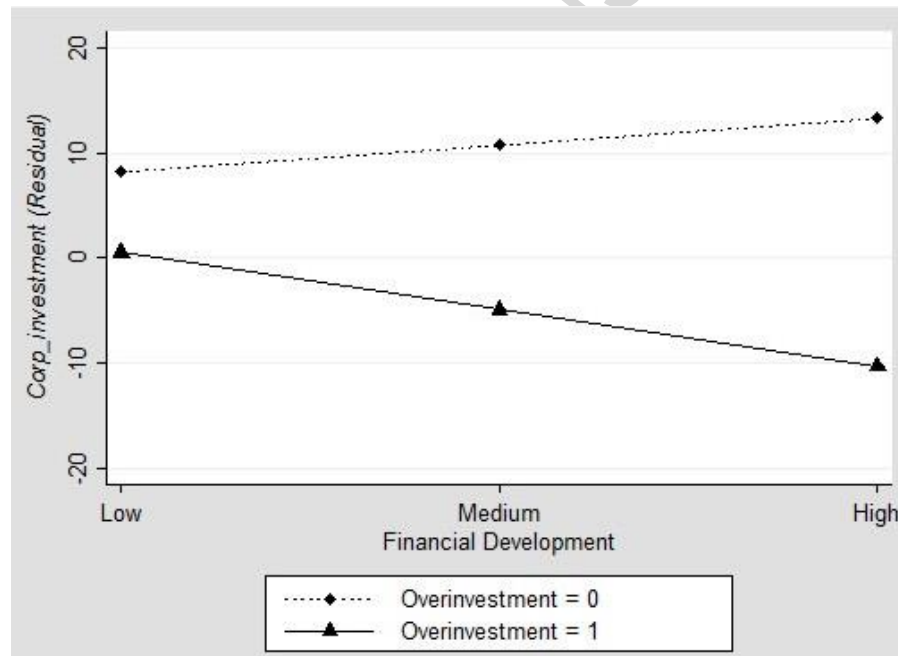
The above-discussed assortment of reasons suggests that the problem of over-investment will be less pervasive in countries with higher degree of financial development. This outcome is largely due to the monitoring mechanisms and good governance practices yielded by financial development.

Estimation results of Eq. (2) for both H2 and H3 are depicted in Figure III. The figure shows the relationship between *Corp\_investment* and *Fin\_development*. Based on the estimated coefficients, holding other variables constant, it is evident that the effect of financial development is likely to become strong, when the likelihood of over-investment is increased.

Empirical findings of Eq. (4) are also reported in Table 3. By and large, regression results of our control variables are consistent with previous studies. The interaction term

$Fin\_development \times Free\_CF$  ( $\beta_2 = -0.022$ ,  $t\text{-stat} = -2.10$ ) is negative and statistically significant at 5 percent level. This result implies that, keeping others constant, increasing  $Fin\_development$  in a country by one standard deviation is expected to decrease the  $Abn\_investment$  by 0.022 percent in firms that are over-investing. This finding indicates that financial development plays a role in curbing over-investment, and hence, has positive ramifications on corporate investment efficiency. The results of Eq. (4) confirm the findings of Eq. (2) for H3, and reaffirm that those firms that are over-investing due to agency issues, reduce their investment spending when development in the financial sector increases. Once more, we find supporting evidence for H3.

[insert Figure III here]



**Figure III. Regression Relationship (Hypothesis H2 and H3).** This figure shows the regression relationship between  $Corp\_investment$  residuals and  $Financial\_development$  of a country. The top line represents an association when Overinvestment is zero, and hence, under-investment is most likely. The bottom line depicts the relationship when Overinvestment is most likely. Data is collected from Datastream and World Bank's World Development Indicators (WDI).



## 5. Robustness checks

We conducted four additional evaluations to ensure that our empirical results are robust. These robustness checks include: 1) applying the Generalized Method of Moments (GMM) technique; 2) using different specifications of dependent and independent variables; and, 3) dividing data into subsamples.

### 5.1. Estimation by Generalized Method of Moments (GMM)

To confirm the robustness of our earlier results the Generalized Method of Moments (GMM) estimation technique is used. These estimators are developed by Arellano and Bond (1991), Arellano and Bover (1995), and Blundell and Bond (1998). System-GMM is applied to perform the test. To execute a dynamic regression model, a lagged dependent variable is added to the right-hand-side of Eq. (1) and Eq. (2).

Results of the System-GMM estimations for H1 in Table 4 show that *Fin\_development* is positive and statistically significant at 10 percent level in determining *Corp\_investment*. This statistics confirms H1. For H2, *Fin\_development* again is positive and statistically significant at 1 percent level in influencing *Corp\_investment*. The coefficient of *Fin\_development*, in this case, measures the relationship between financial development of a country and corporate investment when under-investment is more likely. The result, therefore, reaffirms the findings of Eq. (2) for H2. The System-GMM result of the interaction term *Fin\_development* × *Over\_investment* is also consistent with the earlier results of Eq. (2). The coefficient of this interaction term reveals a negative and statistically significant relationship at 1 percent level. This finding also provides support to the earlier result of H3, and suggests that when *Fin\_development* is improved, *Corp\_investment* of firms which are likely to over-invest will fall.

### 5.2. Alternative Specifications of Financial Development Variable

In this study, our financial development variable represents a sum of stock market and banking sector development. To gain further insights and reaffirm our previous empirical results, we separate our original *Fin\_development* variable into two components: stock market (*Stock\_development*) and banking (*Bank\_development*) development. *Stock\_development* is the development in the stock market and is measured as the ratio of stock market capitalization to the GDP of a country. *Bank\_development* is measured as a ratio of credit provided by the banks to

the GDP of a country. Both Eq. (1) and Eq. (2) are re-estimated by replacing *Fin\_development* and *Fin\_development*×*Over\_investment* with *Stock\_development* and *Stock\_development*×*Over\_investment*, and the same with *Bank\_development*.

Estimation results are presented in Table 4, and they indicate that *Stock\_development* is positive and statistically significant in determining *Corp\_investment* at 1 percent level. Similarly, the relationship between the interaction term *Stock\_development*×*Over\_investment* and *Corp\_investment* of over-investment firms is found to be negative and statistically significant at 5 percent level. These results are in line with the expectations and corroborate earlier findings of our three hypotheses.

Similarly, the relationship of corporate investment with banking sector development is also analyzed. As predicted, the results in Table 4 show that *Bank\_development* is associated positively and statistically with *Corp\_investment* at 5 percent significance level. Again, the coefficient of the interaction term *Bank\_development*×*Over\_investment* is found to be significant at 1 percent level, and negatively impacting *Corp\_investment* of firms that are over-investing. These observations confirm the consistency of the *Fin\_development* variable used in this study and also provide credence to our earlier findings.

[insert Table 4 here]

	GMM		<i>Stock_development</i>	<i>Bank_development</i>
	Eq. (1)	Eq. (2)	Eq. (2)	Eq. (2)
<i>lag. Corp_investment</i>	0.359*** (4.48)	0.267*** (3.28)		
<i>Fin_development</i>	2.128* (1.72)	12.364*** (2.83)		
<i>Fin_development</i> × <i>Over_investment</i>		-29.830*** (-2.61)		
<i>Stock_development</i>			0.343*** (3.46)	
<i>Stock_development</i> × <i>Over_investment</i>			-0.722** (-2.09)	
<i>Bank_development</i>				0.235** (2.10)
<i>Bank_development</i> × <i>Over_investment</i>				-2.320*** (-5.79)
<i>Joint impact</i> ( $\beta_1 + \beta_2$ )		-17.468** (-2.35)	-0.378 (-1.44)	-2.084*** (-6.24)
<i>Cash</i>	11.752 (0.91)	8.684 (0.72)	2.876*** (9.16)	2.801*** (9.10)
<i>Sales</i>	-5.894** (-2.52)	-3.166 (-1.13)	0.386*** (5.02)	0.377*** (4.90)
<i>Fin_leverage</i>	-12.908* (-1.70)	-11.488 (-1.29)	-2.430*** (-13.05)	-2.389*** (-12.93)
<i>Firm_size</i>	-0.584 (-0.80)	-2.004 (-0.98)	-1.281*** (-18.07)	-1.300*** (-18.52)
<i>Tangibility</i>	24.115*** (3.22)	21.665*** (2.61)	5.120*** (15.20)	5.162*** (15.48)
<i>TobinQ</i>	0.704 (0.76)	-1.405 (-1.13)	1.602*** (25.28)	1.558*** (25.43)
<i>Slack</i>	-0.044 (-0.09)	-0.074 (-0.19)	-0.021*** (-3.18)	-0.019*** (-2.94)
<i>Loss</i>	-9.246*** (-3.29)	-13.527*** (-4.35)	-0.851*** (-15.27)	-0.848*** (-15.17)
<i>Dividend</i>	-2.049 (-0.52)	2.599 (0.69)	0.659*** (8.60)	0.652*** (8.58)
Constant	14.34 (1.34)	29.27 (1.21)	21.33*** (23.46)	21.58*** (23.86)
Firm fixed effect	Included	Included	Included	Included
Country fixed effect	Included	Included	Included	Included
Time fixed effect	Included	Included	Included	Included
Observations	107,537	104,641	105,661	107,751
Firms	10,891	10,661	10,686	10,802
Adjusted R-squared			0.153	0.152

Data is collected from Datastream and World Bank's World Development Indicators (WDI). *Stock\_development* is a ratio of stock market capitalization to the GDP, while, *Bank\_development* is a ratio of credit extended by banks to the GDP of a country. *t*-statistics are in parentheses and are based on robust standard errors. \*\*\* $p < 0.01$ , \*\* $p < 0.05$ , \* $p < 0.10$ .

**Table 4. Robustness Check Results of GMM and *Stock\_development*, *Bank\_development* Variables**

### 5.3. Alternative Proxies of Dependent and Independent Variables

Corporate investment proxy. We use alternative measures of our dependent variable *Corp\_investment* to test if the main results are sensitive to these changes. Two alternative measures of *Corp\_investment* are investigated: 1) the ratio of Capex less cash receipts from property, plant and equipment divided by lagged total assets; and, 2) Capex divided by total capital. Estimation results of these re-defined corporate investment variables in Table 5<sup>8</sup> confirm that our earlier findings are rigorous to these alternative measures.

Over-investment proxy. Biddle et al. (2009) use a ranking variable based on the amount of cash flow and level of debt amassed by firms to measure the likelihood of over-investment. In this study, their over investment variable is modified by incorporating firm size to measure the over-investment tendencies of firms. The earlier regression models used in this study are based on this newly construct of over-investment. To test for result robustness, we apply Biddle's ranking variable to Eq. (2). The re-examined results exhibit in Table 5 reveal that our earlier findings are comparable to those of Biddle et al. (2009).

[insert Table 5 here]

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<sup>8</sup> We also provide earlier estimation results in first column of Table 5 for comparison purpose.

	Eq. (2)			
	$Capex_{i,t}$ $/TA_{i,t-1}$	$Capex_{i,t}$ $/K_{i,t-1}$	$Capex_{i,t}$ $PPE_{i,t}/TA_{i,t-1}$	$Over\_investment^{BD}$
<i>Fin_development</i>	0.423*** (3.85)	0.801*** (4.69)	0.420*** (3.01)	0.448*** (4.43)
<i>Fin_development</i> × <i>Over_investment</i>	-1.324*** (-3.43)	-2.846*** (-4.75)	-1.807*** (-3.30)	
<i>Fin_development</i> × <i>Over_investment</i> <sup>BD</sup>				-1.657*** (-4.28)
<i>Joint impact</i> ( $\beta_1 + \beta_2$ )	-0.902*** (-2.94)	-2.045*** (-4.27)	-1.387*** (-3.06)	-1.209*** (-3.80)
<i>Cash</i>	2.860*** (9.10)	2.985*** (6.78)	6.637*** (15.09)	3.395*** (10.69)
<i>Sales</i>	0.382*** (4.95)	1.950*** (14.82)	0.289*** (2.63)	0.319*** (4.14)
<i>Fin_leverage</i>	-2.400*** (-12.85)	-3.246*** (-10.49)	-0.585* (-1.93)	-2.426*** (-13.03)
<i>Firm_size</i>	-1.283*** (-17.97)	-2.005*** (-16.74)	-2.824*** (-23.57)	-1.441*** (-20.62)
<i>Tangibility</i>	5.177*** (15.25)	6.172*** (11.90)	-5.164*** (-10.58)	5.156*** (15.25)
<i>TobinQ</i>	1.613*** (25.34)	2.284*** (23.66)	2.352*** (27.17)	1.584*** (25.24)
<i>Slack</i>	-0.021*** (-3.11)	-0.020** (-2.09)	0.013 (1.30)	-0.020*** (-2.90)
<i>Loss</i>	-0.854*** (-15.15)	-0.816*** (-8.42)	-2.236*** (-21.15)	-0.847*** (-15.08)
<i>Dividend</i>	0.655*** (8.49)	0.655*** (5.12)	1.412*** (11.59)	0.650*** (8.45)
Constant	21.30*** (23.25)	35.13*** (23.02)	39.77*** (26.54)	23.57*** (26.06)
Firm fixed effect	Included	Included	Included	Included
Country fixed effect	Included	Included	Included	Included
Time fixed effect	Included	Included	Included	Included
Observations	104,895	105,005	105,441	105,081
Firms	10,687	10,687	10,714	10,700
Adjusted R-squared	0.151	0.150	0.135	0.158

Data is collected from Datastream and World Bank's World Development Indicators (WDI). *Capex* is the capital expenditure, *PPE* is the amount of property, plant and equipment, *TA* is the amount of total assets and *K* is the capital amount. *Over\_investment*<sup>BD</sup> is a ranking variable based on the values of cash flow and debt. *t*-statistics are in parentheses and are based on robust standard errors.

\*\*\* p<0.01, \*\* p<0.05, \* p<0.10.

**Table 5. Robustness Check Results of Alternative Corporate Investment and Over Investment Proxies**

#### 5.4. Dividing Data into Subsamples

Robustness check is also carried out by partitioning the sample of OECD countries into three groups according to their Year-on-Year (YOY) Gross Domestic Product (GDP) growth rates. Specifically, the data is divided into following subsamples: High GDP growth represents the fourth quartile values; Medium GDP growth is based on second and third quartile; while, Low GDP growth represents subsample when values of GDP growth fall in first quartile. Eq. (2) is re-estimated for these three subsamples, and the results are cited in Table 6.

These results largely support our earlier findings in the relationship between *Corp\_investment* and *Fin\_development* of both over and under-investing firms. However, a very distinctive pattern emerges showing how this relationship varies among the three subsamples. For under-investment firms, the magnitude of  $\beta_1$  increases (from 0.218 for Low Growth to 0.490 for High Growth), likewise, for over-investment firms  $\beta_2$  also increases (from -1.337 to -2.862, correspondingly) with GDP growth rates. These figures infer that financial development is most effective on improving investment efficiency for both under- and over-investment firms in countries with high economic growth. This positive effect is probably because countries with high economic growth have more resources to develop and strengthen their financial systems, and hence, reducing firm investment inefficiency. Overall, H2 and H3 are supported when the data is divided into these three subsamples, more importantly, this partitioning process highlights one key characteristic between financial development and corporate investment among countries when economic growth is taken into consideration.

[insert Table 6 here]

	<i>Fin_</i> <i>development</i>	<i>Fin_</i> <i>development</i> × <i>Over_</i> <i>investment</i>	<i>Joint impact</i> ( $\beta_1 + \beta_2$ )	<i>Cash</i>	<i>Sales</i>	<i>Fin_</i> <i>leverage</i>	<i>Firm_size</i>	<i>Tangibility</i>	<i>TobinQ</i>	<i>Slack</i>	<i>Loss</i>	<i>Dividen</i> <i>d</i>	Obs.	Adj. R <sup>2</sup>
<i>Predicted</i> <i>sign</i>	+	-	-	+	+	-	+	+	+	-	-	+		
<b>All OECD sample countries</b>	0.423*** (3.85)	-1.324*** (-3.43)	-0.902*** (-2.94)	2.860*** (9.10)	0.382*** (4.95)	-2.400*** (-12.85)	-1.283*** (-17.97)	5.177*** (15.25)	1.613*** (25.34)	-0.021*** (-3.11)	-0.854*** (-15.15)	0.655*** (8.49)	104,895	0.151
<b>High GDP growth</b>	0.490** (2.18)	-2.862*** (-3.11)	-2.372*** (-3.19)	4.158*** (4.28)	0.405** (2.12)	-2.661*** (-5.00)	-1.940*** (-9.43)	3.035*** (4.04)	2.364*** (12.59)	-0.035 (-1.49)	-1.273*** (-5.68)	1.163 (4.58)	18,491	0.185
<b>Med. GDP growth</b>	0.440*** (3.43)	-1.372*** (-3.10)	-0.931*** (-2.69)	2.890*** (7.79)	0.279*** (3.16)	-2.360*** (-11.20)	-1.303*** (-15.78)	5.212*** (13.72)	1.761*** (23.80)	-0.020*** (-2.22)	-1.007*** (-13.40)	0.640*** (6.50)	49,960	0.160
<b>Low GDP growth</b>	0.218 (1.40)	-1.337*** (-2.96)	-1.119*** (-3.19)	3.185*** (5.71)	0.704*** (5.00)	-3.072*** (-8.47)	-0.894*** (-8.39)	5.398*** (8.17)	1.124*** (11.12)	-0.021*** (-3.00)	-0.446*** (-6.69)	0.485** (5.25)	31,469	0.116

Data is collected from Datastream and World Bank's World Development Indicators (WDI). Dependent variable is *Corp\_investment*. Gross Domestic Product (GDP) growth is based on Year-on-Year (YOY) GDP growth values. Low GDP growth represents subsample when values of GDP growth fall in first quartile, medium GDP growth is based on second and third quartile, while, high GDP growth represents the fourth quartile values. *t*-statistics are in parentheses and are based on robust standard errors. Firm fixed effects, time fixed effects and country fixed effects are included for each model. \*\*\*p<0.01, \*\*p<0.05, \*p<0.10.

**Table 6. Robustness Check Regression Results of Subsamples**

## 6. Conclusions

This study begins with firstly examining the relationship between financial development and corporate investment in 35 OECD member countries and then proceeds to investigate the mechanisms through which financial development can impact investment efficiency of non-financial firms. Supported by prior research, we provide detailed discussions on how financing constraints and agency issues of firms can distort investment decisions. Firms that have limited capacity to obtain external financing are forced to cut investment outlays which leads to under-investment. On the other hand, several agency issues could impair managers' judgments and lead to over-investment of firms' resources in unprofitable projects. This study finds empirical evidence demonstrating that financial development can reduce frictions that cause financing constraints to those under-investment firms, at the same time; it renders its usefulness through its monitoring function to mitigate agency issues in those over-investment firms. On the whole, it has been shown that financial development has positive consequences on investment efficiency.

Our empirical findings indicate that on average, a one standard deviation increase in financial development can help to increase 0.209 percent in corporate investment among the non-financial firms in 35 OECD member countries. Considering the important role of corporate investment plays in the promotion of economic activities vis-à-vis economic growth of a country, this positive effect of financial development should not be discounted lightly. Furthermore, we have estimated that for a one standard deviation increase in financial development, it can help to reduce investment inefficiency in non-financial firms that are under investing (mostly due to financing constraints) by 0.423 percent, and by 0.902 percent for non-financial firms that are over investing (mostly due to agency issues). Once more, these improvements are of great values at both firm and economy levels. Additionally and equally importantly, our subsample results bring to light further evidence for the positive association between investment efficiency and economic growth: less inefficiency, more investment, more economic growth, better financial development, less inefficiency, more investment, more growth, and so on.

This study maintains that investment efficiency is difficult to achieve without financial development. Our findings are consistent with the proposition that economic potential of a country can be strengthened with the improvement in financial development of a country (Demirgüç-Kunt & Maksimovic, 1998; King & Levine, 1993b; Levine, 2005; Schumpeter, 1912).



Since corporate investment is an important vehicle of economic growth, even a slight improvement in investment volume could translate into the equivalent gains of millions/billions of dollars.

This study could provide useful inputs for both policy makers and other stakeholders. First, given the importance of financial development in affecting investment efficiency, it is vital that policy makers formulate such policies that can help to advance the financial system of a country. Stringent laws and regulations about financial contracts should be adopted and enforced to warrant financial development. Moreover, to strengthen the monitoring function of financial development, bank managers are encouraged to closely scrutinize firms' actions when extending credits to firms, especially, where the complementary support of financial development is minimal. Likewise, firm managers are advised to take advantage of financial development by exploring new funding sources so as to exploit valuable growth opportunities for the firm.

Our study contributes to the corporate investment literature in two ways. First, we construct and employ a new over-investment measure that takes into account of firm size which is an important factor in determining corporate investment. Second, the literature is limited with respect to documenting the direct impact of financial development in terms of over-investment and under-investment as indicators of corporate investment efficiency. The present study adds to this strand of knowledge by presenting evidence in this regard from an extensive dataset.

Despite the positive insights we offer, this study has some limitations. First, development in the banking and stock market sectors is taken as a proxy to measure financial development of a country; however, we believe a more accurate measure should involve legal effectiveness as an equally important determinant. Second, we primarily focus on the financing aspect of financial development from the supply perspective. We acknowledge that, it is difficult to provide insights into both supply and demand aspects of financial development concurrently in one study, and this is a limitation of the study and a potential for future research. Third, contrasting evidences have been cited in the literature about the impact of financial development on the accessibility of financing to firms that are financially constrained. Although, this study presents an extensive dataset entails a set of international countries and a time span of 25 years, a more in-depth analysis, such as by segregating investment-grade and non-investment-grade (lemon) firms, could help to precisely measure the demand side of finance accessibility issue. Fourth, 35 OECD

member countries are examined in this study. Although, this dataset covers almost all major regions of the world, the sample lacks representation from some developing and under-developed countries especially those from Africa and Asia. How a much lower degree of economic and legal development in these areas would affect the relationship between financial development and corporate investment efficiency is a fruitful future research direction. Moreover, a case study based on a country specific analysis can be undertaken to advance the research into this topic. Additionally, only non-financial firms are considered for the extant research and therefore care must be taken while extending results to other sectors that are subject to different accounting procedures and investment objectives.

## Appendix A

### 1. Development of the KZ Index

Following Lamont et al. (2001), KZ index is obtained by the following equation:

$$KZ_{i,t} = -1.002 \frac{Cashflow_{i,t}}{Capital_{i,t}} + 2.083 \times TobinQ_{i,t} + 3.139 \frac{Debt_{i,t-1}}{Capital_{i,t-1}} - 39.368 \frac{Divident_{i,t}}{Capital_{i,t-1}} - 1.315 \frac{Cash_{i,t-1}}{Capital_{i,t-1}} \quad (A1)$$

Where, *Cashflow* is the sum of net income and depreciation, *Capital* is capital stock, *TobinQ* is Tobin's q measured as the ratio of market value of assets to book value of assets, *Debt* is the total debt, *TotalCapital* is the sum of debt and equity, *Dividend* is dividend paid and *Cash* is the cash and cash equivalents. The subscripts 'i' and 't' denote firms and years respectively.

### 2. Richardson (2006) Model

This model involves four steps. Firstly, expected investment expenditures of firms are predicted, by regressing investment with its lagged values and a set of other accounting variables. The fitted values of the following equation are considered as an optimal or expected investment level, which incorporates future positive NPV projects. The equation used to predict optimal investment level is as follows:

$$Investment_{i,t} = \alpha + \beta_1 Investment_{i,t-1} + \beta_2 Cash_{i,t-1} + \beta_3 Size_{i,t-1} + \beta_4 TobinQ_{i,t-1} + \beta_5 ROA_{i,t-1} + \beta_6 Fin\_leverage_{i,t-1} + \varepsilon_{i,t} \quad (A2)$$

Where, 'i' denotes firms and 't' denotes years. *Investment* is the investment level measured as a difference of capital expenditure (Capex) and property, plant and equipment (PPE) divided by the total assets. *Cash* is the net income plus depreciation divided by total assets. *Size* is a log of total assets. *TobinQ* is measured as a ratio of market value of assets to the book value of assets. *ROA* is measured as total assets divided by sales, and *Fin\_leverage* is measured as the sum of long-term debt and short-term debt divided by lagged total assets. Richardson (2006) points out that the fitted values of the above equation can be considered as the optimal investment level (*Opt\_investment*).

Secondly, the difference between the fitted values of optimal investment and the observed investment values is calculated to compute un-explained/abnormal investment. This abnormal investment can either take on positive or negative values depicting over-investment or under-investment respectively, as follows:

$$Abn\_investment_{i,t} = Opt\_investment_{i,t} - Investment_{i,t} \quad (A3)$$

In Eq. (A3), *Abn\_investment* is the investment level that deviates from expected investment level, *Opt\_investment* is the fitted values of Eq. (A2) and *Investment* is the actual observed values of Eq. (A2).

Thirdly, the amount of funds which are required to maintain optimal investment levels is calculated. These funds are available on companies' annual statements under depreciation, amortization and depletion head. Therefore, maintenance investment, *Maint\_investment*, is:

$$Maint\_investment_{i,t} = Depreciation, Amortization and Depletion_{i,t} \quad (A4)$$

Fourthly, the amount of free cash flow available in excess of the amount required for optimal investment and its maintenance is calculated. According to Richardson (2006) and Guariglia and Yang (2016), any surplus amount of free cash flow, i.e. over and above required for investment expenditures, is a candidate to serve as a proxy for agency cost of over-investment. Thus, this agency cost is calculated by subtracting the expected and maintenance investment from the free cash flow:

$$Agency\_cost_{i,t} = Free\_CF_{i,t} - Opt\_investment_{i,t} - Maint\_investment_{i,t} \quad (A5)$$

Where, *Free\_CF* is the amount of free cash flow available to the firm calculated as the amount of cash from operating activities.

## Appendix A

	Country*	Number of firms	Number of observations
1	Australia	508	3,713
2	Austria	119	1,657
3	Belgium	123	1,521
4	Canada	313	1,849
5	Chile	115	1,290
6	Czech Republic	90	650
7	Denmark	139	1,586
8	Estonia	15	109
9	Finland	97	1,160
10	France	385	4,283
11	Germany	371	3,699
12	Greece	220	1,654
13	Hungary	21	193
14	Iceland	15	119
15	Ireland	53	597
16	Israel	54	728
17	Italy	59	645
18	Japan	1,879	18,740
19	Latvia	43	373
20	Luxembourg	44	294
21	Mexico	286	2,750
22	Netherlands	568	7,035
23	New Zealand	210	1,253
24	Norway	215	2,042
25	Poland	373	2,266
26	Portugal	63	643
27	Slovakia	10	89
28	Slovenia	22	138
29	South Korea	793	5,977
30	Spain	260	3,854
31	Sweden	394	3,976
32	Switzerland	286	3,299
33	Turkey	260	1,651
34	UK	717	10,353
35	US	1,895	20,150
	Total	11,015	110,336

The table provides the list of countries, number of firms and number observations in the dataset. The dataset is dominated by US, Japan and the UK firms, however, we conduct analysis by dividing the data into different subsamples in Section 5.3 and the results are not influenced by these large countries.

**Table A1. Sample Coverage**

\*Dataset consists of all member countries as on January 2018. Lithuania joined the OECD afterwards on July 5, 2018.

## Appendix A

	<i>Corp_investmen t</i>	<i>Fin_developmen t</i>	<i>Cash</i>	<i>Sales</i>	<i>Fin_leverag e</i>	<i>Firm_size</i>	<i>Tangibilit y</i>	<i>TobinQ</i>	<i>Slack</i>	<i>Loss</i>
<i>Fin_developmen t</i>	-0.14***									
<i>Cash</i>	0.08***	0.15***								
<i>Sales</i>	0.01**	0.02***	-0.04***							
<i>Fin_leverage</i>	0.17***	-0.02***	-0.08***	-0.04***						
<i>Firm_size</i>	-0.08***	-0.03***	-0.27***	0.00	0.11***					
<i>Tangibility</i>	0.55***	-0.13***	-0.15***	-0.13***	0.26***	0.08***				
<i>TobinQ</i>	0.12***	0.10***	0.35***	0.11***	-0.17***	-0.09***	-0.11***			
<i>Slack</i>	-0.11***	0.09***	0.39***	-0.07***	-0.07***	-0.22***	-0.28***	0.16***		
<i>Loss</i>	0.05***	0.12***	0.21***	-0.27***	0.01***	-0.46***	-0.02***	-0.07***	0.19***	
<i>Dividend</i>	-0.09***	-0.09***	-0.23***	0.13***	-0.10***	0.46***	0.02***	-0.07***	-0.18***	-0.48***

Data is collected from Datastream and World Bank's World Development Indicators (WDI). This table provides Pearson's pairwise correlation among main variables. All variables are explained in Table 1. \*\*\*p<0.01, \*\*p<0.05, \*p<0.10.

**Table A2. Correlation Matrix**

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**Highlights:**

- Financing constraints and agency issues of firms can distort investment decisions causing investment inefficiency in non-financial firms in OECD countries
- Financial development can reduce frictions that cause financing constraints and enhance investment in non-financial firms that are under-investing
- Monitoring function rendered by financial development can mitigate agency issues prevalent in non-financial firms that are over-investing
- Overall financial development has positive ramifications on corporate investment efficiency of non-financial firms in OECD countries