

Declining Fixed Investment and Increasing Financial Investment of Korean Corporations

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This paper aims to determine factors causing the stagnation of Korean firms' fixed investment after the global financial crisis, using panel data for the period of 1999-2016. Fixed investment remained sensitive to cash flow and Tobin's q although their effects decreased after the global financial crisis. A decreasing trend of cash flow and an increase in Tobin's q since the early 2000's imply that the worsening cash flow was a major factor behind the sluggish investment after the crisis. Meanwhile, debt-equity ratio remained significant for non-chaebol affiliated firms, reflecting disparity in access to external financing. Volatility of stock returns also became insignificant after the crisis, casting doubt on the argument that uncertainty was a major factor contributing to the decline of fixed investment. Analysis of financial investment confirmed the significant effect of cash flow, larger than that on financial investment than on fixed investment. In particular, debt repayment and other financial investment, except share repurchase, were sensitive to cash flow. However, the substitution of fixed investment by financial investment is a consequence, rather than a cause of declining fixed investment.

Keywords: Stagnant Fixed Investment, Financial Investment, Cash Flow, Tobin's q , Global Financial Crisis

JEL Classification: E22, G31, G32

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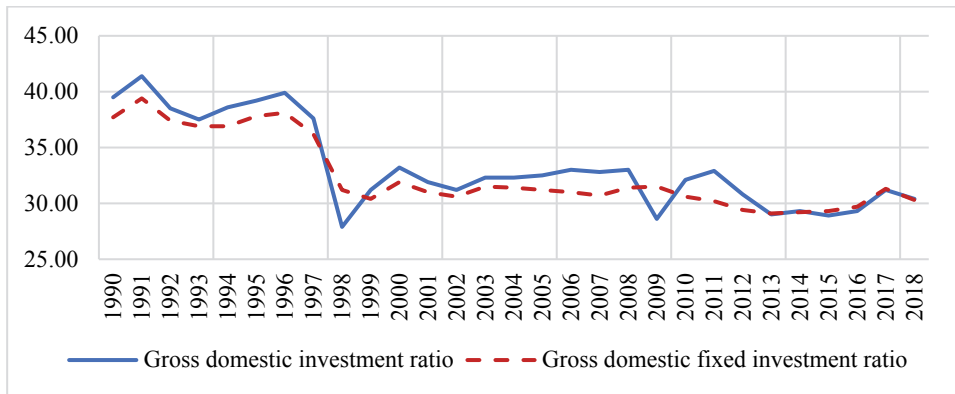
I. INTRODUCTION

The sluggish investment of the corporate sector and disappearing job opportunities in the Korean economy are at the heart of controversy on its structural weakness. Bank of Korea has recently cut growth and inflation forecasts, blaming weakening exports and slowing business investment (BOK, 2019). In contrast to the sluggish investment, Korea's corporate savings rates have substantially increased since the early 2000s. If so, it is questionable why the corporate sector does not invest enough although it has abundant financial resources.

In retrospect, Korea's rapid economic growth was spurred by active capital accumulation. After the 1997 currency crisis, the Korean economy experienced radical structural reforms in the financial sector and investment rates considerably decreased. Some researchers such as Eichengreen, Perkins and Shin (2012) have claimed that a slowdown in investment is inevitable in the process of transition to a mature economy. They insisted that, although the investment rates had to decline gradually before the 1997 financial crisis set in, the actual investment rates did not and resulted in overheated growth. Although they have argued that sluggish investment is an evidence of Korea's return to a normal orbit, it is ambiguous whether the current situation after the global financial crisis is normal.

Figure 1 shows macroeconomic indicators related to investment: the gross domestic investment and the gross domestic fixed investment ratios with respect to GDP. The gross domestic fixed investment is calculated as producers' net acquisition of domestic non-financial assets equals to gross domestic investment minus investment in inventories. Clearly, the 1997 financial crisis had a long-term negative effect on Korea's investment. Both investment ratios sharply decreased following the 1997 currency crisis, only partially recovering in the early 2000s. The gross domestic investment ratio decreased once again in 2009 as a response to the global financial crisis, although the decrease was less dramatic compared to the previous drop in 1998. For total fixed investments, the impact of the global financial crisis was also negative, though not so noticeable.

Figure 1. Trends in Domestic Investment Ratios



Note: Gross domestic (fixed) investment ratio is defined as gross (fixed) capital formation divided by GDP. The ratio is expressed in percentage.

Source: Bank of Korea, Economic Statistics System <<http://ecos.bok.or.kr>>

This paper asks if the sluggish investment in Korea can be explained by changes in economic fundamentals that affect fixed investment of the corporate sector, such as cash flows and investment opportunities. Specifically, this study aims to explore factors responsible for the slowdown of investment after the global financial crisis. We first analyze to what extent that financial constraints and the investment opportunities played the role. We then compare investment behaviors of chaebol-affiliated firms and non-chaebol-affiliated firms, expected to differ significantly in terms of access to financial markets and the use of investment opportunities. Another aim of this study is to analyze determinants of financial investment, as a mirror image of fixed investment in the distribution of cash flow. We further ask what types of financial investment among debt repayment, share repurchase, and other financial investment would be the most sensitive to cash flow.

Our empirical analysis showed that cash flow and Tobin's q well explained investment decision of both chaebol-affiliated and non-chaebol-affiliated firms after the global financial crisis. Accordingly, a decline in cash flow seemed to have played a major role in the decline of fixed investment after the global financial crisis, while an increase in Tobin's q had offset it to some extent. While the effect of cash flow on fixed investment decreased, that on financial investment increased. Particularly, debt repayment became more sensitive to cash flow while the opposite was the case for other financial investment. The effect of cash flow on share repurchase remained

insignificant.

This paper is organized as follows. Section II reviews the literature on Korea's corporate sector investment. In Section III, we present analytical framework and discuss the trends in explanatory and dependent variables during the sample period between 1999 and 2016. Section IV presents an empirical analysis of factors that determine fixed investment and financial investment, taking the effect of global financial crisis into consideration. Section V concludes.

II. LITERATURE REVIEW

Sluggish investment after the global financial crisis has become a common phenomenon, not only for most developed economies, but also for emerging market economies. Kose, Ohnsorge, Ye, and Islamaj (2017) have argued that the weak investment growth in emerging markets and developing economies since 2010 reflects obstacles to investment, such as economic recession, negative terms-of-trade shocks, increased debt burden, and heightened political risk. They have recommended that weak private investment should be compensated for by an increase in public investment, because the corporate sector alone cannot cope with various factors related to the overall growth prospects and the business climate. To judge whether such government intervention would be effective in revitalizing investment, it is a prerequisite to analyze whether the sluggish investment can be explained by worsening economic conditions or by some other factors unmentioned. Candidates for Korea's cooling down of the investment fever include falling capital productivity, stronger import competition, the slowdown of economic growth, greater investment risk, and population ageing (see Nam, 2012; Ro and Kim, 2014; and BOK, 2015). Still, it is not easy to single out factors that can explain the sluggish investment.

Park, Shin, and Jongwanich (2009) have provided a different perspective on this issue from examining the decline of investment in East Asia since the Asian financial crisis. They insisted that there was an overinvestment before the crisis, but no evidence for overinvestment after the crisis. In the same context, Eichengreen, Perkins, and Shin (2012) have argued that there was an overinvestment in Korea and the investment slump was inevitable with the slowdown of economic growth that followed the crisis.¹

¹ They argue that there is nothing aberrant about the slowdown of growth after the financial crisis of 1997-1998. They insisted that what was rather distinctive was that the slowdown was successfully

Lee (2017) published the so-called ‘normalization hypothesis’ to argue that, although investment by chaebol enterprises was normalized after the 1997 currency crisis, the investment by non-chaebol-affiliated firms (e.g. ventures, small and medium-sized firms, and foreign companies) was not. He insisted that the sluggish investment reflects the fact that investment by firms not affiliated with chaebols was not sufficient to compensate for a decrease in investment by chaebol firms that resulted from normalization.

It goes without saying that the 1997 crisis has changed the investment-financing relationship of the corporate sector in Korea. According to Kim, Ryou, and Takagi (2010), corporate financing of both chaebol-affiliated and non-chaebol-affiliated firms has become more responsive to factors such as return on assets, cash flows and credit rating. They also emphasized that changed corporate incentives in an environment of greater market discipline and improved prudential supervision were the main causes for the more diversified patterns of Korean corporate financing practices in the post-crisis period. In the same context, Lee, Park and Shin (2009) have shown that the internal capital market of chaebol-affiliated firms is replaced by a public debt market, because chaebol firms’ coordinated attempts to achieve healthier financial structures have taken place at the expense of investment efficiency in the wake of the crisis. Meanwhile, Goh, Choi and Cho (2016) have focused on chaebol firms’ overinvestment and shown that it is significantly reduced after the 1997 crisis. They postulated that governance and financial reforms focusing on chaebol firms and emphasizing long-term firm value were the ones that discouraged chaebol firms’ overinvestment practices.

Apart from the question of overinvestment, it is important to understand to what extent financial constraints faced by the firms, particularly by non-chaebol firms, have contributed to the weakening of investment. Hong (2006) has emphasized that the burden of debt is the cause for the sluggish corporate investment after the 1997 crisis. He interpreted the significance of cash flow as an explanatory variable of the slowdown of investment was mainly related to the downside risk from the debt-asset ratio, rather than to the uncertainty concerning the future profitability of investment. In contrast, Lee (2005) insisted that financial constraints was not important in explaining the sluggish investment after the 1997 crisis, as shown in the disappearance of sensitivity of investment to cash flows. He pointed out that uncertainty was the major cause,

resisted for a period of years in the first half of 1990s due to artificially boosted investment rates (Eichengreen, Perkins, and Shin, 2012, pp. 2-3).

particularly for firms with a low-interest coverage ratio or high debt-asset ratio, and small manufacturing firms.

The interaction between investment and cash flow began to attract rekindled attention after the global financial crisis. Brown and Petersen (2009) have reported that the investment-cash flow sensitivity largely disappears for physical investment and remains comparatively strong for R&D. They insist that the changing composition of investment and the rising importance of public equity as a source of funds can account for the decline of sensitivity for total investment. Similarly, Lakin, Ng, and Zhu (2018) have insisted that the fading of investment-cash flow sensitivity, observed only for firms in rich countries, happens because financial development can enrich external resources for investment and promote the allocation efficiency of internal resources. However, it is unclear whether the fading of investment-cash flow sensitivity means relaxation of financial constraints. Chen and Chen (2012) have insisted that the disappearance of investment-cash flow sensitivity during the 2007-2009 credit crunch implies that it is not a good measure of financial constraints. They have added that the decline and disappearance cannot be explained by changes in sample composition, corporate governance, or market power.

The possible negative effect of financial investment on fixed investment is another issue in our exploration. Since restrictions for foreign investment shares have been completely lifted after the 1997 financial crisis, companies might have been forced to buy their own shares to defend their managerial rights. In particular, Korea has no other option but to secure stake as much as possible to protect its managerial rights as it has no defense mechanism such as poison pill. Of course, share repurchase is a common strategy used by many companies. Using firm-level data from seven major countries, Lee and Suh (2011) have argued that firms can discharge excess capital to reduce agency conflict and distribute temporary cash flows. Meanwhile, share buyback is not the only reason for financial investment. Shu, Zhang and Zheng (2018) have insisted that the sluggish fixed investment in China reflects the trend of financialization, meaning that profits of non-financial firms can come increasingly through financial channels rather than the main business of production. Of course, financialization itself is driven by the slowing down of China's economic growth and decreasing returns on fixed investment.

III. ANALYTICAL FRAMEWORK AND DATA

1. Analytical Framework

Various economic theories have been proposed to explain investment flows, including a neoclassical model, Tobin's q theory, and the accelerator model. We adopted a simple model postulating that investment decisions are affected by investment opportunities represented by Tobin's q (Q), and cash flow (CFK) under possible financial constraints of access to an external capital market (Chen and Chen, 2012; Larkin et al., 2018).

$$IK_t = f(CFK_t, Q_{t-1}) \quad (1)$$

IK_t is the investment ratio of year t . It is defined as the difference between tangible fixed assets at the end of year t and at the beginning of year t , divided by the total asset at the beginning of year t . CFK_t is the cash flow ratio of year t . It is calculated as the cash flow (cash inflow from operating activities) during year t divided by the total assets at the beginning of year t . Q_t is Tobin's q . It is calculated as the sum of the total liabilities and the equity market capitalization at the end of year t divided by the total asset at the end of year t . Both explanatory variables are expected to have positive effects on the dependent variable.

Next, we extend equation (1) to consider other plausible determinants of fixed investment: the debt-to-assets ratio ($DEBT$), growth rate of sales ($DSALE$) and volatility of the rate of return on equity ($VOLATIL$).

$$IK_t = f(CFK_t, Q_{t-1}, DEBT_t, VOLATIL_t, DSALE_t) \quad (2)$$

$DEBT_t$ denotes the ratio of total liabilities over equity, and $DSALE_t$ denotes the growth rate of sales over the previous year. $VOLATIL_t$ is calculated as the sample standard deviation of daily stock returns of year t .

The debt-to-equity ratio ($DEBT$) is another proxy for financial constraint. It would have a negative effect on fixed investment if a firm is financially pressed to pay back external debt. On the other hand, it would have a positive effect if investment is financed by means of external debt financing (Hong, 2006). The growth rate of sales

(*DSALE*) is complementary to Tobin's q (Q) in that it contains information about future investment opportunities. It would have a positive effect on fixed investment, if it is not fully reflected in the market value of the firms concerned. Meanwhile, volatility of the daily rate of return on equity is often used as a proxy for uncertainty faced by the firm concerned. It is expected to have a negative effect on fixed investment (Lee, 2005; Smietanka et al., 2018).

In general, cash flows are allocated to investment in fixed tangible and intangible assets or financial investment and dividend payment. If so, the latter can be seen as a mirror image of the former. Thus, equation (1) can be used to analyze the determinants of financial investment.

$$FINV_t = f(CFK_t, Q_{t-1}) \quad (3)$$

$FINV_t$ is the financial investment ratio of year t . It is calculated as the net financial investment during year t divided by the total assets at the beginning of year t . As in equation (1), both explanatory variables are expected to affect financial investment positively. At the same time, if the sensitivity of fixed investment to cash flow decreases in equation (1), it is expected that the sensitivity of financial investment to cash flow in equation (3) will increase.

We can use equation (3) to analyze what types of financial investment among debt repayment (*DEBT_REPAY*), share repurchase (*SHARE_REPCH*) and other financial investment (*OTHER_FINV*), would be the most sensitive to cash flow.

$$DEBT_REPAY_t = f(CFK_t, Q_{t-1}) \quad (4)$$

$$SHARE_REPCH_t = f(CFK_t, Q_{t-1}) \quad (5)$$

$$OTHER_FINV_t = f(CFK_t, Q_{t-1}) \quad (6)$$

DEBT_REPAY denotes a decrease in current and long-term debt, and *SHARE_REPCH* denotes net purchase of common and preferred stock. *OTHER_FINV* is defined as financial investment excluding debt repayment and share purchase.

2. Data and Variables

We obtained firm-level data from Nice Information Service (KISVALE). KISVALUE distributes comprehensive corporate and financial information on companies listed on the Korea Exchange. We selected a group of non-financial firms from the manufacturing and service sectors for the period between 1990 and 2016. Table 1 shows definition of variables.

Table 1. Definition of Variables

| Variables | Definition |
|-------------|---|
| IK | Increase in property, plant and equipment (current year), divided by total assets (end-of-last year) |
| CFK | Cash flow (current year) divided by total assets (end-of-last year) |
| Q | Market value (end-of-current year)/TA (end-of-current year). Market value = liabilities + equity market capitalization |
| FINV | Net cash flow from investing activities + net cash flow from financing activities – dividend – net increase in property, plant and equipment (current year), divided by total assets (end-of-last-year) |
| DEBT_REPAY | Decrease in current and long-term debt (current year), divided by total assets (end-of-last-year) |
| SHARE_REPCH | Purchase of common and preferred stock – sale of common and preferred stock (current year), divided by total assets (end-of-last-year). |
| OTHER_FINV | Financial investment excluding DEBT_REPAY and SHARE_PURCH (current year), divided by total assets (end-of-last-year) |
| DEBT | Total liabilities (current year) divided by total equity (current year) |
| DSALE | Sales growth rate over the previous year |
| VOLATIL | Standard deviation of daily stock returns, using the adjusted closing share price (current year) |

After winsorizing at 0.5% at both ends for each year, the unbalanced panel data consisting of up to 623 firms (161 chaebol-affiliated firms and 462 non-chaebol-affiliated firms) for 1999-2016 were left. Table 2 summarizes statistical characteristics of variables during the total sample period and two sub-periods of 1999-2007 and 2010-2016. If pre-crisis period (F) and post-crisis period (L) were compared, the mean of fixed investment ratio (*IK*) slightly decreased from 3.9% to 3.6%. The mean value of cash flow ratio (*CFK*) decreased from 6.1% to 4.7%, while the mean value of Tobin's *q* (*Q*) considerably increased to surpass 1.0 after the global financial crisis.

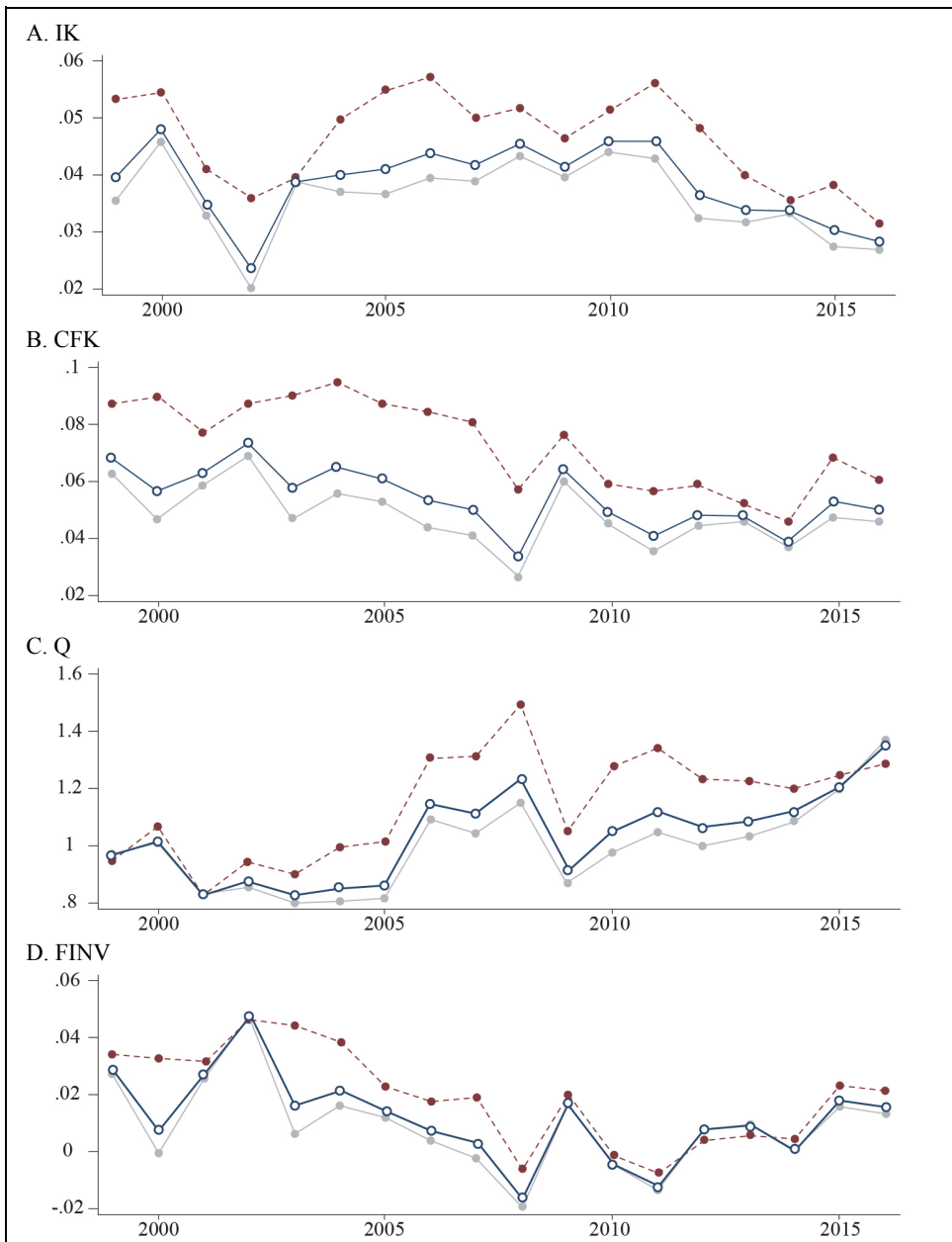
Second, the mean of financial investment ratio (*FINV*) drastically decreased by more than 80%. The decrease was mainly driven by a sharp drop of debt repayment from 1.7% to -1.3%. In contrast, share repurchase and other financial investment increased by 159% and 25%, respectively. Third, the mean of debt divided by equity (*DEBT*) decreased from 1.48 to 1.13, while the growth rate of sales (*DSALE*) considerably decreased from 11.4% to 6.6%. Finally, the standard deviation of daily equity returns slightly decreased from 0.0368 to 0.0303.

Table 2. Summary Statistics (1999-2016)

| Variables | 1999-2016 | | 1999-2007(F) | | 2010-2016(L) | |
|--------------------|-----------|----------|--------------|---------|--------------|---------|
| | Mean | Std.Dev. | Mean | Std.Dev | Mean | Std.Dev |
| <i>IK</i> | 0.0376 | 0.0640 | 0.0391 | 0.0735 | 0.0361 | 0.0521 |
| <i>CFK</i> | 0.0543 | 0.0893 | 0.0611 | 0.0971 | 0.0471 | 0.0795 |
| <i>Q</i> | 1.0425 | 0.6373 | 0.9469 | 0.5185 | 1.1434 | 0.7289 |
| <i>FINV</i> | 0.0104 | 0.0936 | 0.0173 | 0.1041 | 0.0032 | 0.0804 |
| <i>DEBT_REPAY</i> | -0.0055 | 0.0979 | 0.0017 | 0.0939 | -0.0132 | 0.1014 |
| <i>SHARE_REPCH</i> | 0.0014 | 0.0132 | 0.0022 | 0.0154 | 0.0057 | 0.0103 |
| <i>OTHER_FINV</i> | 0.0145 | 0.1176 | 0.0129 | 0.1272 | 0.0161 | 0.1064 |
| <i>DEBT</i> | 1.3093 | 3.0713 | 1.4781 | 3.8824 | 1.1312 | 1.8511 |
| <i>DSALE</i> | 0.0907 | 0.4455 | 0.1141 | 0.5106 | 0.0661 | 0.3628 |
| <i>VOLATIL</i> | 0.0337 | 0.0324 | 0.0368 | 0.0142 | 0.0303 | 0.0439 |

Figure 2 shows trends of key variables included in the baseline model. First, *IK* decreased after the global financial crisis for all three groups (total firms, chaebol-affiliated firms, and non-chaebol-affiliated firms), particularly for chaebol-affiliated firms. Second, the key explanatory variables *CFK* and *Q* showed stark contrast to each other. *CFK* showed a decreasing trend since the early 2000s except for the short period of 2015-2016. On the other hand, the Tobin's *q* switched to an upward trend in 2005 after a long-run decrease since the mid-1990s. Third, alternatives to fixed investment (*FINV*) showed a decreasing trend since the early 2000's. After the brief turmoil of the 2008 global financial crisis, it began to increase since 2012.

Figure 2. Trends in Major Variables



Note: solid – all firms, dashed – chaebol-affiliated firms, dotted – non-chaebol-affiliated firms.

IV. EMPIRICAL ANALYSIS

1. Fixed Investment

Table 3 shows regression results of our baseline model (Equation 1). We first estimated the whole sample period of 1999-2016. We then analyzed two sub-periods of 1999-2007 and 2010-2016, respectively, to check the structural change after the global financial crisis. In addition, we estimated separate samples of total firms, chaebol-affiliated firms, and non-chaebol-affiliated firms.²

First, the estimate for the total firms (A) showed that both cash flow (*CFK*) and Tobin's q (Q) had the expected signs and significant effects on fixed investment for the whole sample period (1999-2016). After the crisis, the estimate showed that the significance of both *CFK* and Q decreased, although changes of their coefficients between the two sub-periods (L-F) were not statistically significant.

Second, the estimate of the chaebol-affiliated firms (B) implied that both cash flow (*CFK*) and Tobin's q (Q) had significant effects on fixed investment after the global financial crisis. Before the global financial crisis (1999-2007), however, Tobin's q (Q) lost its significance as the explanatory variable. Still, the change of coefficient of Tobin's q (Q) between the two sub-periods appeared to be insignificant. This was the same for the coefficient of cash flow (*CFK*).

Third, the estimate of non-chaebol-affiliated firms (C) appeared to be similar to that of total firms (A). Both cash flow (*CFK*) and Tobin's q (Q) had significant effect on fixed investment for the three sample periods. Interestingly, the change of estimated coefficient of *CFK* appeared to be statistically significant, implying structural changes after the global financial crisis.

² The generalized method of moments (GMM) is often used to take care of the endogeneity problem of explanatory variables. In our case, the results turn out to be very sensitive to choice of instrumental variables and became unstable.

Table 3. Fixed Investment: The Baseline Model

| A. Total Firms | | | | |
|---------------------------------|-----------------|-----------------|------------------|-----------------|
| | 1999-2016 | 1999-2007(F) | 2010-2016(L) | Change (L-F) |
| <i>Constant</i> | 0.0212(5.41)*** | 0.0181(3.02)*** | 0.0342(10.20)*** | |
| <i>CFK</i> | 0.1219(7.30)*** | 0.1350(5.04)*** | 0.0851(4.41)*** | -0.0499(-1.51) |
| <i>Q(-1)</i> | 0.0124(5.81)*** | 0.0143(2.91)*** | 0.0081(3.21)*** | -0.0063(-1.14) |
| Obs. (firms) | 9622(623) | 4370(542) | 4144(622) | |
| Adj. R sq. | 0.1012 | 0.1119 | 0.1092 | |
| B. Chaebol-Affiliated Firms | | | | |
| | 1999-2016 | 1999-2007(F) | 2010-2016(L) | Change (L-F) |
| <i>Constant</i> | 0.0326(3.60)*** | 0.434(4.56)*** | 0.0335(4.87)*** | |
| <i>CFK</i> | 0.1061(4.21)*** | 0.0752(2.17)** | 0.0785(2.05)** | 0.0032(0.06) |
| <i>Q(-1)</i> | 0.0143(3.66)*** | 0.0056(0.93) | 0.0114(2.73)*** | 0.0057(0.77) |
| Obs. (firms) | 2375(161) | 1047(131) | 1058(161) | |
| Adj. R sq. | 0.1597 | 0.1454 | 0.1559 | |
| C. Non-Chaebol-Affiliated Firms | | | | |
| | 1999-2016 | 1999-2007(F) | 2010-2016(L) | Change (L-F) |
| <i>Constant</i> | 0.0177(4.10)*** | 0.0111(1.55) | 0.0342(9.01)*** | |
| <i>CFK</i> | 0.1261(6.25)*** | 0.1532(4.76)*** | 0.0856(3.88)*** | -0.0676(-1.78)* |
| <i>Q(-1)</i> | 0.0119(4.72)*** | 0.0167(2.74)*** | 0.0068(2.28)** | -0.0099(-1.39) |
| Obs. (firms) | 7247(462) | 3323(411) | 3086(461) | |
| Adj. R sq. | 0.0824 | 0.0949 | 0.0917 | |

Note: *** (** and *) denotes statistical significance at the 1% (5% and 10%) level.

In summary, a decreasing trend of cash flow and an increase in Tobin's q (Q) since the early 2000's imply that the worsening cash flow was a major factor behind the sluggish investment after the crisis. The sensitivity of investment to cash flow deserves further discussion. Koo and Maeng (2019) have shown that the cash-flow sensitivity depends on the investment opportunity. That is, firms can decide to hold cash in response to an increase in cash flow when there is no good investment opportunity. Our finding is interesting in that both chaebol-affiliated firms and non-chaebol-affiliated firms are still sensitive to the investment opportunities. However, it was questionable why non-chaebol-affiliated firms did not invest in response to improvement of q after the global financial crisis.

Investment-cash flow sensitivity is often interpreted as an evidence for the importance of constraint of financial resources in investment decision. Before the 1997 financial crisis, the effect of cash flow on fixed investment was significant for non-chaebol firms only (see Table A1 in the appendix). This fact implies that chaebol-affiliated firms

were able to raise external funds, not necessarily depending on internal funds. Our results in Table 3 imply that such disparity in access to financial market between chaebol-affiliated firms and non-chaebol-affiliated firms has disappeared after the 1997 crisis.

Table 4 summarizes test results of difference between estimated coefficients of chaebol-affiliated firms and those of non-chaebol-affiliated firms as shown in Table 3. The difference between the two groups was only significant for the case of *CFK* during 1999-2007, where the coefficient of *CFK* for chaebol-affiliated firms (0.0752) was much smaller than that for non-chaebol-affiliated firms (0.1532). Such a significant difference disappeared after the global financial crisis. On the other hand, the difference of estimated coefficients for Tobin's *q* remained insignificant for both sub-sample periods.

We then estimated the extended model (Equation 3) with additional explanatory variables, such as debt ratio (*DEBT*), growth of sales (*DSALE*) and volatility of daily rate of return on equity (*VOLATIL*). Regression results are summarized in Table 5.

Table 4. Test of Difference between Chaebol-Affiliated Firms and Non-Chaebol-Affiliated Firms

| | 1999-2016 | 1999-2007 | 2010-2016 |
|--------------|-----------------|-----------------|----------------|
| <i>CFK</i> | -0.02000(-0.62) | -0.0779(-1.65)* | -0.0071(-0.16) |
| <i>Q(-1)</i> | 0.0023(0.50) | -0.0110(-1.28) | 0.0046(0.89) |

Note: Numbers show how much coefficients of chaebol-affiliated firms (Table 3 (B)) differ from those of non-chaebol-affiliated firms (Table 3 (C)). T statistics are reported inside round brackets. * denotes significance at the 10% level.

First, the estimate of the extended model for 2000-2016 appeared to be similar to that for the baseline model in that cash flow (*CFK*) and Tobin's *q* (*Q*) remained significant. Meanwhile, the explanatory power of additional variables differed depending on the sample period. In the case of total firms (A), all three variables, *DEBT*, *DSALE*, and *VOLATIL*, appeared to have significant effects on fixed investment before the global financial crisis. The sign of *DEBT* was negative, implying that debt-payment was burdensome for firms with high debt-asset ratios. The growth of sales appeared to predict correctly an increase in investment. The coefficient of *VOLATIL* was negative, reflecting the negative effect of increased uncertainty on investment. After the global financial crisis, the coefficient of *VOLATIL* became smaller and statistically insignificant.

If uncertainty is correctly measured by the volatility of equity returns, it cannot explain much about the situation after the crisis.

Second, estimation results of the two subgroups, chaebol-affiliated firms and non-chaebol-affiliated firms, were different from each other. For chaebol-affiliated firms, *DSALE* turned out to be significant during 1999-2007, but not during 2010-2016. This finding implies that information about the current market condition is not necessarily helpful for predicting the future profitability of investments. After the global financial crisis, all three additional variables were statistically insignificant. In the case of non-chaebol-affiliated firms, the impact of global financial crisis appeared to be greater. Only the debt ratio remained significant. That is, the sluggish fixed investment of non-chaebol-affiliated firms could not be explained well by changes in growth of sales (*DSALE*) or volatility of equity return (*VOLATIL*) after the global financial crisis.

Table 5. Fixed Investment: The Extended Model

A. Total Firms

| | 1999-2016 | 1999-2007(F) | 2010-2016(L) | Change (L-F) |
|-----------------|-------------------|-------------------|-------------------|-----------------|
| <i>Constant</i> | 0.0261(6.02)*** | 0.0478(5.65)*** | 0.0356(10.58)*** | |
| <i>CFK</i> | 0.1198(7.43)*** | 0.1333(5.21)*** | 0.0826(4.46)*** | -0.0507(-1.61)* |
| <i>Q(-1)</i> | 0.0120(5.80)*** | 0.0144(2.98)*** | 0.0077(3.07)*** | -0.0067(-1.23) |
| <i>DEBT</i> | -0.0012(-3.86)*** | -0.0007(-2.07)** | -0.0015(-3.68)*** | -0.0008(-1.42) |
| <i>DSALE</i> | 0.0117(3.97)*** | 0.0094(2.36)*** | 0.0059(1.72)* | -0.0035(-0.67) |
| <i>VOLATIL</i> | -0.0793(-2.86)*** | -0.5958(-4.48)*** | -0.0182(-1.35) | 0.5776(4.33)*** |
| Obs. (firms) | 9622(623) | 4370(542) | 4144(622) | |
| Adj. R sq. | 0.1162 | 0.1401 | 0.1157 | |

B. Chaebol-Affiliated Firms

| | 1999-2016 | 1999-2007(F) | 2010-2016(L) | Change (L-F) |
|-----------------|-----------------|-----------------|-----------------|----------------|
| <i>Constant</i> | 0.0347(3.76)*** | 0.0651(4.16)*** | 0.0354(4.77)*** | |
| <i>CFK</i> | 0.1030(4.14)*** | 0.0646(1.96)** | 0.0796(2.11)** | 0.0150(0.30) |
| <i>Q(-1)</i> | 0.0142(3.59)*** | 0.0060(0.95) | 0.0115(2.70)*** | 0.0054(0.71) |
| <i>DEBT</i> | -0.0006(-1.22) | -0.0001(-0.20) | -0.0015(-1.39) | -0.0014(-1.00) |
| <i>DSALE</i> | 0.0095(2.90)*** | 0.0144(2.31)** | 0.0037(1.01) | -0.0107(-1.46) |
| <i>VOLATIL</i> | -0.0389(-0.63) | -0.4871(-1.18) | -0.0460(-1.17) | 0.4412(1.27) |
| Obs. (firms) | 2375(161) | 1047(131) | 1058(161) | |
| Adj. R sq. | 0.1676 | 0.1780 | 0.1897 | |

Table 5. Continued

| C. Non-Chaebol-Affiliated Firms | | | | |
|---------------------------------|-------------------|-------------------|-------------------|-----------------|
| | 1999-2016 | 1999-2007(F) | 2010-2016(L) | Change (L-F) |
| <i>Constant</i> | 0.0203(4.78)*** | 0.0426(4.18)*** | 0.0357(9.43)*** | |
| <i>CFK</i> | 0.1244(6.42)*** | 0.1531(4.99)*** | 0.0817(3.91)*** | -0.715(-2.0)** |
| <i>Q(-1)</i> | 0.0114(4.71)*** | 0.0167(2.81)*** | 0.0064(2.13)** | -0.0104(-1.47) |
| <i>DEBT</i> | -0.0013(-3.60)*** | -0.0008((-2.04)** | -0.0015(-3.57)*** | -0.0007(-1.23) |
| <i>DSALE</i> | 0.0122(3.59)** | 0.0092(2.13)** | 0.0065(1.55) | -0.0026(-0.45) |
| <i>VOLATIL</i> | -0.0828(-2.78)*** | -0.6206(-4.14)*** | -0.0169(-1.17) | 0.6036(4.05)*** |
| Obs. (firms) | 7247(462) | 3323(411) | 3086(461) | |
| Adj. R sq. | 0.0686 | 0.1203 | 0.0976 | |

Note: *** (** and *) denotes statistical significance at the 1% (5% and 10%) level.

Table 6 summarizes test results of difference between estimated coefficients of chaebol-affiliated firms and those of non-chaebol-affiliated firms for the extended model. As in the case of the baseline model, the only significant difference between the two groups was the *CFK* during 1999-2007. For all other explanatory variables, the difference remain insignificant for both previous-crisis and post-crisis periods.

Table 6. Test of Difference of Chaebol-Affiliated Firms and Non-Chaebol-Affiliated Firms

| | 1999-2016 | 1999-2007 | 2010-2016 |
|----------------|----------------|------------------|----------------|
| <i>CFK</i> | -0.2014(-0.68) | -0.0886(-1.97)** | -0.0021(-0.05) |
| <i>Q(-1)</i> | 0.0027(0.59) | -0.0107(-1.23) | 0.0051(0.99) |
| <i>DEBT</i> | 0.0007(1.17) | 0.0007(0.78) | 0.0000(0.03) |
| <i>DSALE</i> | -0.0027(-0.57) | 0.0052(0.69) | -0.0028(-0.51) |
| <i>VOLATIL</i> | 0.0438(0.64) | 0.1334(0.35) | -0.0291(-0.70) |

Note: Numbers show how much coefficients of chaebol-affiliated firms (Table 5 (B)) differ from those of non-chaebol-affiliated firms (Table 5 (C)). T statistics are reported inside round brackets. ** denotes significance at the 5% level.

Next, we tested robustness of our results regarding the impact of global financial crisis using two sub-groups: one with high foreign assets and one with high export ratio. It is easy to expect that globalized firms are more susceptible to external shocks. Our result shown in Table 7 does not support such expectation.

The first group of firms with high foreign assets (A) showed that *DEBT* became significant after the crisis, while *DSLAE* lost its explanatory power. Such a change was not much different from the general case reported in Table 5 (A). Firms with high foreign assets would have continued to invest actively overseas except for a short

period immediately after the global financial crisis. They seemed to be more cautious about the financial burden from a high debt ratio after the crisis.

The second group of firms with high export share ratios showed the similar results. All explanatory variables except *VOLATIL* remained statistically significant in spite of global financial crisis. Although most explanatory variables remained significant after crisis, high export ratio firms appeared to be resilient to external shocks originated from the global financial crisis.

Table 7. Effects of High Foreign Assets or High Exports

| A. High Foreign Asset Firms | | | | |
|-----------------------------|-------------------|-------------------|-------------------|-----------------|
| | 1999-2016 | 1999-2007(F) | 2009-2016(L) | Change (L-F) |
| <i>Constant</i> | 0.0363(6.27)*** | 0.0682(5.06)*** | 0.0335(6.56)*** | |
| <i>CFK</i> | 0.1091(5.49)*** | 0.1172(3.53)*** | 0.0728(2.90)*** | -0.444(-1.11) |
| <i>Q(-1)</i> | 0.0154(4.35)*** | 0.0165(1.79)* | 0.0135(3.97)*** | -0.0030(-0.30) |
| <i>DEBT</i> | -0.0011(-2.82)*** | -0.0045(-0.98) | -0.0017(-3.52)*** | -0.0012(-1.85)* |
| <i>DSALE</i> | 0.0072(2.00)** | 0.0084(2.02)** | 0.0031(0.58) | -0.0053(-0.78) |
| <i>VOLATIL</i> | -0.0835(-2.45)** | -0.7439(-3.32)*** | -0.0284(-2.08)** | 0.7154(3.22)*** |
| Obs. (firms) | 4593(488) | 1969(374) | 2070(433) | |
| Adj. R sq. | 0.1243 | 0.1475 | 0.1209 | |
| B. High Export Share Firms | | | | |
| | 1999-2016 | 1999-2007(F) | 2009-2016(L) | Change (L-F) |
| <i>Constant</i> | 0.0303(4.96)*** | 0.0643(5.57)*** | 0.0370(6.32)*** | |
| <i>CFK</i> | 0.1178(5.83)*** | 0.1236(4.17)*** | 0.0881(3.90)*** | -0.0355(-0.95) |
| <i>Q(-1)</i> | 0.0150(3.98)*** | 0.0164(1.87)* | 0.0090(2.45)** | -0.0074(-0.77) |
| <i>DEBT</i> | -0.0012(-3.44)*** | -0.0010(-2.34)** | -0.0015(-2.89)*** | -0.0005(-0.74) |
| <i>DSALE</i> | -0.0139(2.73)*** | 0.0128(2.31)** | 0.0131(1.94)** | 0.0003(0.04) |
| <i>VOLATIL</i> | -0.827(-2.17)** | -0.8650(-4.22)*** | -0.0150(-1.62) | 0.8500(4.15)*** |
| Obs. (firms) | 4806(448) | 2182(314) | 2070(410) | |
| Adj. R sq. | 0.1177 | 0.1534 | 0.1183 | |

Note: *** (** and *) denotes statistical significance at the 1% (5% and 10%) level.

2. Financial Investment

Table 8 shows regression results of financial investment (Equation 2). As expected, cash flow appeared to be an important determinant of financial investment. This confirms the postulate that financial investment is a mirror image of fixed investment in the distribution of cash flow.

First, for total firms (A), the coefficient of cash flow on financial investment was statistically significant. Its size surpassed 0.8, which was much larger compared to the case of fixed investment. It slightly increased after the global financial crisis, reflecting decrease of the effect of cash flow on fixed investment. Financial investment of chaebol-affiliated firms appeared to be more sensitive to cash flow compared to that of non-chaebol-affiliated firms. The coefficient of cash flow (*CFK*) was 0.92 for chaebol-affiliated firms and 0.88 for non-chaebol-affiliated firms during 2010-2016.

Second, coefficients for Tobin's *q* (*Q*) had negative values. They were statistically significant, particularly for chaebol-affiliated firms. This result implies that firms are sensitive to opportunities for fixed investment. In this context, it seems to be an overstatement to claim that financial investment discourages fixed investment. In the case of non-chaebol-affiliated firms, the effect of Tobin's *q* (*Q*) on financial investment was not statistically significant. Thus, the same argument did not hold.

In summary, an increase in coefficients of *CFK* on financial investment, even if it is not drastic enough, can explain the rising financial investment after the global financial crisis. This finding matches well with the case of China and Taiwan where firms would reduce capital expenditures to raise their cash holdings (Shiau et al., 2018).

Table 8. Financial Investment: The Baseline Model

| A. Total Firms | | | | |
|-----------------------------|-------------------|-------------------|--------------------|----------------|
| | 1999-2016 | 1999-2007(F) | 2010-2016(L) | Change (L-F) |
| <i>Constant</i> | -0.0204(-5.17)*** | 0.0199(-3.17)*** | -0.0428(-10.73)*** | |
| <i>CFK</i> | 0.8514(41.44)*** | 0.8359(22.36)*** | 0.8897(22.36)*** | 0.0538(1.17) |
| <i>Q(-1)</i> | -0.0133(-5.73)*** | -0.0121(-2.28)** | -0.0074(-2.05)** | 0.0047(0.74) |
| Obs. (firms) | 9622(623) | 4370(542) | 4144(622) | |
| Adj. R sq. | 0.5365 | 0.4869 | 0.5610 | |
| B. Chaebol-Affiliated Firms | | | | |
| | 1999-2016 | 1999-2007(F) | 2010-2016(L) | Change (L-F) |
| <i>Constant</i> | -0.0316(-3.59)*** | -0.0432(-4.81)*** | -0.0407(-5.59)*** | |
| <i>CFK</i> | 0.8950(35.84)*** | 0.9264(25.45)*** | 0.9242(23.70)*** | -0.0022(-0.04) |
| <i>Q(-1)</i> | -0.0178(-4.52)*** | -0.0086(-1.58) | -0.0144(-3.23)** | -0.0059(-0.84) |
| Obs. (firms) | 2375(161) | 1047(131) | 1058(161) | |
| Adj. R sq. | 0.5604 | 0.5273 | 0.5300 | |

Table 8. Continued

| C. Non-Chaebol-Affiliated Firms | | | | |
|---------------------------------|-------------------|------------------|-------------------|--------------|
| | 1999-2016 | 1999-2007(F) | 2010-2016(L) | Change (L-F) |
| <i>Constant</i> | -0.0173(-3.86)*** | -0.0137(-1.49) | -0.0428(-9.32)*** | |
| <i>CFK</i> | 0.8400(33.40)*** | 0.8093(17.67)*** | 0.8823(27.61)*** | 0.0730(1.32) |
| <i>Q(-1)</i> | -0.0120(-4.28)*** | -0.0129(-1.96)** | -0.0052(-1.19) | 0.0077(0.91) |
| Obs. (firms) | 7247(462) | 4370(542) | 3323(411) | |
| Adj. R sq. | 0.5326 | 0.0343 | 0.4761 | |

Note: *** (**) denotes statistical significance at the 1% (5%) level.

Next, we analyzed determinants of various types of financial investment, debt repayment, share repurchase and other financial investment. Results are shown in the appendix (Tables A2, Table A3 and Table A4 for total firms, chaebol-affiliated firms and non-chaebol affiliated firms, respectively).

First, estimation results for total firms showed that debt repayment and other financial investment were sensitive to cash flow, particularly after the global financial crisis. It was noteworthy that the response of debt repayment to cash flow increased after the global financial crisis, in contrast to the case of other financial investment. On the other hand, the coefficient of cash flow for share repurchase was quite smaller compared to those of the other two.

Second, separate regression analysis of chaebol-affiliated firms and non-chaebol-affiliated firms confirmed the sensitiveness of debt repayment and other financial investment to cash flow, but not share repurchase. For both groups, the effect of cash flow on share repurchase is not statistically significant during the pre-crisis period (1999-2007) or the post-crisis period (2010-2016). This finding cast doubt on the argument that firms might have used cash holdings for share repurchase (Lee and Suh, 2011).

We also tested whether estimated coefficients of chaebol-affiliated firms were significantly different from those of non-chaebol-affiliated firms for financial investment. In the case of total financial investment (A), the only significant difference between the two groups was the *CFK* during 1999-2007, corresponding to the test result on fixed investment (Table 4). For debt repayment, differences of coefficients of *CFK* were significantly large during the sub-sample period of 1999-2007, and the total sample period of 1999-2016 (B). The difference for *CFK* was not significant for the case of share repurchase, or other financial investment. Interestingly, the difference

for Q was significantly large for share repurchase (C) and other financial investment (D), but not for debt repayment (B).

Table 9. Test of Difference of Chaebol-Affiliated Firms and Non-Chaebol-Affiliated Firms

| A. Total Financial Investment | | | |
|-------------------------------|----------------|-------------------|----------------|
| | 1999-2016 | 1999-2007 | 2010-2016 |
| <i>CFK</i> | 0.0551(1.56) | 0.1171(2.01)** | 0.0420(0.83) |
| <i>Q(-1)</i> | -0.0058(-1.20) | 0.0043(0.51) | -0.0092(-1.47) |
| B. Debt Repayment | | | |
| | 1999-2016 | 1999-2007 | 2010-2016 |
| <i>CFK</i> | 0.0957(2.10)** | 0.1373(2.49)*** | -0.0310(-0.38) |
| <i>Q(-1)</i> | -0.0089(-1.10) | -0.0240(-1.63)* | 0.0090(0.65) |
| C. Share Repurchase | | | |
| | 1999-2016 | 1999-2007 | 2010-2016 |
| <i>CFK</i> | 0.0047(0.92) | 0.0034(0.39) | -0.0006(-0.08) |
| <i>Q(-1)</i> | -0.0018(-1.24) | -0.0049(-2.04)*** | -0.0012(-0.75) |
| D. Other Financial Investment | | | |
| | 1999-2016 | 1999-2007 | 2010-2016 |
| <i>CFK</i> | -0.0682(-1.34) | -0.0339(-0.47) | 0.0345(0.42) |
| <i>Q(-1)</i> | 0.0059(0.64) | 0.0364(2.20)** | -0.0161(-1.05) |

Note: The table reports the differences in the estimated coefficients between chaebol-affiliated firms and non-chaebol-affiliated firms (shown in Tables 3, 4, and 8). T statistics are reported inside round brackets. *** (** and *) indicates significance at the 1% (5% and 10%) level.

V. CONCLUSION

In this paper, we examined possible causes for the sluggish investment by Korean firms, particularly after the global financial crisis. We also analyzed determinants of financial investment using the same framework applied to fixed investment. The major findings of this paper can be summarized as follows.

First, fixed investment by the corporate sector remained sensitive to cash flow and investment opportunity measured by Tobin's q after the global financial crisis, although their effects decreased compared to those during the pre-crisis period. Taking into account a decreasing trend of cash flow and an increase in Tobin's q since the early 2000's, the worsening cash flow seems to be a major factor behind the sluggish investment after the crisis. Other factors such as debt-asset ratio for non-chaebol

affiliated firms aggravated the sluggish investment. This finding implies that access to external financing differs depending on affiliation with chaebol groups. Growth of sales became insignificant after the global financial crisis regardless of affiliation with chaebol groups. Such a change implies that its value in predicting the future profitability of investment separately from Tobin's q became meaningless. Meanwhile, volatility of equity return lost its explanatory power for both chaebol-affiliated firms and non-chaebol-affiliated firms as the aftermath of the global financial crisis. Accordingly, it is difficult to point out that uncertainty is the major factor behind the declining fixed investment.

Second, analysis of financial investment confirmed that financial investment was a mirror image of fixed investment in the distribution of cash flow. The effect of cash flow on financial investment is statistically significant. Its size was much larger than that on fixed investment. It slightly increased after the global financial crisis. Meanwhile, coefficients for Tobin's q were negative and statistically significant, particularly for chaebol-affiliated firms. Therefore, it seems to be an overstatement that financial investment discourages fixed investment, at least for these firms. Subsequent analysis showed that debt repayment and other financial investment were sensitive to cash flow, particularly after the global financial crisis. Interestingly, the effect of cash flow on the share repurchase was not statistically significant either during the pre-crisis period (1999-2007) or the post-crisis period (2010-2016). Accordingly, it is doubtful that firms have used cash holdings for share repurchase.

Finally, the normalization hypothesis that there was an overinvestment prior to 1997 currency crisis and that post-1997 invest rates were returning to a normal level was useful for understanding the slowdown of fixed investment rate since the early 2000's to some extent. Before the 1997 crisis, our baseline model which explained fixed investment using cash flow and Tobin's q did not fit well, particularly for chaebol-affiliated firms. After the global financial crisis, the same model explained well investment decision of both chaebol-affiliated and non-chaebol-affiliated firms. On the other hand, it was noteworthy that the effect of cash flow on fixed investment decreased, while that on financial investment increased. Accordingly, deterioration of business environment responsible for the decreasing of cash flows deserves due attention in coping with the declining fixed investment.

APPENDIX

Table A1. Fixed Investment: 1994-1997

A. The Baseline Model

| | Total | Chaebol | Non-chaebol |
|-----------------|-----------------|----------------|-----------------|
| <i>Constant</i> | 0.04361(2.35)** | -0.0150(-0.24) | 0.0543(3.77)*** |
| <i>CFK</i> | 0.0996(1.87)* | 0.1117(0.98) | 0.1082(2.11)** |
| <i>Q(-1)</i> | 0.0156(0.98) | 0.0793(1.57) | 0.0021(0.16) |
| Obs. (firms) | 1405(403) | 328(91) | 1077(312) |
| Adj. R sq. | 0.0769 | 0.0966 | 0.0701 |

B. The Extended Model

| | Total | Chaebol | Non-chaebol |
|-----------------|-----------------|-----------------|-----------------|
| <i>Constant</i> | 0.0575(1.92)** | -0.0628(-0.83) | 0.0822(3.27)*** |
| <i>CFK</i> | 0.0611(1.12) | -0.0848(-0.68) | 0.1044(2.00)** |
| <i>Q(-1)</i> | 0.0153(0.90) | 0.1138(2.11)** | -0.0015(-0.61) |
| <i>DEBT</i> | -0.0003(-0.86) | -0.0014(-1.59) | -0.0002(-0.61) |
| <i>DSALE</i> | 0.0514(2.92)*** | 0.1274(4.14)*** | 0.0168(1.11) |
| <i>VOLATIL</i> | -0.8080(-1.37) | -0.1051(-0.09) | -0.9941(-1.49) |
| Obs. (firms) | 1405(403) | 328(91) | 1077(312) |
| Adj. R sq. | 0.1096 | 0.1429 | 0.0839 |

Note: *** (** and *) denotes statistical significance at the 1% (5% and 10%) level.

Table A2. Financial Investment: Total Firms

A. Debt Repayment

| | 1999-2016 | 1999-2007(F) | 2010-2016(L) | Change (L-F) |
|-----------------|-------------------|------------------|-------------------|------------------|
| <i>Constant</i> | 0.0227(3.50)*** | 0.0217(2.94)*** | -0.0199(-2.47)*** | |
| <i>CFK</i> | 0.2709(12.15)*** | 0.1795(7.59)*** | 0.4267(10.78)*** | 0.2472(5.36)*** |
| <i>Q(-1)</i> | -0.0188(-4.64)*** | -0.0104(-1.96)** | -0.0261(-4.31)** | -0.0156(-1.94)** |
| Obs. (firms) | 9622(623) | 4370(542) | 4144(622) | |
| Adj. R sq. | 0.0790 | 0.0467 | 0.0830 | |

B. Share Repurchase

| | 1999-2016 | 1999-2007(F) | 2010-2016(L) | Change (L-F) |
|-----------------|----------------|--------------|----------------|-----------------|
| <i>Constant</i> | 0.0011(1.11) | 0.0002(0.15) | 0.0005(1.18) | |
| <i>CFK</i> | 0.0061(2.34)** | 0.0033(0.76) | 0.0049(1.67)* | 0.0016(0.30) |
| <i>Q(-1)</i> | 0.0008(1.17) | 0.0019(1.55) | -0.0004(-0.61) | -0.0023(-1.66)* |
| Obs. (firms) | 9622(623) | 4370(542) | 4144(622) | |
| Adj. R sq. | 0.0313 | 0.0343 | 0.0051 | |

C. Other Financial Investment

| | 1999-2016 | 1999-2007(F) | 2010-2016(L) | Change (L-F) |
|-----------------|-------------------|-------------------|-------------------|-------------------|
| <i>Constant</i> | -0.0441(-6.18)*** | -0.0413(-4.54)*** | -0.0265(-2.82)*** | |
| <i>CFK</i> | 0.5890(22.06)*** | 0.6639(16.27)*** | 0.4865(13.12)*** | -0.1774(-3.22)*** |
| <i>Q(-1)</i> | 0.0047(0.91) | -0.0037(-0.47) | 0.0203(2.63)*** | 0.0241(2.19)** |
| Obs. (firms) | 9622(623) | 4370(542) | 4144(622) | |
| Adj. R sq. | 0.1705 | 0.2216 | 0.1244 | |

Note: *** (** and *) denotes statistical significance at the 1% (5% and 10%) level.

Table A3. Financial Investment: Chaebol-Affiliated Firms

| A. Debt Repayment | | | | |
|-------------------------------|-------------------|-------------------|------------------|----------------|
| | 1999-2016 | 1999-2007(F) | 2010-2016(L) | Change (L-F) |
| <i>Constant</i> | 0.0489(3.18)*** | 0.0583(2.97)*** | -0.0393(-2.00)** | |
| <i>CFK</i> | 0.3470(9.29) | 0.2898(5.92)*** | 0.4000(5.85)**** | 0.1102(1.28) |
| <i>Q(-1)</i> | -0.0243(-3.71)*** | -0.0288(-2.09)** | -0.0170(-1.42) | 0.0118(0.63) |
| Obs. (firms) | 2375(161) | 1047(131) | 1058(161) | |
| Adj. R sq. | 0.1290 | 0.0838 | 0.0939 | |
| B. Share Repurchase | | | | |
| | 1999-2016 | 1999-2007(F) | 2010-2016(L) | Change (L-F) |
| <i>Constant</i> | 0.0010(0.41) | 0.0028(0.90) | 0.0032(1.83)* | |
| <i>CFK</i> | 0.0097(2.39)** | 0.0060(0.86) | 0.0044(0.64) | -0.0015(-0.16) |
| <i>Q(-1)</i> | -0.0006(-0.53) | -0.0021(-1.10) | -0.0014(-0.92) | 0.0007(0.30) |
| Obs. (firms) | 2375(161) | 1047(131) | 1058(161) | |
| Adj. R sq. | 0.0297 | 0.0105 | 0.0016 | |
| C. Other Financial Investment | | | | |
| | 1999-2016 | 1999-2007(F) | 2010-2016(L) | Change (L-F) |
| <i>Constant</i> | -0.8117(-5.71)*** | -0.1062(-5.93)*** | -0.0070(-0.35) | |
| <i>CFK</i> | 0.5351(13.45)*** | 0.6334(12.27)*** | 0.5173(7.44)*** | -0.1161(-1.37) |
| <i>Q(-1)</i> | 0.0079(1.18) | 0.0246(1.75)* | 0.0059(0.478) | -0.0187(-0.99) |
| Obs. (firms) | 2375(161) | 1047(131) | 1058(161) | |
| Adj. R sq. | 0.1288 | 0.1295 | | |

Note: *** (** and *) denotes statistical significance at the 1% (5% and 10%) level.

Table A4. Financial Investment: Non-Chaebol-Affiliated Firms

A. Debt Repayment

| | 1999-2016 | 1999-2007(F) | 2010-2016(L) | Change (L-F) |
|-----------------|------------------|-----------------|-------------------|-------------------|
| <i>Constant</i> | 0.0128(1.87)* | 0.0095(1.28) | -0.01712(-2.00) | |
| <i>CFK</i> | 0.2513(9.57)*** | 0.1525(5.93)*** | 0.4310(9.29)*** | 0.2784(5.42)*** |
| <i>Q(-1)</i> | 0.0154(-3.21)*** | -0.0048(-0.88) | -0.0260(-3.81)*** | -0.0213(-2.38)*** |
| Obs. (firms) | 7247(462) | 3323(411) | 3086(461) | |
| Adj. R sq. | 0.0675 | 0.0377 | 0.0837 | |

B. Share Repurchase

| | 1999-2016 | 1999-2007(F) | 2010-2016(L) | Change (L-F) |
|-----------------|--------------|----------------|----------------|-----------------|
| <i>Constant</i> | 0.0011(1.05) | -0.0004(-0.21) | -0.0001(-0.14) | |
| <i>CFK</i> | 0.0050(1.58) | 0.0026(0.50) | 0.0050(1.58) | 0.0024(0.42) |
| <i>Q(-1)</i> | 0.0011(1.44) | 0.0028(1.90)* | -0.0001(-0.21) | -0.0030(-1.86)* |
| Obs. (firms) | 7247(462) | 3323(411) | 3086(461) | |
| Adj. R sq. | 0.0339 | 0.0384 | 0.0087 | |

C. Other Financial Investment

| | 1999-2016 | 1999-2007(F) | 2010-2016(L) | Change (L-F) |
|-----------------|-------------------|------------------|-------------------|-------------------|
| <i>Constant</i> | -0.3108(-3.88)*** | -0.2166(-2.15)** | -0.0287(-2.79)*** | |
| <i>CFK</i> | 0.6033(18.71)*** | 0.6673(13.31)*** | 0.4828(11.27)*** | -0.1845(-2.73)*** |
| <i>Q(-1)</i> | 0.0020(0.32) | -0.0118(-1.33) | 0.0220(2.42)** | 0.0338(2.66)*** |
| Obs. (firms) | 7247(462) | 3323(411) | 3086(461) | |
| Adj. R sq. | 0.1892 | 0.2546 | 0.1338 | |

Note: *** (** and *) denotes statistical significance at the 1% (5% and 10%) level.

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