Investment of private firms and the stock price of public industry peers

Hee Jung Choi [a], Dong Wook Lee [a,*]

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Abstract

This paper examines how the stock price of publicly traded firms is related to the investment decisions made by private firms in the same industry. As a readily observable measure of common economic fundamentals, the stock price of public firms can help private firms learn about their growth options and it can also facilitate their capital-raising by helping communicate with outside capital providers. Using data from Korea for the period of 2000-2013, we find that private firms invest more, the higher is the stock-market valuation of their public industry peers. Such a positive relationship is more pronounced when the cashflows of private firms are negative and the public peers are limited to a group of small-sized companies that are particularly comparable to private firms—namely, the KOSDAQ-listed companies. We also find that the external capital-raising by private firms is positively related to the stock price of public peers, especially to the stock price of the KOSDAQ-listed peers and when the cashflows of private firms are negative. Our results are consistent with the notion that, when private firms lack internal funds and need to raise funds externally, the stock-market valuation of related public companies facilitates their capital-raising by making available relevant information to outside capital providers. We find only limited support for the learning channel.

Keywords: Private firms; Public industry peers; Stock price; Investment; Korea

JEL classification: G14; G31; G32

[a] Korea University Business School (KUBS), Seoul, Korea 136-701

[*] Corresponding author. Professor of Finance, Korea University Business School. Address: 523 Hyundai Motors Hall, Korea University Business School, An-am, Seong-buk, Seoul, Korea 136-701; Tel.: + 82.2.3290.2820; Email: donglee@korea.ac.kr (all lower case).

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1. Introduction

This paper examines how the stock price of publicly traded firms is related to the investment decisions of private firms in the same industry. Given the allocational role of stock price in an economy (e.g., Hayek 1945; Leland 1992; Dow and Gorton 1997; Subrahmanyam and Titman 1999, 2001; and Dow and Rahi 2003), it is important to understand whether it also has any influence on private firms and, if so, how the observed effects arise. As an economy is typically populated disproportionately more by private firms than by public firms, the investment decisions of private firms is by itself an important topic. True, that a given private firm is small in size. However, the large number of private firms in the economy makes them economically relevant as a whole. In this paper, we examine whether and how those private firms are affected by the stock price of their public industry peers.

We focus on the role of public-firm stock price because it can serve as a readily observable measure of economic fundamentals not only for the public firms themselves but also for other companies—including private firms—in them same industry. It is thus expected that the investment decisions of private firms are positively related to the stock price of public industry peers (Tobin 1969).[1] However, such a positive relationship does not necessarily mean that the public-firm stock price plays any active role in the investment decisions of private firms. It could be that the growth options of private firms are correlated with those of public firms, the latter of which is reflected in their stock prices. In this paper, we consider—and seek empirical evidence of—more active roles of public-firm stock price in the investment of private companies.

Specifically, we consider the learning channel and the facilitated-funding channel. The learning channel holds that private firms learn about their growth options from the stock price of their industry peers. The facilitated-funding channel, on the other hand, is that the readily observable stock price of public peers helps private firms communicate their growth opportunities with outside

[1] Foucault and Fresard (2014) also report such a positive relationship between public-firm stock price and private-firm investment, using the pre-IPO data of public firms.

investors, thereby mitigating information asymmetries and facilitating external capital-raising. Each channel has been put forth and tested by prior studies in the own-firm setting,[2] and they are distinguishable by the direction of information asymmetries. The learning channel is premised on financial markets knowing something that the company does not know, whereas the funding channel is made plausible when the company knows more than outside investors.

Applying this notion to our other-firm setting, we make the following empirical predictions. First, the learning channel is particularly plausible when the stock price of public industry peers is informative. Furthermore, given that it is the price of other (albeit related) firms, the information that private firms learn from it is likely to be industry-wide or market-wide. Thus, the learning channel is more likely with the "bellwether" stocks, such as large-firm stocks, that can inform private firms of the "state of the world." In sharp contrast, the facilitated-funding channel requires comparability between private firms and public industry peers. In this channel, private firms already know what growth options are available and they only need to communicate those opportunities with outside investors. Thus, the "flagship" stocks for the industry won't help much. Instead, the stock price of relatively smaller—and thus more comparable—public firms will be useful in convincing outside investors that the company has good investment opportunities.[3] Another set of empirical predictions is that the learning channel is likely when private firms lack their own sources of information, whereas the facilitated-funding channel is reasonable when private firms lack internal funds and need to raise capital externally. In evaluating those empirical implications, we carefully exclude the "spurious" effect with which the public-firm stock price is simply correlated with the unobservable growth options of private firms.

[2] See, e.g., Durnev, Morck, and Yeung (2004), Luo (2005), or Chen, Goldstein, and Jiang (2007) for the learning channel. For the funding channel, see Baker, Stein, and Wurgler (2003) or Polk and Sapienza (2009). Foucault and Fresard (2014) examine the learning channel in the other-firm context, but their focus is not private firms.

[3] For example, a loan officer who is scrutinizing the loan application from a private firm is likely to refer to the stock price of similar-sized public firms in the industry rather than the industry's flagship companies.

Our study is made possible by a rich dataset for private firms in Korea. In 1998, the Korean government had required all companies whose total assets are worth at least 7 billion Korean won to be externally audited, thereby making their financial information publicly available; later in 2009, this cutoff was raised to 10 billion Korean won.[4] As a result, the database provides financial information of more than 14,000 private firms together with approximately 1,500 public firms in a given year during our study period of 2000-2013. The Korean database also uniquely provides the full identity of private firms, unlike the U.S. datasets in which financial information of private firms is anonymous (see, e.g., Asker, Farre-Mensa, and Ljungqvist (2014)). In addition, the Korean stock market has two distinct groups of public firms, one of which consists of large and well-established—i.e., "bellwether"-type—public firms (listed on the KOSPI market) and the other of which is composed of small and less well-known—and thus more comparable to private firms—companies (listed on the KOSDAQ market). The two groups can thus serve as a natural measure of the stock price informativeness and the similarity between public and private firms.

We find that private firms invest more, the higher is the stock-market valuation—as measured by the q-ratio—of their public industry peers. This positive relationship between private-firm investment and public-firm stock price is remarkably robust, as it survives many modifications to our empirical specification. Interestingly, the positive relationship is particularly strong with an equally weighted portfolio of public peers than with the value-weighted portfolio. Equally notable is the finding that the positive relationship is more pronounced with the KOSDAQ-listed peers than with the KOSPI-listed ones. The two patterns combined suggest that the stock price of the similar-sized—i.e., small—public peers is more relevant for the investment decisions of private firms than that of large, flagship-type public companies.

We examine the public-private firm similarity more directly by computing their cashflow correlation and then analyzing the sub-samples sorted by the correlation. We find that the

[4] To put the size cutoff in perspective, note that the new cutoff level of 10 billion Korean won corresponds to the bottom 0.5 percentile of all publicly traded firms in Korea as of the end of year 2008.

investment-stock price relation strengthens with the correlation. However, the stronger investment-stock price relation with higher cashflow correlation is found only with the KOSPI-listed peers. With the KOSDAQ-listed peers, the investment-stock price relation is always positive and significant.

To further test the learning and the facilitated-funding hypotheses, we create different sets of sub-samples. First, we construct sub-samples sorted by the volatility of cashflows. The rationale for this analysis is that with volatile cashflows—that is, with a noisy measure of growth options for private firms, learning from the stock price of their public peers is more likely. We find that the relation between private firms' investment and public industry peers' stock price is more pronounced when the private firms' cashflows are more volatile. Moreover, this pattern is observed both with the KOSPI-listed and the KOSDAQ-listed peers. However, the difference between the low- and high-cashflow volatility groups is very small in magnitude.

Alternatively, we construct the sub-samples sorted by the sign of cashflows. The idea is that with negative cashflows, companies are forced to raise capital externally and that is the time when the facilitated-funding effect is relevant. Consistent with this hypothesis, we find that the private-firm investment and public-firm stock price are much more strongly associated with each other when the private firms' cashflows are negative. Interestingly, this pattern is observed only with the KOSDAQ-listed peers; with the KOSPI-listed peers, the pattern is the opposite. The different results with the KOSPI- listed peers mean that the KOSPI peers' stock price is more related to the investment of private firms when those private firms receive their own signal about their growth options (i.e., positive cashflows). Thus, it is likely that the observed relation is due to the correlated growth options.

We take a closer look at the facilitated-funding channel by directly examining the funding activities of private firms and their industry peers. We find that private firms rely on internal funds and external debt, with the least use of external equity funds, and that the debt financing of private

firms is highly correlated with that of public firms. When we regress the debt financing of private firms on the stock price of industry public peers, the relation turns out to be significant and positive. More importantly, this association is found only with the KOSDAQ-listed peers and when the private firms' cashflows are negative. The result is also stronger with the debt financing than with the equity financing.

Overall, our results are consistent with the facilitated-funding hypothesis, namely, that when private firms lack internal funds and need to raise capital externally, the existence of stock-market valuation of similar public peers facilitates their capital-raising. However, the support for the learning hypothesis is at best weak.

This paper proceeds as follows. Section 2 describes our sample and data. Section 3 reports the empirical results and Section 4 concludes the paper.

2. Sample and data

We begin with all non-financial firms in the FnGuide database. Those non-financial firms include companies that are delisted at some point in time. Hence, there is no survivorship bias. We then drop the firm-year observations whose total assets are missing or negative during the 2000-2013 period. We also carefully exclude any remaining investment trusts and public enterprises from our sample (by dropping firms with no corporation identification code and those whose industry classification is missing and whose industry code is "K" or "O" or "Q").[5] We also clean up a small number of duplicate observations for a given firm-year. As a result, we end up 224, 957 firm-year observations for the period from 2000 to 2013. Of those firm-year observations, approximately 90% (203, 565) are private firms. Not surprisingly, the typical asset size of a private firm is about one tenth of a public firm. However, aggregately, private firms are comparable to public firms. To be more precisely, the aggregate assets under the management of private firms is

[5] The detailed information about the three sectors is as follows. K: financials & insurance companies; O: Public administration, national defense & social security administration; Q: Public health & social welfare.

approximately 842 trillion Korean won, whereas those under the control of public firms is 967 trillion Korean won. To conduct the analysis, we require a private firm to have at least one public industry peer. This requirement reduces the dataset down to 153,850 firm-year observations. In the final dataset, we have 9,504 private firms and 1,485 public firms in a given year.

The industry distribution is not so different between private and public firms. The majority of private and public firms are in the manufacturing sector (Korean industry code "C"). While the real estate management sector is almost entirely composed of private firms, private firms are similarly distributed over other sectors to public firms. When we require private firms to have at least one public industry peer, the distribution of private firms across sectors remains similar.

Table 1 show that private firms are much smaller than public firms, in general. However, there are a larger number of private firms in the economy (and in our sample); consequently, the aggregate size is comparable between public and private firms. The same set of statements can be made for corporate investment. That is, while a given private firm invests much less than a typical public firm, the aggregate investment by private firms is nearly comparable to that of public firms as a whole. Another observation meriting our attention is the size and capital expenditure of the KOSDAQ-listed firms. On average, they are similar both in size and in capital expenditure to private firms. Aggregately, however, KOSDAQ firms account for a much smaller fraction of the economy that the entire private-firm group.

3. Empirical results

3.1. Baseline result

We examine the relationship between the investment of private firms and the stock price of their public industry peers by estimating the following regression:

$$\frac{I_{i,t}}{A_{i,t-1}} = \frac{CF_{i,t-1}}{A_{i,t-1}} + \ln(A_{i,t-1}) + Q_{peer,t-1} + \frac{CF_{peer,t-1}}{A_{peer,t-1}} + \ln(A_{peer,t-1}) + f_i + y_t + \varepsilon_{i,t}, \qquad (1)$$

where $I_{i,t}$ is the capital expenditure of firm i during year t, $CF_{i,t}$ is the cashflow—i.e., operating income plus depreciation—of firm i at the end of year t, and $A_{i,t}$ is the total assets of firm i at the end of year t. The variables for "peer", such as $A_{peer,t}$, are either equally or value weighted portfolio of the same-industry peers whose stocks are publicly traded. We require at least one publicly traded industry peer, using the narrowest industry classification (KSIC 5-digit codes). Q is computed as the ratio of: total assets minus book value of equity plus market value of equity, to total assets. The capital expenditure is the sum of the cashflow-statement items that are associated with changes in tangible assets, intangible assets, and real estates. When those items are missing, we treat it as zero. Finally, f and y are respectively firm and year fixed-effects.[6]

Table 2, Panel A, reports the summary statistics of the regression variables and Panel B reports the regression results. We find that the q-ratio of public industry peers is significantly and positively related to the investment by private firms. We also find that the equally weighted q-ratio of public industry peers is more strongly related to the private-firm investment than the value-weighted q-ratio. Other variables carry the usual signs. For example, the coefficient for the own-cashflow is positive, while that of the own-size variable is negative. Interestingly, the cashflow and size of public industry peers do not enter the regression significantly.

To ensure robustness of the earlier results, we make several changes to the regression specification. First, we drop real estate when computing the capital expenditure amount, since the real estate item we use is defined "for investment purposes" in the database we use. Second, we use as the dependent variable the changes in properties, plants, and equipments item plus depreciation: hence we substitute the balance-sheet variable for the cashflow-statement variable. Third, we include the capital expenditure of public industry peers to the regression to control for (spuriously) correlated investment between public and private firms. Fourth, we exclude from our sample the companies that belong to a business group (as identified by the Korean Fair Trade Commission).

[6] We do not include sales growth rate in the regression because the introduction of the International Financial Reporting Standards (IFRS) in 2009 makes the sales data difficult to compare across years.

Finally, we focus on manufacturing firms or service-industry firms, two of the largest industry sectors in our sample.

Across those alternative specifications, the q-ratio of public industry peers continues to enter the regression with a significant and positive coefficient. Other regression variables remain mostly unchanged, with two notable exceptions. One is that the coefficient for the own-cashflow is different between the manufacturing sector and the service sector, and the other is that the size of public peers is positively relate to the private-firm investment in the manufacturing sector, whereas the pattern is the opposite in the service sector—i.e., the smaller are the public industry peers, the more private firms spend on their capital expenditure. Those patterns are consistent with the notion that public and private firms work in a supplier-customer relationship in the manufacturing sector, while they do not (and perhaps compete with each other) in the service sector. At any rate, the q-ratio of public industry peers enters the regression with a significant and positive coefficient in each sector.

3.2. Links between private-firm investment and public-firm stock price

To examine the possible channels through which the stock price of public industry peers plays an active role in the investment decisions of private firms, we conduct the following analyses. First, we repeat the analysis with KOSPI-listed or KOSDAQ-listed peers only. Second, we compute the cashflow correlation between private firms and public peers and repeat the analysis only with the low- correlation group or with high-correlation group. Third, we substitute cashflow volatility for cashflow correlation. Finally, we divide the sample into two groups by the sign of private firms' cashflows, and we repeat the sub-sample analysis. Below we offer the motivation for each analysis and report their results.

3.2.1. KOSPI- vs. KOSDAQ-listed peers

In Section 2, we have seen that private firms are more comparable to KOSDAQ firms than to KOSPI firms. At the same time, however, it is also widely—and rightly—believed that the stock valuation is noisier for those KOSDAQ firms than for the KOSPI firms. In general, it must be the case that private firms pay more attention to and learn from the stock price of their public peers when the price is less noisy. However, when it comes to the communication with outside capital providers, the tradeoff between the inter-firm comparability and the stock-price precision might be different. In evaluating a private firm for capital provision purposes, outside investors might well put more emphasis on the comparability than on the precision because the latter serves as information. That is, the noisy stock valuation of KOSDAQ peers is the very measure of their credit risks and the risks of similar firms. On these grounds, we conjecture that the learning channel is more likely with KOSPI-listed peers but the facilitated-funding channel is better at work with KOSDAQ peers.

Table 3 reports the results. We find that the q-ratio of KOSDAQ-listed peers plays a more important role in the private-firm investment than the q of KOSPI peers. When we examine the manufacturing sector and the service sector separately—while maintaining the KOSPI-only or the KOSDAQ-only setting, we find that the q-ratio of KOSPI peers is significant in the manufacturing sector but not in the service sector. In contrast, the q ratio of KOSDAQ peers enters the regression in both sectors. We also consider a different set of sub-samples, namely, that a group of private firms that only have KOSPI-listed peers and another group of private firms with KOSDAQ-listed peers alone. We find that, while the q-ratio is always significant, the economic importance of KOSDAQ peers' q-ratio is twice as large as that of KOSPI peers.

3.2.2. Cashflow correlation

Compared to the KOSPI vs. KOSDAQ analysis, the cashflow-correlation analysis can more directly speak to the competition/collaboration relationship between private and public firms. More

specifically, a negative correlation would imply that private firms compete with public firms, whereas a positive correlation points to the two groups of firms collaborating possibly in a customer-supplier relationship. This analysis thus puts the earlier KOSPI/KOSDAQ results into perspective, since the customer-supplier relationship is more likely with large KOSPI-listed peers than with small KOSDAQ peers. Thus, we particularly expect the q-ratio of KOSPI peers to be sensitive to the cashflow correlation: that is, the q-ratio is more significant when the cashflows are highly and positively correlated. Even without the collaboration, the high cashflow correlation can ensure the relevance of KOSPI firms for private firms; otherwise, much-larger and well-established KOSPI firms would be irrelevant for private firms. Regarding KOSDAQ firms, their cashflow correlation may or may not matter, since they are already similar in other dimensions (i.e., size and industry) and they potentially compete with each other.

The results are in Table 4. We find that the q-ratio of public industry peers is more significant, the higher is the cashflow correlation. Interestingly, this pattern is more pronounced when we limit public peers to those listed in KOSPI. However, the economic importance appears to be marginal, since, for example, the coefficient for the equally weighted q-ratio changes from 0.0083 to 0.0104 to 0.0114, from the bottom to top tercile. With a value-weighted q-ratio, the pattern is somewhat clearer (from 0.0024 to 0.0041 to 0.0078), further confirming that the high cashflow correlation guarantees similarity between private firms and KOSPI firms. In stark contrast, the q-ratio of KOSDAQ peers is always significant and positive, with little change in the magnitude of the coefficient across the sub-samples. Again, this result indicates that KOSDAQ firms are related to private firms regardless of their cashflow correlation.

3.2.3. Cashflow volatility

This measure is intended to capture the noisiness of private firms' own signal about their growth options, since the recent studies suggest that the cashflow can serve as a proxy for growth

options. With rather stable cashflows, private firms may be able to figure out their own growth opportunities. In the same spirit, volatile cashflows mean a noisy signal and thus private firms have greater incentive to learn from other sources, such as the stock price of their public industry peers.

Table 5 reports the results. We find that the q-ratio is more significant, the more volatile are the cashflows of the private firm. Unlike the earlier cashflow correlation analysis, the pattern is observed both with KOSPI peer and with KOSDAQ peers and it is relatively more pronounced with the KOSDAQ sub-sample. What is troubling, however, is that the coefficient for the own-cashflow is insignificant when the cashflow volatility is *low*, particularly when we focus on KOSDAQ peers. To the extent that the own-cashflow is the private firm's own signal of growth options, this result means that private firms pay less attention to their own signal when the signal is reliable. With the KOSPI sub-sample, on the other hand, the own-cashflows is more important when the cashflow is less volatile. Overall, the results suggest that the learning channel is at work with the KOSPI-listed peers but not with the KOSDAQ-listed peers.

3.2.4. Negative vs. positive cashflows

Cashflows are also a measure of internal funds available for capital expenditure. Negative cashflows mean that the company has few internal funds and thus need to raise capital in outside capital markets. Thus, this effect speaks to the facilitated-funding channel. Given that the q-ratio of KOSDAQ peers is significantly but is not well suited for the learning channel, we pay particular attention to the KOSDAQ group in this facilitated-funding channel. Positive cashflows, on the other hand, can be a good signal about the private firm's growth options. Thus, if the q-ratio of public peers turns out to be significant in the positive-cashflow case, then it would be an indication that the result is stemming from the correlated growth opportunities between public and private firms without any directional influences.

Table 6 shows a dramatic difference between the KOSPI and the KOSDAQ sub-samples. With KOSPI-listed peers, the q-ratio is significant only when the cashflows of private firms are positive. However, in the KOSDAQ-peer sub-sample, the q-ratio is much more significant when the cashflows are negative (although the q-ratio is significant in the positive-cashflow case). Hence, the results lend support to the facilitated-funding channel. However, our results do not support the learning channel: most of the KOSPI-related results are likely to be due to the correlated growth opportunities.

3.3. Direct evidence of facilitated-funding channel

We now seek more direct evidence for the facilitated-funding channel. To this end, we first examine the sources of funds for our sample firms. Specifically, we examine the internal funds, external debt funds, and external equity funds. Those variables are computed using the balance-sheet items, as in Chen and Chen (2012). Specifically, the debt capital is the change in total debt, the equity capital is the change in total equity, which is the change in: the sum of common stock, capital surplus, and preferred stocks, minus capital surplus.

Table 7 first reports the summary statistics of those funds. As might be expected, the internal funds are the main source of funds for private firms, followed by debt funds and then by equity funds. While this is also the case for the large KOSPI-listed firms, KOSDAQ firms show a different patter: they use equity funds the most and utilize internal funds the least. Figure 1 then shows that external capital-raising is similar between public and private firms and this correlation is particularly pronounced for the debt capital raising by private firms and by KOSDAQ-listed peers. It is also interesting to see that the equity financing is very distinct with KOSDAQ firms but their debt financing show similar patterns with that of private firms.

To directly examine the facilitated-funding channel, we estimate the following regression:

$$\frac{funds_{i,t}}{A_{i,t-1}} = \frac{CF_{i,t-1}}{A_{i,t-1}} + \ln(A_{i,t-1}) + Q_{peer,t-1} + \frac{CF_{peer,t-1}}{A_{peer,t-1}} + \ln(A_{peer,t-1}) + f_i + y_t + \varepsilon_{i,t}, \quad (2)$$

where $funds_{i,t}$ is the external debt or equity funds raised by firm *i* during year *t*,. Other variables are the same as in Eq. (1).

Table 8 shows the results. First, Panel A shows that private firms' external capital raising—both debt and equity financing—is significantly and positively related to the q-ratio of public industry peers. In Panels B and C, we separately examine the KOSPI peers (Panel B) and the KOSDAQ peers (Panel C). The q-ratio of the industry peers is slightly stronger with the KOSPI peers. However, the difference is only nuanced.

We examine the data from a different angle. Specifically, we divide the sample into two groups by the sign of private firms' cashflows. Panels A1-1 and 1-2 are the results using all public industry peers (KOSPI and KOSDAQ). While the q-ratio is significant in all sub-samples, the magnitude is noticeably larger in the negative cashflow sub-sample. In Panels B1-1 and 1-2, we examine only the KOSPI peers. Overall, the statistical significance of the q-ratio weakens and this weakening pattern is more pronounced in the negative cashflow sub-sample and for the debt financing. Even in the positive cashflow sub-sample, the q-ratio enters the regression significantly only when the dependent variable is the equity funds. Panels C1-1 and 1-2 show that the capital-raising by private firms is significantly and positively related to the KOSDAQ peers. This pattern is stronger when the private firms' cashflows are negative.

Overall, our results lend strong support to the facilitated-funding channel, namely, that when private firms lack internal funds and need to raise funds externally, the stock-market valuation of related public companies facilitates their capital-raising by making available relevant information to outside capital providers.

4. Conclusions

In this paper, we examine how the investment decisions of private firms are affected by the stock price of their public industry peers. Using data from Korea for the period of 2000-2013, we find that private firms invest more, the higher is the stock-market valuation of their public industry peers. Such a positive relationship is more pronounced when the cashflows of private firms are negative and the public peers are limited to KOSDAQ-listed companies, a group of small-sized public companies that are more comparable to private firms. We also find that the external capital-raising by private firms is positively related to the stock price of public peers, particularly to the stock price of the KOSDAQ-listed peers and when the cashflows of private firms are negative.

Given our results, it is crucial to maintain and enhance the stock price informativeness in public markets, especially in the exchanges where relatively smaller companies are listed. As private firms are also small in size, their investment decisions are affected specifically by the stock prices of the similarly small firms listed in the public exchange. Consequently, this public market can send out a shock—be it good or bad—that can reverberate across the entire economy through private firms.

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Table 1 Basic properties of Korean firms

The table presents basic properties of entire and our sample data. It provides average figures of yearly average number of firms, firm size, and investments. The sample consists of nonfinancial firms listed on the KOSPI or KOSDAQ market of the Korea Exchange (KRX), or private companies which disclose their financial statements. Our sample period is 2000-2013. We drop firm-year observations without total assets or corporate registration number. We also exclude firms in financial and insurance activities (industry K), public administration and defense; compulsory social security (industry O), or human health and social work activities (industry Q) by KSIC industry classification to be included in the entire data. Our final sample further requires firm-years to have valid record of our key variables used in this study. We winsorized our firm size variable (total assets in billion won) at the 1st and 99th percentiles.

(₩billion)

	Entire data				Our sample			
	Private	Public	KOSPI	KOSDAQ	Private	Public	KOSPI	KOSDAQ
Number of firms	14,540	1,528	651	878	8,064	1,386	618	768
Average size	55.7	620.6	1,355.3	86.5	60.8	609.2	1,273.8	89.9
Median size	17.7	85.3	232.1	53.4	20.4	90.9	226.9	55.8
Aggregate size	842,319	966,670	888,466	78,204	512,577	867,603	795,874	71,729
Average Investments	3.2	34.8	75.3	5.4	3.0	33.1	68.8	5.5
Median investments	0.3	2.6	4.9	1.9	0.4	2.6	4.8	1.8
Aggregate investments	47,973	53,937	49,272	4,665	24,758	46,969	42,892	4,077

Table 2 Private investment-to-public price: private firm-years with public peers

The table describes median, mean (in square brackets) and standard deviation (in parentheses) for our private and public sample (Panel A), baseline regression results (Panel B), and robustness test results for the panel B specification (Panel C). Variables of the public peers are defined as the equally- or value-weighted (shaded) average values across private firm i's peers denoted with subscript –*i*), where public peers are defined as any of the public firm in the same industry using the KSIC5 industry classifications. Alternatively we define KOSPI (KOSDAQ) peers as any public firm listed in the KOSPI (KOSDAQ) market. We require our sample to have at list 1 public (KOSPI or KOSDAQ) peer listed in the market. In our baseline regression, the dependent variable is investment of private firm i (I_i), defined as capital expenditures calculated using statements of cash flows items divided by lagged value of total assets. CF is calculated as operating income plus depreciation over total assets. Size is log total assets. Q is defined as the total assets plus market value of common stocks less book value of common stocks scaled by total assets. We use lagged values of these explanatory variables. To perform robustness checks, we employee an alternative dependent variable (investment variable without investment-purposes real estate or investment as change in property plant and equipment + depreciation), add investments of public peers as an explanatory variable, use sample without business group firms, or use sub-samples which includes only firms in manufacturing (industry C) or others (defined as all industries other than agriculture, forestry and fishing, Manufacturing , Construction , and Transportation) by 1-digit KSIC industry classifications. The sample period is from 2000 to 2013. All specifications include firm and year fixed effects and cluster-robust standard errors are presented in brackets. We winsorize all variables at the 1st and 99th percentiles before estimating regressions. Symbols *, ** and *** indicate two-tailed significance at the 10%, 5% and 1% levels, respectively.

Panel A: Summary statistics

	Public		Private						
				Public peers		KOSPI peers		KOSDAQ peers	
				EW	VW	EW	VW	EW	VW
I_i	0.029	0.017	I_{-i}	0.035	0.036	0.024	0.027	0.039	0.040
	[0.052]	[0.059]		[0.046]	[0.051]	[0.032]	[0.039]	[0.054]	[0.058]
	(0.085)	(0.129)		(0.060)	(0.066)	(0.049)	(0.055)	(0.072)	(0.076)
CF_i lag	0.071	0.076	CF_{-i} lag	0.068	0.077	0.067	0.077	0.065	0.071
	[0.064]	[0.081]		[0.062]	[0.077]	[0.066]	[0.078]	[0.057]	[0.067]
	(0.103)	(0.109)		(0.062)	(0.067)	(0.062)	(0.068)	(0.076)	(0.079)
$Size_i$ lag	18.263	16.793	$Size_{-i}$ lag	18.405	18.732	19.079	19.412	17.983	18.183
	[18.513]	[17.019]		[18.619]	[19.250]	[19.244]	[19.828]	[18.016]	[18.201]
	(1.426)	(0.964)		(1.121)	(1.644)	(1.187)	(1.664)	(0.752)	(0.825)
Q_i lag	0.961		Q_{-i} lag	0.993	1.057	0.913	0.980	1.045	1.065
	[1.179]			[1.133]	[1.251]	[1.018]	[1.133]	[1.196]	[1.285]
	(0.748)			(0.515)	(0.637)	(0.434)	(0.558)	(0.597)	(0.713)
N	19,404	112,892	N	112,892	112,892	83,256	83,256	90,486	90,486

Panel B: Baseline results: public peers

CF_i lag	$Size_i$ lag	Q_{-i} lag	CF_{-i} lag	$Size_{-i}$ lag	Constant	Obs.	R^2	# of firm	Firm FE	Year FE	EW/VW
0.0937***	-0.0595***	0.0183***	0.0030	-0.0002	1.0701***	112,892	0.069	21,133	YES	YES	EW
[0.006]	[0.002]	[0.001]	[0.009]	[0.002]	[0.042]						
0.0941***	-0.0597***	0.0130***	-0.0020	-0.0008	1.0919***	112,892	0.068	21,133	YES	YES	VW
[0.006]	[0.002]	[0.001]	[0.009]	[0.001]	[0.034]						

Panel C: Robustness checks for baseline results

CF_i lag	$Size_i$ lag	Q_{-i} lag	CF_{-i} lag	$Size_{-i}$ lag	I_i	Constant	Obs.	R^2	# of firm	Firm FE	Year FE	Industry
1. Dependent variable without investment-purposes real estate												
0.0931***	-0.0596***	0.0184***	0.0030	-0.0002		1.0731***	112,892	0.069	21,133	YES	YES	ALL
[0.006]	[0.002]	[0.001]	[0.009]	[0.002]		[0.042]						
0.0935***	-0.0598***	0.0130***	-0.0019	-0.0008		1.0948***	112,892	0.068	21,133	YES	YES	
[0.006]	[0.002]	[0.001]	[0.009]	[0.001]		[0.034]						
2. Dependent variable as change in PPE + depreciation												
0.1130***	-0.0730***	0.0168***	0.0215**	-0.0020		1.3324***	112,892	0.074	21,133	YES	YES	ALL
[0.006]	[0.002]	[0.002]	[0.010]	[0.002]		[0.045]						
0.1133***	-0.0732***	0.0116***	0.0163	-0.0014		1.3346***	112,892	0.073	21,133	YES	YES	
[0.006]	[0.002]	[0.001]	[0.010]	[0.001]		[0.038]						
3. Add investments of public peers												
0.0939***	-0.0594***	0.0166***	-0.0010	0.0013	0.0773***	1.0396***	112,892	0.070	21,133	YES	YES	ALL
[0.006]	[0.002]	[0.001]	[0.009]	[0.002]	[0.011]	[0.041]						
0.0945***	-0.0595***	0.0112***	-0.0062	-0.0001	0.0770***	1.0734***	112,892	0.069	21,133	YES	YES	
[0.006]	[0.002]	[0.001]	[0.009]	[0.001]	[0.010]	[0.034]						
4. Without business group firms												
0.0948***	-0.0598***	0.0190***	0.0046	0.0004		1.0610***	110,015	0.069	20,754	YES	YES	ALL
[0.006]	[0.002]	[0.001]	[0.009]	[0.002]		[0.042]						
0.0951***	-0.0599***	0.0134***	0.0001	-0.0006		1.0902***	110,015	0.068	20,754	YES	YES	
[0.006]	[0.002]	[0.001]	[0.009]	[0.001]		[0.034]						

5. Manufacturing only or others only											
0.1687***	-0.0759***	0.0154***	-0.0061	0.0097***	1.1547***	62,513	0.08	11,013	YES	YES	Manufac-
[0.008]	[0.003]	[0.002]	[0.013]	[0.002]	[0.056]						turing
0.1700***	-0.0756***	0.0088***	-0.0021	0.0022*	1.2928***	62,513	0.079	11,013	YES	YES	
[0.008]	[0.003]	[0.001]	[0.012]	[0.001]	[0.048]						
0.0348***	-0.0628***	0.0192***	0.0001	-0.0053**	1.2435***	31,004	0.089	6,343	YES	YES	Others
[0.011]	[0.003]	[0.002]	[0.015]	[0.002]	[0.073]						
0.0348***	-0.0630***	0.0149***	-0.0115	-0.0044**	1.2400***	31,004	0.088	6,343	YES	YES	
[0.011]	[0.003]	[0.002]	[0.015]	[0.002]	[0.067]						

Table3. Private investment-to-public price: private firm-years with alternative definition of public peers

The table presents estimates for the baseline specification using alternative definition of public peers (KOSPI or KOSDAQ peers). Variables of the KOSPI (KOSDAQ) peers are defined as the equally- or value-weighted (shaded) average values across private firm i's peers (denoted with subscript *–i*), where KOSPI (KOSDAQ) peers are defined as any KOSPI (KOSDAQ) listed firm in the same industry using the KSIC5 industry classifications. We require our sample to have at list 1 KSE (KOSDAQ) peer listed in the market. Panel A reports baseline regression results using alternative definition of public peers. In panel B (C), we use a sub-sample with KOSPI (KOSDAQ) peers which includes only firms in manufacturing (industry C) or others (defined as all industries other than agriculture, forestry and fishing, Manufacturing , Construction , and Transportation) by 1-digit KSIC industry classifications. Since a private firm may have KOSPI (KOSDAQ) peers only or both, in panel D, we limit our sample to have KOSPI (KOSDAQ) peers only. The dependent variable is investment of private firm i (I_i), defined as capital expenditures calculated using statements of cash flows items divided by lagged value of total assets. CF is calculated as operating income plus depreciation over total assets. Size is log total assets. Q is defined as the total assets plus market value of common stocks less book value of common stocks scaled by total assets. We use lagged values of these explanatory variables. The sample period is from 2000 to 2013. All specifications include firm and year fixed effects and cluster-robust standard errors are presented in brackets. We winsorize all variables at the 1st and 99th percentiles before estimating regressions. Symbols *, ** and *** indicate two-tailed significance at the 10%, 5% and 1% levels, respectively.

Peers	CF_i lag	$Size_i$ lag	Q_{-i} lag	CF_{-i} lag	$Size_{-i}$ lag	Constant	R^2	# of firm	Firm FE	Year FE	R^2	Industry
Panel A: Alternative definition of public peers												
KOSPI	0.1043***	-0.0503***	0.0099***	0.0287***	0.0036**	0.8476***	83,256	0.056	15,568	YES	YES	ALL
	[0.006]	[0.002]	[0.002]	[0.010]	[0.002]	[0.041]						
	0.1049***	-0.0502***	0.0045***	0.0262***	0.0008	0.9042***	83,256	0.056	15,568	YES	YES	
	[0.006]	[0.002]	[0.001]	[0.010]	[0.001]	[0.036]						
KOSDAQ	0.0917***	-0.0653***	0.0143***	-0.0042	-0.0006	1.1829***	90,486	0.074	16,999	YES	YES	
	[0.006]	[0.002]	[0.001]	[0.008]	[0.002]	[0.048]						
	0.0916***	-0.0654***	0.0113***	0.0011	-0.0011	1.1968***	90,486	0.074	16,999	YES	YES	
	[0.006]	[0.002]	[0.001]	[0.008]	[0.002]	[0.043]						
Panel B: Manufacturing only or others only : KOSPI peers												
KOSPI	0.1667***	-0.0732***	0.0121***	0.0372***	0.0056**	1.1889***	49,261	0.078	8,410	YES	YES	Manufac-
	[0.009]	[0.003]	[0.003]	[0.013]	[0.002]	[0.060]						turing
	0.1682***	-0.0730***	0.0047**	0.0242*	0.0012	1.2763***	49,261	0.077	8,410	YES	YES	
	[0.009]	[0.003]	[0.002]	[0.012]	[0.001]	[0.053]						
	0.0593***	-0.0349***	0.0054*	-0.0142	0.0014	0.6283***	18,449	0.043	4110	YES	YES	Others
	[0.011]	[0.003]	[0.003]	[0.017]	[0.003]	[0.073]						
	0.0592***	-0.0346***	0.0019	-0.0065	-0.0013	0.6814***	18,449	0.042	4,110	YES	YES	
	[0.011]	[0.003]	[0.002]	[0.017]	[0.002]	[0.072]						

Panel C: Manufacturing only or others only : KOSDAQ peers												
KOSDAQ	0.1693***	-0.0810***	0.0120***	-0.0221*	0.0086***	1.2679***	52,144	0.082	9,558	YES	YES	Manufac-
	[0.009]	[0.003]	[0.002]	[0.012]	[0.002]	[0.062]						turing
	0.1694***	-0.0808***	0.0080***	-0.0069	0.0035*	1.3576***	52,144	0.082	9,558	YES	YES	
	[0.009]	[0.003]	[0.001]	[0.012]	[0.002]	[0.056]						
	0.0211	-0.0829***	0.0131***	-0.0016	-0.0042	1.5922***	23,066	0.111	4,499	YES	YES	Others
	[0.014]	[0.004]	[0.002]	[0.016]	[0.003]	[0.095]						
	0.0207	-0.0831***	0.0116***	-0.0000	-0.0037	1.5887***	23,066	0.111	4,499	YES	YES	
	[0.014]	[0.004]	[0.002]	[0.015]	[0.003]	[0.092]						
Panel D: KOSPI only or KOSDAQ only												
KOSPI	0.1012***	-0.0412***	0.0070**	0.0319*	-0.0004	0.7539***	22,406	0.044	5,142	YES	YES	ALL
only	[0.012]	[0.003]	[0.003]	[0.018]	[0.003]	[0.074]						
	0.1008***	-0.0414***	0.0064**	0.0383**	0.0012	0.7264***	22,406	0.044	5,142	YES	YES	
	[0.012]	[0.003]	[0.003]	[0.018]	[0.003]	[0.070]						
KOSDAQ	0.0598***	-0.0954***	0.0158***	-0.0022	-0.0029	1.7313***	29,636	0.109	6,293	YES	YES	
only	[0.013]	[0.004]	[0.002]	[0.015]	[0.003]	[0.093]						
	0.0598***	-0.0956***	0.0135***	0.0043	-0.0037	1.7506***	29,636	0.108	6,293	YES	YES	
	[0.013]	[0.004]	[0.002]	[0.014]	[0.003]	[0.090]						

Table4. Cash flows correlation subsample results

The table reports subsample results classified by cash flows correlation between private and public peers. To construct cash flows correlation subsamples, we calculate average cash flows of public (KOSPI or KOSDAQ) peers on a yearly basis. For each year-industry, we measure correlation coefficients between private and average value of public peers. Finally, for each year, we divide our sample into 3 subgroups by cash flows correlation. Variables of the public peers are defined as the equally- or value-weighted (shaded) average values across private firm i's peers (denoted with subscript *–i*), where public peers are defined as any of the public firm in the same industry using the KSIC5 industry classifications. Alternatively we define KOSPI (KOSDAQ) peers as any public firm listed in the KOSPI (KOSDAQ) market. We require our sample to have at list 1 public (KOSPI or KOSDAQ) peer listed in the market. Panel A (B or C) provides regression results using definition of peers as all public (KOSPI or KOSDAQ) peers. For each panel and subgroup, we denote mean value of cash flows correlation (in parentheses). The dependent variable is investment of private firm i (I_i), defined as capital expenditures calculated using statements of cash flows items divided by lagged value of total assets. CF is calculated as operating income plus depreciation over total assets. Size is log total assets. Q is defined as the total assets plus market value of common stocks less book value of common stocks scaled by total assets. We use lagged values of these explanatory variables. The sample period is from 2000 to 2013. All specifications include firm and year fixed effects and cluster-robust standard errors are presented in brackets. We winsorize all variables at the 1st and 99th percentiles before estimating regressions. Symbols *, ** and *** indicate two-tailed significance at the 10%, 5% and 1% levels, respectively.

CF correlation Subgroup	CF_i lag	$Size_i$ lag	Q_{-i} lag	CF_{-i} lag	$Size_{-i}$ lag	Constant	Obs.	R^2	# of firm	Firm FE	Year FE
Panel A: All public peers (CF correlation = 0.118)											
Low	0.0879***	-0.0730***	0.0178***	-0.0044	0.0038	1.2366***	30,687	0.088	4,685	YES	YES
(-0.483)	[0.011]	[0.003]	[0.003]	[0.017]	[0.002]	[0.072]					
	0.0890***	-0.0731***	0.0108***	-0.0037	0.0011	1.2989***	30,687	0.087	4,685	YES	YES
	[0.011]	[0.003]	[0.002]	[0.016]	[0.002]	[0.065]					
Median	0.0974***	-0.0522***	0.0180***	-0.0053	0.0015	0.9140***	39,279	0.06	4,686	YES	YES
(0.140)	[0.009]	[0.003]	[0.002]	[0.015]	[0.002]	[0.060]					
	0.0982***	-0.0523***	0.0123***	-0.0104	-0.0010	0.9679***	39,279	0.06	4,686	YES	YES
	[0.009]	[0.003]	[0.002]	[0.014]	[0.002]	[0.051]					
High	0.1004***	-0.0512***	0.0178***	0.0098	-0.0091**	1.0936***	32,853	0.063	4,685	YES	YES
(0.652)	[0.011]	[0.003]	[0.002]	[0.018]	[0.004]	[0.095]					
VW	0.0982***	-0.0520***	0.0153***	0.0029	-0.0030	0.9987***	32,853	0.063	4,685	YES	YES
	[0.011]	[0.003]	[0.002]	[0.018]	[0.002]	[0.066]					
Panel B: KOSPI public peers (CF correlation = 0.131)											
Low	0.0975***	-0.0592***	0.0083**	0.0278	-0.0003	1.0804***	22,569	0.066	3,456	YES	YES
(-0.474)	[0.012]	[0.004]	[0.003]	[0.020]	[0.003]	[0.082]					
	0.0970***	-0.0592***	0.0024	0.0190	0.0008	1.0654***	22,569	0.065	3,456	YES	YES
	[0.012]	[0.004]	[0.003]	[0.019]	[0.002]	[0.072]					

Median	0.1112***	-0.0451***	0.0104***	0.0375**	0.0033	0.7644***	28,968	0.055	3,456	YES	YES
(0.158)	[0.011]	[0.003]	[0.003]	[0.016]	[0.002]	[0.060]					
	0.1121***	-0.0449***	0.0041**	0.0264*	0.0004	0.8238***	28,968	0.054	3,456	YES	YES
	[0.011]	[0.003]	[0.002]	[0.015]	[0.002]	[0.053]					
High	0.1102***	-0.0458***	0.0114***	0.0130	0.0082**	0.6779***	24,297	0.052	3,456	YES	YES
(0.662)	[0.011]	[0.003]	[0.004]	[0.019]	[0.003]	[0.075]					
	0.1087***	-0.0454***	0.0078**	0.0262	0.0018	0.7947***	24,297	0.052	3,456	YES	YES
	[0.011]	[0.003]	[0.003]	[0.019]	[0.002]	[0.064]					
Panel C: KOSDAQ public peers (CF correlation =0.117)											
Low	0.0860***	-0.0833***	0.0141***	-0.0175	0.0048*	1.4037***	24,985	0.099	3,767	YES	YES
(-0.475)	[0.012]	[0.004]	[0.002]	[0.015]	[0.003]	[0.084]					
	0.0876***	-0.0835***	0.0107***	-0.0052	0.0025	1.4516***	24,985	0.098	3,767	YES	YES
	[0.012]	[0.004]	[0.002]	[0.015]	[0.002]	[0.080]					
Median	0.0960***	-0.0544***	0.0147***	-0.0058	0.0004	0.9761***	31,598	0.063	3,768	YES	YES
(0.146)	[0.011]	[0.003]	[0.002]	[0.013]	[0.003]	[0.068]					
	0.0958***	-0.0544***	0.0113***	0.0060	-0.0011	1.0068***	31,598	0.063	3,768	YES	YES
	[0.011]	[0.003]	[0.001]	[0.012]	[0.002]	[0.061]					
High	0.0987***	-0.0554***	0.0123***	-0.0053	-0.0119**	1.2193***	25,746	0.067	3,767	YES	YES
(0.656)	[0.012]	[0.003]	[0.002]	[0.018]	[0.005]	[0.108]					
	0.0981***	-0.0559***	0.0105***	-0.0110	-0.0085**	1.1696***	25,746	0.066	3,767	YES	YES
	[0.012]	[0.003]	[0.002]	[0.017]	[0.004]	[0.093]					

Table5. Cash flows volatility subsample results

The table reports subsample results classified by volatility of cash flows. We define cash flow volatility as standard deviation of cash flows of a firm during our sample period. For each year, we divide our sample into 2 subgroups by cash flow volatility. Variables of the public peers are defined as the equally- or value-weighted (shaded) average values across private firm i's peers (denoted with subscript *–i*), where public peers are defined as any of the public firm in the same industry using the KSIC5 industry classifications. Alternatively we define KOSPI (KOSDAQ) peers as any public firm listed in the KOSPI (KOSDAQ) market. We require our sample to have at list 1 public (KOSPI or KOSDAQ) peer listed in the market. Panel A (B or C) provides regression results using definition of peers as all public (KOSPI or KOSDAQ) peers. The dependent variable is investment of private firm i (I_i), defined as capital expenditures calculated using statements of cash flows items divided by lagged value of total assets. CF is calculated as operating income plus depreciation over total assets. Size is log total assets. Q is defined as the total assets plus market value of common stocks less book value of common stocks scaled by total assets. We use lagged values of these explanatory variables. The sample period is from 2000 to 2013. All specifications include firm and year fixed effects and cluster-robust standard errors are presented in brackets. We winsorize all variables at the 1st and 99th percentiles before estimating regressions. Symbols *, ** and *** indicate two-tailed significance at the 10%, 5% and 1% levels, respectively.

CF volatility Subgroup	CF_i lag	$Size_i$ lag	Q_{-i} lag	CF_{-i} lag	$Size_{-i}$ lag	Constant	Obs.	R^2	# of firm	Firm FE	Year FE
Panel A: All public peers											
CF volatility	0.0297*	-0.0879***	0.0149***	0.0231*	-0.0034	1.5905***	56,440	0.08	10,702	YES	YES
Low	[0.016]	[0.003]	[0.002]	[0.013]	[0.002]	[0.068]					
	0.0308*	-0.0883***	0.0112***	0.0127	-0.0011	1.5600***	56,440	0.08	10,702	YES	YES
	[0.016]	[0.003]	[0.002]	[0.013]	[0.001]	[0.059]					
CF volatility	0.0925***	-0.0444***	0.0196***	-0.0100	0.0030	0.7795***	56,452	0.07	10,431	YES	YES
High	[0.006]	[0.002]	[0.002]	[0.013]	[0.002]	[0.052]					
	0.0927***	-0.0444***	0.0139***	-0.0092	-0.0004	0.8500***	56,452	0.069	10,431	YES	YES
	[0.006]	[0.002]	[0.002]	[0.012]	[0.001]	[0.041]					
Panel B: KOSPI public peers											
CF volatility	0.1213***	-0.0714***	0.0093***	0.0465***	0.0016	1.2143***	40,440	0.060	7,677	YES	YES
Low	[0.016]	[0.003]	[0.003]	[0.014]	[0.002]	[0.066]					
	0.1226***	-0.0714***	0.0036*	0.0407***	0.0012	1.2274***	40,440	0.059	7,677	YES	YES
	[0.016]	[0.003]	[0.002]	[0.014]	[0.001]	[0.060]					
CF volatility	0.0939***	-0.0408***	0.0106***	0.0123	0.0057**	0.6676***	42,816	0.061	7,891	YES	YES
High	[0.007]	[0.002]	[0.003]	[0.014]	[0.002]	[0.054]					
	0.0945***	-0.0406***	0.0058***	0.0132	0.0007	0.7652***	42,816	0.061	7,891	YES	YES
	[0.007]	[0.002]	[0.002]	[0.014]	[0.002]	[0.046]					

Panel C: KOSDAQ public peers											
CF volatility	0.0087	-0.0946***	0.0114***	0.0067	-0.0034	1.7059***	45,336	0.088	8,596	YES	YES
Low	[0.018]	[0.004]	[0.002]	[0.012]	[0.003]	[0.077]					
	0.0095	-0.0947***	0.0088***	0.0036	-0.0036*	1.7149***	45,336	0.087	8,596	YES	YES
	[0.018]	[0.004]	[0.001]	[0.012]	[0.002]	[0.072]					
CF volatility	0.0933***	-0.0486***	0.0151***	-0.0111	0.0013	0.8928***	45,150	0.074	8,403	YES	YES
High	[0.007]	[0.002]	[0.002]	[0.012]	[0.003]	[0.062]					
	0.0927***	-0.0487***	0.0123***	0.0021	0.0009	0.9053***	45,150	0.074	8,403	YES	YES
	[0.007]	[0.002]	[0.001]	[0.011]	[0.002]	[0.052]					

Table6. Negative or nonnegative cash flows subsample results

The table reports subsample results classified by negative or nonnegative cash flows. Variables of the public peers are defined as the equally- or value-weighted (shaded) average values across private firm i's peers (denoted with subscript *–i*), where public peers are defined as any of the public firm in the same industry using the KSIC5 industry classifications. Alternatively we define KOSPI (KOSDAQ) peers as any public firm listed in the KOSPI (KOSDAQ) market. We require our sample to have at list 1 public (KOSPI or KOSDAQ) peer listed in the market. Panel A (B or C) provides regression results using definition of peers as all public (KOSPI or KOSDAQ) peers. The dependent variable is investment of private firm i (I_i), defined as capital expenditures calculated using statements of cash flows items divided by lagged value of total assets. CF is calculated as operating income plus depreciation over total assets. Size is log total assets. Q is defined as the total assets plus market value of common stocks less book value of common stocks scaled by total assets. We use lagged values of these explanatory variables. The sample period is from 2000 to 2013. All specifications include firm and year fixed effects and cluster-robust standard errors are presented in brackets. We winsorize all variables at the 1st and 99th percentiles before estimating regressions. Symbols *, ** and *** indicate two-tailed significance at the 10%, 5% and 1% levels, respectively.

Negative/ nonnegative CF Subgroup	CF_i lag	$Size_i$ lag	Q_{-i} lag	CF_{-i} lag	$Size_{-i}$ lag	Constant	Obs.	R^2	# of firm	Firm FE	Year FE
Panel A: All public peers											
Negative	0.1060***	-0.0706***	0.0338***	-0.0297	-0.0177***	1.6638***	20,890	0.119	9,333	YES	YES
	[0.020]	[0.004]	[0.005]	[0.029]	[0.007]	[0.144]					
	0.1069***	-0.0711***	0.0265***	-0.0495*	-0.0132***	1.6074***	20,890	0.117	9,333	YES	YES
	[0.020]	[0.004]	[0.004]	[0.030]	[0.004]	[0.112]					
Nonnegative	0.1099***	-0.0577***	0.0128***	0.0019	0.0051***	0.9336***	92,002	0.057	18,519	YES	YES
	[0.008]	[0.002]	[0.001]	[0.010]	[0.001]	[0.040]					
	0.1108***	-0.0577***	0.0085***	0.0015	0.0012	1.0088***	92,002	0.056	18,519	YES	YES
	[0.008]	[0.002]	[0.001]	[0.009]	[0.001]	[0.036]					
Panel B: KOSPI public peers											
Negative	0.0778***	-0.0443***	0.0036	-0.0549*	-0.0074*	1.0275***	15,292	0.062	6,889	YES	YES
	[0.021]	[0.004]	[0.006]	[0.028]	[0.004]	[0.108]					
	0.0775***	-0.0443***	0.0022	-0.0489	-0.0054	0.9933***	15,292	0.061	6,889	YES	YES
	[0.021]	[0.004]	[0.005]	[0.030]	[0.004]	[0.098]					
Nonnegative	0.1118***	-0.0553***	0.0089***	0.0351***	0.0051***	0.8932***	67,964	0.054	13,682	YES	YES
	[0.009]	[0.002]	[0.002]	[0.011]	[0.002]	[0.047]					
	0.1130***	-0.0551***	0.0034**	0.0295***	0.0015	0.9640***	67,964	0.053	13,682	YES	YES
	[0.009]	[0.002]	[0.002]	[0.011]	[0.001]	[0.042]					

Panel C: KOSDAQ public peers											
Negative	0.1121***	-0.0833***	0.0279***	0.0233	-0.0200**	1.9268***	15,483	0.139	7,061	YES	YES
	[0.023]	[0.005]	[0.005]	[0.031]	[0.009]	[0.184]					
	0.1119***	-0.0842***	0.0245***	0.0284	-0.0134*	1.8281***	15,483	0.138	7,061	YES	YES
	[0.023]	[0.005]	[0.004]	[0.031]	[0.007]	[0.163]					
Nonnegative	0.1149***	-0.0606***	0.0108***	-0.0112	0.0041***	1.0073***	75,003	0.06	15,161	YES	YES
	[0.009]	[0.002]	[0.001]	[0.009]	[0.002]	[0.044]					
	0.1151***	-0.0607***	0.0081***	-0.0065	0.0012	1.0609***	75,003	0.06	15,161	YES	YES
	[0.009]	[0.002]	[0.001]	[0.008]	[0.001]	[0.042]					

Table7. Funding pattern – summary statistics

The table represents funding pattern for the entire and our sample data. It provides average figures of yearly average number of firms, internal (cash flows) and external financing variables (ΔDebt and ΔEquity). Internal fund is defined as identical to our CF variable, operating income plus depreciation over total assets. Debt financing is defined as change in long-term debt scaled by lagged value of total assets, and equity financing is defined as change in commitment to equity plus capital surplus scaled by lagged value of total assets. The sample consists of nonfinancial firms listed on the KOSPI or KOSDAQ market of the Korea Exchange (KRX), or private companies which disclose their financial statements. Our sample period is 2000-2013. We drop firm-year observations without total assets or corporate registration number. We also exclude firms in financial and insurance activities (industry K), public administration and defense; compulsory social security (industry O), or human health and social work activities (industry Q) by KSIC industry classification to be included in the entire data. Our final sample further requires firm-years to have valid record of our key variables used in this study. We winsorize all variables at the 1st and 99th percentiles.

	Entire data				Our sample			
	Private	Public	KOSPI	KOSDAQ	Private	Public	KOSPI	KOSDAQ
Number of firms	14,540	1,528	651	878	8,064	1,386	618	768
Internal Fund (CF)	0.071	0.056	0.068	0.048	0.075	0.054	0.068	0.042
Debt Financing	0.054	0.044	0.017	0.067	0.057	0.040	0.018	0.063
Equity Financing	0.015	0.084	0.019	0.139	0.017	0.055	0.015	0.093

Table8. Funding regressions

The table presents estimates for robustness checks by adding financing variables. Variables of the public peers are defined as the equally- or value-weighted (shaded) average values across private firm i's peers (denoted with subscript *–i*), where public peers are defined as any of the public firm in the same industry using the KSIC5 industry classifications. We define KOSPI (KOSDAQ) peers as any public firm listed in the KOSPI (KOSDAQ) market. We require our sample to have at list 1 public (KOSPI or KOSDAQ) peer listed in the market. The dependent variable is investment of private firm i (I_i), defined as capital expenditures calculated using statements of cash flows items divided by lagged value of total assets. CF is calculated as operating income plus depreciation over total assets. Size is log total assets. Q is defined as the total assets plus market value of common stocks less book value of common stocks scaled by total assets. We use lagged values of these explanatory variables. Debt financing (ΔDebt) is defined as change in long-term debt scaled by lagged value of total assets, and equity financing (ΔEquity) is defined as change in commitment to equity plus capital surplus scaled by lagged value of total assets. We additionally include ΔDebt, ΔEquity or both of the variables to control external financing. Panel A (B or C) provides regression results using definition of peers as all public (KOSPI or KOSDAQ) peers. Panel A (B or C) 1 displays subsample results classified by negative or nonnegative cash flows for each definition of peers. The sample period is from 2000 to 2013. All specifications include firm and year fixed effects and cluster-robust standard errors are presented in brackets. We winsorize all variables at the 1st and 99th percentiles before estimating regressions. Symbols *, ** and *** indicate two-tailed significance at the 10%, 5% and 1% levels, respectively.

Dep. Var.	CF_i lag	$Size_i$ lag	Q_{-i} lag	CF_{-i} lag	$Size_{-i}$ lag	Constant	Obs.	R^2	# of firm	Firm FE	Year FE
Panel A: All public peers											
ΔDebt	0.0795***	-0.2209***	0.0179***	0.0907***	0.0178***	3.4034***	112,892	0.11	21,133	YES	YES
	[0.015]	[0.004]	[0.003]	[0.022]	[0.003]	[0.088]					
	0.0807***	-0.2206***	0.0129***	0.0668***	0.0109***	3.5292***	112,892	0.11	21,133	YES	YES
	[0.015]	[0.004]	[0.002]	[0.021]	[0.002]	[0.077]					
ΔEquity	-0.0142***	-0.0211***	0.0140***	0.0024	0.0027***	0.3439***	112,892	0.044	21,133	YES	YES
	[0.004]	[0.001]	[0.001]	[0.005]	[0.001]	[0.020]					
	-0.0137***	-0.0211***	0.0099***	-0.0031	0.0007	0.3865***	112,892	0.042	21,133	YES	YES
	[0.004]	[0.001]	[0.001]	[0.005]	[0.001]	[0.018]					
Panel B: KOSPI public peers											
ΔDebt	0.0989***	-0.2168***	0.0127***	0.1616***	0.0208***	3.2694***	83,256	0.106	15,568	YES	YES
	[0.018]	[0.005]	[0.004]	[0.025]	[0.004]	[0.105]					
	0.1011***	-0.2161***	0.0027	0.1160***	0.0130***	3.4146***	83,256	0.106	15,568	YES	YES
	[0.018]	[0.005]	[0.003]	[0.023]	[0.002]	[0.091]					
ΔEquity	-0.0107**	-0.0189***	0.0077***	0.0090	0.0020**	0.3190***	83,256	0.031	15,568	YES	YES
	[0.005]	[0.001]	[0.001]	[0.006]	[0.001]	[0.025]					
	-0.0103**	-0.0189***	0.0054***	0.0056	0.0006	0.3477***	83,256	0.031	15,568	YES	YES
	[0.005]	[0.001]	[0.001]	[0.006]	[0.001]	[0.021]					

Panel C: KOSDAQ public peers											
ΔDebt	0.1010***	-0.2219***	0.0135***	-0.0068	0.0195***	3.4104***	90,486	0.11	16,999	YES	YES
	[0.017]	[0.005]	[0.002]	[0.020]	[0.004]	[0.096]					
	0.1018***	-0.2219***	0.0097***	-0.0187	0.0159***	3.4789***	90,486	0.11	16,999	YES	YES
	[0.017]	[0.005]	[0.002]	[0.019]	[0.003]	[0.090]					
ΔEquity	-0.0165***	-0.0223***	0.0109***	-0.0036	0.0024***	0.3789***	90,486	0.043	16,999	YES	YES
	[0.005]	[0.001]	[0.001]	[0.005]	[0.001]	[0.023]					
	-0.0164***	-0.0224***	0.0082***	-0.0029	0.0019***	0.3926***	90,486	0.042	16,999	YES	YES
	[0.005]	[0.001]	[0.001]	[0.004]	[0.001]	[0.022]					

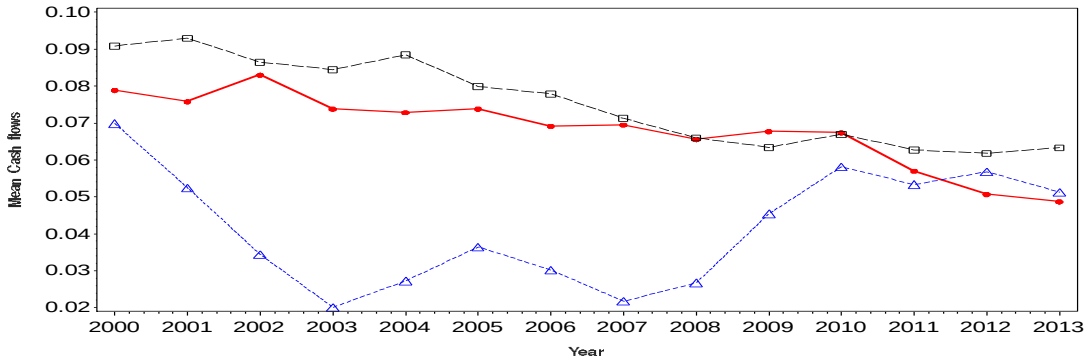
Dep. Var.	CF_i lag	$Size_i$ lag	Q_{-i} lag	CF_{-i} lag	$Size_{-i}$ lag	Constant	Obs.	R^2	# of firm	Firm FE	Year FE
Panel A 1-1: All public peers (Negatie CF subsample)											
ΔDebt	0.5022***	-0.2911***	0.0284***	0.2306***	0.0494***	4.2283***	20,890	0.166	9,333	YES	YES
	[0.063]	[0.011]	[0.011]	[0.081]	[0.012]	[0.271]					
	0.5010***	-0.2893***	0.0180**	0.2106**	0.0225**	4.7043***	20,890	0.165	9,333	YES	YES
	[0.063]	[0.011]	[0.009]	[0.082]	[0.009]	[0.237]					
ΔEquity	-0.0609***	-0.0247***	0.0266***	0.0135	0.0051	0.4084***	20,890	0.054	9,333	YES	YES
	[0.023]	[0.003]	[0.004]	[0.023]	[0.003]	[0.072]					
	-0.0607***	-0.0246***	0.0203***	-0.0101	0.0028	0.4603***	20,890	0.052	9,333	YES	YES
	[0.023]	[0.003]	[0.003]	[0.022]	[0.003]	[0.068]					
Panel A 1-2: All public peers (Nonnegatie CF subsample)											
ΔDebt	0.0118	-0.2256***	0.0115***	0.0239	0.0092***	3.6193***	92,002	0.109	18,519	YES	YES
	[0.018]	[0.005]	[0.003]	[0.021]	[0.003]	[0.091]					
	0.0131	-0.2255***	0.0080***	0.0085	0.0057***	3.6859***	92,002	0.109	18,519	YES	YES
	[0.018]	[0.005]	[0.002]	[0.019]	[0.002]	[0.082]					
ΔEquity	0.0128***	-0.0183***	0.0098***	-0.0009	0.0020***	0.3009***	92,002	0.04	18,519	YES	YES
	[0.004]	[0.001]	[0.001]	[0.005]	[0.001]	[0.021]					
	0.0132***	-0.0183***	0.0069***	-0.0017	0.0005	0.3335***	92,002	0.039	18,519	YES	YES
	[0.004]	[0.001]	[0.001]	[0.005]	[0.000]	[0.019]					
Panel B 1-1: KSE public peers (Negatie CF subsample)											
ΔDebt	0.5570***	-0.2901***	0.0133	0.2253***	0.0532***	4.1512***	15,292	0.163	6,889	YES	YES
	[0.072]	[0.013]	[0.016]	[0.084]	[0.016]	[0.363]					
	0.5578***	-0.2896***	-0.0003	0.2247***	0.0255**	4.6772***	15,292	0.162	6,889	YES	YES
	[0.072]	[0.013]	[0.013]	[0.084]	[0.011]	[0.303]					
ΔEquity	-0.0557**	-0.0188***	0.0114*	0.0192	0.0038	0.3065***	15,292	0.022	6,889	YES	YES
	[0.025]	[0.003]	[0.006]	[0.027]	[0.004]	[0.098]					
	-0.0559**	-0.0188***	0.0089*	0.0090	0.0018	0.3471***	15,292	0.022	6,889	YES	YES
	[0.025]	[0.003]	[0.005]	[0.027]	[0.003]	[0.082]					

Panel B 1-2: KSE public peers (Nonnegatie CF subsample)											
ΔDebt	0.0179	-0.2285***	0.0088**	0.0655***	0.0101***	3.6509***	67,964	0.11	13,682	YES	YES
	[0.022]	[0.005]	[0.004]	[0.025]	[0.004]	[0.112]					
	0.0202	-0.2282***	0.0016	0.0296	0.0082***	3.6878***	67,964	0.11	13,682	YES	YES
	[0.022]	[0.005]	[0.003]	[0.023]	[0.002]	[0.097]					
ΔEquity	0.0143***	-0.0168***	0.0067***	0.0048	0.0006	0.3029***	67,964	0.033	13,682	YES	YES
	[0.005]	[0.001]	[0.001]	[0.006]	[0.001]	[0.025]					
	0.0147***	-0.0168***	0.0046***	0.0025	0.0000	0.3150***	67,964	0.033	13,682	YES	YES
	[0.005]	[0.001]	[0.001]	[0.005]	[0.001]	[0.022]					
Panel C 1-1: KOSDAQ public peers (Negative CF subsample)											
ΔDebt	0.4601***	-0.2787***	0.0219**	0.1055	0.0517***	4.0057***	15,483	0.159	7,061	YES	YES
	[0.070]	[0.012]	[0.010]	[0.082]	[0.014]	[0.305]					
	0.4614***	-0.2774***	0.0147*	0.0692	0.0375***	4.2513***	15,483	0.159	7,061	YES	YES
	[0.070]	[0.012]	[0.009]	[0.080]	[0.013]	[0.289]					
ΔEquity	-0.0767***	-0.0289***	0.0240***	-0.0048	0.0056	0.4825***	15,483	0.061	7,061	YES	YES
	[0.027]	[0.003]	[0.004]	[0.025]	[0.004]	[0.086]					
	-0.0766***	-0.0290***	0.0204***	-0.0077	0.0060	0.4827***	15,483	0.061	7,061	YES	YES
	[0.027]	[0.003]	[0.003]	[0.023]	[0.004]	[0.082]					
Panel C 1-2: KOSDAQ public peers (Nonnegative CF subsample)											
ΔDebt	0.0417**	-0.2292***	0.0098***	-0.0119	0.0115***	3.6442***	75,003	0.113	15,161	YES	YES
	[0.019]	[0.005]	[0.002]	[0.019]	[0.003]	[0.096]					
	0.0424**	-0.2292***	0.0071***	-0.0200	0.0092***	3.6896***	75,003	0.113	15,161	YES	YES
	[0.019]	[0.005]	[0.002]	[0.018]	[0.003]	[0.092]					
ΔEquity	0.0102**	-0.0190***	0.0074***	-0.0039	0.0019**	0.3219***	75,003	0.038	15,161	YES	YES
	[0.005]	[0.001]	[0.001]	[0.004]	[0.001]	[0.024]					
	0.0102**	-0.0191***	0.0054***	-0.0036	0.0015**	0.3330***	75,003	0.037	15,161	YES	YES
	[0.005]	[0.001]	[0.001]	[0.004]	[0.001]	[0.023]					

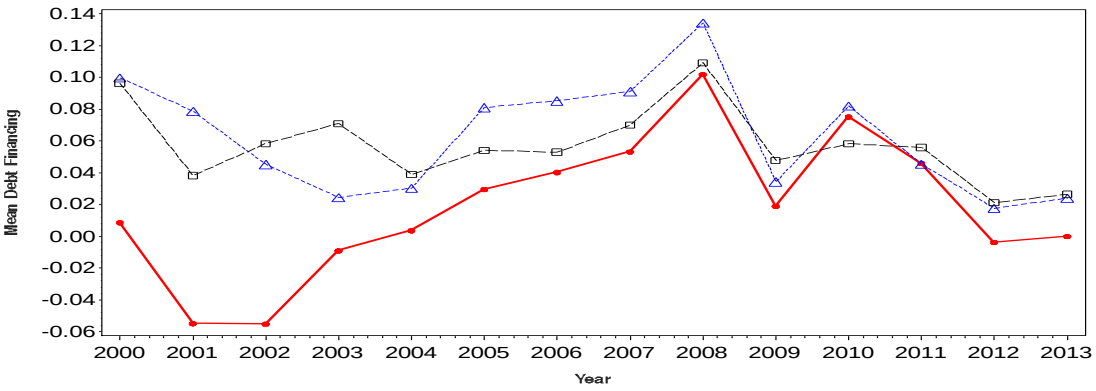
Figure1. Time trend of funding patterns

Figure1 plot the mean value of funding patterns of private (□), KOSPI(•), and KOSDAQ (△) firms. Figure A1 to A3 show time trend of internal fund (cash flows), and two components of external fund, debt financing and equity financing, respectively. Internal fund is defined as identical to our cash flows variable, operating income plus depreciation over total assets. Debt financing is defined as change in long-term debt scaled by lagged value of total assets, and equity financing is defined as change in commitment to equity plus capital surplus scaled by lagged value of total assets. We winsorize all variables at the 1st and 99th percentiles.

A1. Mean Cash flows over time



A2. Mean debt financing over time



A3 Mean equity financing over time